An Environmental Analysis and Design for Georgia Southern College

Wayne S. Lynn
AN ENVIRONMENTAL ANALYSIS AND DESIGN FOR GEORGIA SOUTHERN COLLEGE

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by
Wayne S. Lynn

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Approved by

Committee:

[Signatures]

Major Professor
Department Chairman

Dean, Graduate School

Daniel S. Dunn
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PREFACE

The idea for this thesis probably began in the author's mind over two years ago. Upon reading Ian McHarg's *Design with Nature*, the inspiration was planted and grew steadily into a desire to learn more about, and actually use, ecological planning methods.

The author is convinced that such an approach will characterize future planning and land development efforts. Although McHarg's methods were modified somewhat by more current literature, the spirit and rationale of the study were basically those of Ian McHarg.

In appreciation of the assistance provided in completing this thesis, the author acknowledges the great amount of assistance and advice rendered by several persons and organizations. These are indicated in the following list.

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It is important to the author that the help of Drs. Hickman, Huey, and Bishop and Mr. Turner be especially acknowledged. Of equal importance is the recognition of the tremendous job of typing done by the author’s wife, Carole, and the much needed assistance of their friend, Ann Marshall.
CHAPTER 1 - THE PROBLEM

The Introduction

The field of planning is one of the challenging techniques by which modern man seeks to harness new methods of implementation of ordered development and utilize technologies for furthering urban growth, economic development and redevelopment. People seek through the planning process to improve not only the physical but also the economic and social environment of the individual.

A good definition would be one which is found in Local Planning Administration (1959) and used by Herbert H. Smith (1969, p. 16).

The broad object of planning is to further the welfare of the people in the community by helping to create an increasingly better, more healthful, convenient, efficient and attractive community environment. The physical, as well as the social and economic community is a single organism, all features and activities of which are related and interdependent. These factors must be supplemented by the application of intelligent foresight and planned administration and legal coordination if balance, harmony and order are to be insured. It is the task of planning to supply this foresight and this over-all coordination.

Planning, in one form or another, has been in existence for quite a long time. It dates back to ancient military engineering and the castle-town constructions of medieval times. Efforts in the United States date
back to such examples as the plan of Savannah, Georgia by Oglethorpe and L'Enfant's design for Washington, D.C.

Smith (1969, p. 12) gives a brief synopsis of planning progress in the twentieth century United States. His description of the growth of planning is given in Appendix A.

Planning has continued to expand to meet newer and more complex challenges. One of the earmarks of the modern age is the synthesis of previously separate disciplines into new areas of study which give a much more realistic appraisal of the actual world in which we live. The science of ecology is such a synthesis, a marriage of practically all disciplines which deal with the environment on earth.

The theories of planning are also a synthesis as they have begun to bring together the sciences of ecology, geology, anthropology, geography, psychology, sociology, and philosophy into a viable structure for use in analysis and design of problem situations. The trends of these developments tend to point toward the creation of a true science of environmental and social design. It is along these lines that this study will attempt to contribute.

The development of a design science as mentioned will incorporate the analysis techniques developed by the various contributing disciplines to provide a comprehensive, integrated panorama of data giving all critical
factors and relationships which govern the environmental setting—physically, ecologically, socially, visually, spatially, and aesthetically. With this overview in mind, the techniques of environmental design will synthesize the pertinent components into a congruent physical and perceptual whole.

Significance of this Study

The land bordering three of the four major boundaries of the Georgia Southern College campus has, in recent years, become increasingly commercialized and suburbanized. There is a distinct possibility that the fourth direction, the only one which presents opportunities for expansion, will soon undergo development and deny future expansion to the college.

The land surrounding the college is predominantly of medium and low density residential usage. There are outcroppings of commercialization and high density land use such as apartments. There are signs of the continued expansion of these trends to the point of eventually surrounding all property owned by the college.

For these reasons, it is imperative to plan for maximum land utilization of existing college property. Also, there is a great deal of importance to be placed on land usage which is compatible with the natural environment. There are natural-physical factors inherent
in the immediate environment which foster specific types of development and certain social processes.

A recurring theme which becomes apparent in a close study of the visual setting of the campus is the lack of a unifying element which tends to draw the visual elements together into a coherent whole. The area known as Sweetheart Circle probably served the purpose well at one time. However, the campus has grown southward and eastward from there and the activity patterns and lifestyles of most students rarely cross this portion of the campus. The "Circle" has therefore lost its importance in student life.

No new section or place (or system of places) on campus has replaced Sweetheart Circle as a nexus of student activity and a focal point of congregation and densified social experience. It is very important for the mental and social health of the college community that a system be developed to provide a visual environment to not only organize activity patterns for ordinary usage but to provide places for reflection and respite. These will draw the social processes of the college to a place where identity and pride in the school can develop. This system should integrate beauty and environment into the fabric of life at Georgia Southern and provide a more-rounded and intensified social atmosphere.

The significance of the problem becomes apparent
when all of the above mentioned factors are considered as subsystems of the major system which is the Georgia Southern College campus. According to modern systems theory, if any component subsystem is not in tune with the rest of its environment, then the entire parent system is unstable and does not function harmoniously. Upon examination of the several components described above it is apparent that disciplined design and planning is necessary for optimum development and future well-being of the college.

Statement of the Problem

The problem situation encountered in this study is one of rapid growth and expansion on and around the Georgia Southern College campus. As the supply of available land is limited, optimum development patterns and land uses are essential for the health of the college—financially, environmentally and aesthetically. It is the purpose of this study to determine the extent of present growth patterns and to analyze those factors and forces contributing to growth. From this analysis potentials for future growth and development will be outlined. Finally, the potential for rectification of present deficiencies will be identified.

In synopsis, the problem can be stated as follows: there is a demonstrated need for an analysis of the total
environmental system of the area around Georgia Southern College, and for the development of a comprehensive land use and environmental design plan for said area.

**Purpose of this Study**

It is stated that the purposes of this study are as follows:

1. to develop a suitable solution to the major problem which is stated as being the area of research for this thesis

2. the accomplishment of all specific objectives and goals hereafter stated elsewhere in the paper

3. to compile a comprehensive, integrated analysis and design reflective of the environmental design scheme as outlined above

4. to provide a learning vehicle through which the author can accumulate a knowledge of applied planning and environmental design and of the various factors which contribute to this field

5. to provide a basis on which to begin professional experience and to establish a reference for personal qualifications in the field

**Specific Objectives**

Since this undertaking will not primarily be concerned with empirical (experimental statistics) tests, the purposes can be stated in the form of objectives and goals as opposed to research hypotheses. The objectives and goals of this study are as follows:

1. to conduct an environmental analysis of the area's ecology, geology, man-made facilities, and aesthetic values
2. to point out the misuses of land within the campus area and to develop corrective measures.

3. to develop a logical, coherent land use plan for future expansion.

4. to make recommendations for solutions to specific problems confronting the college.

5. to develop design alternatives to the present plans for development which would be more logical environmentally.

6. to propose functional and aesthetic alternatives for the campus environment.

Definition of Terms

The following terms are defined in order of their importance:

1. environmental (or ecological) design- as developed by Ian McHarg (Scottish-born landscape architect, professor at Pennsylvania University in Philadelphia.), this method is based on the collection of several types of scientific and social data which are compiled on maps which, when overlapped, transposed, or superimposed upon each other, show interrelationships, suitabilities, and conflicts of land values and natural processes. According to McHarg (1969, p. 104), "the basic proposition is that any place is the sum of historical, physical, and biological processes, that these are dynamic and constitute social values, that each area has an intrinsic suitability for certain land uses, and finally, that certain areas lend themselves to multiple, coexisting land use".

2. ecosystem- the natural system made up of biological, geological, geographical, climatological, and human subsystems.

3. environmental factors- those components of the ecosystem and the man-made subsystem which affect it. The interrelationships of these various factors determine the stability of man's environment. The state of dynamic equilibrium called "the balance of nature" is the
resultant vector when all forces affecting life processes are at an optimum level

4. growth patterns- directions and areas in which expansion takes place in relation to the physical land environment

5. planning- a systematic and coordinated effort to bring about purposeful, socially acceptable, and dynamic change

6. technologies- tools for the application of knowledge and information

Assumptions

Due to the great reliance on strict scientific data and procedures to be used in this study, very few assumptions (especially those of the behavioral type) need to be stated. For the sake of clarity and avoiding misunderstanding, the following assumptions are put forth:

1. The geographical region in which Statesboro is located is a diverse and complex ecosystem which has unique values and problems of its own

2. There is a significantly large amount of diversity in the natural-physical and social environments in this region to have a great deal of effect on the uses of land and thus justify this study.

Limitations

The basic limitation in a study of this type is the dependency upon availability of data. Due to the uniqueness of the McHarg approach, very little of the necessary information is readily available. Since most of the needed data is obtained through scientific investi-
gation by trained personnel, a serious problem is posed if competent expert help is not available.

The real heart of the McHarg method is in the combination and synthesis of the raw data obtained beforehand. A lack of accurate information could produce serious threats to the reliability and validity of this study. However, a wealth of technical expertise and data was found in the resources and people of the college and the surrounding city and county. In fact, an entire study of this type could be accomplished through efforts of the Georgia Southern College staff with very little outside assistance, provided sufficient direction and coordination were available.
CHAPTER II - THEORY AND RATIONALE

FOR THE STUDY

Perception of Environment

Webster defines environment as the "the aggregate of all the external conditions and influences affecting the life and development of an organism." In the past six to ten years, an awareness of man's environment and his various interrelationships with it has been the subject of much speculation, debate, and scientific study.

Of tremendous significance has been the realization of the very important interrelationship between the physical environment and human perception of it. An indication of the complexity of this problem is given in the difficulty of deciding how to approach the area. According to Thomas F. Saarinen in his Perception of Environment (1969, p. 5), an ecological approach alleviates much of the theoretical problem.

If an ecological approach is adopted, the problem of separating members of the community from their surroundings is avoided. In the case of man, the cultural, natural, and man-made physical environments must be considered. For the purposes of studying man's perception of environment, it is useful to focus on the functional environment, that is, the portion most pertinent to the people or person being investigated. Sonnenfeld provides a thoughtful discussion of this behavioral environment and defines
it in terms of a nested set of environments (Figure 1). The whole environment which is external to man, the entire world, is the objective geographical environment. Within this larger sphere is included the operational environment or the environment in which man operates. It consists of the portions of the world which impinge on man, influencing his behavior in some way or another whether or not he is aware of it. The portion of the operational environment of which man is aware is the perceptual environment. The awareness may be derived either from learning and experience or from physical sensitivity to environmental stimuli. Thus, at this level a portion of the environment is symbolic rather than objectively measurable. The least-inclusive level is the behavioral environment, the portion which elicits a behavioral response or toward which behavior is directed. In distinguishing the behavioral environment, one's thinking is directed towards a consideration of the behaviorally significant and behaviorally insignificant elements of the environment. This selection problem is a major concern of most studies on perception of environment. (Saarinen, 1969, p. 5.)

The preceding paragraphs have given an outline of the human relationship to environment and a basic set of guidelines for divisions of environmental perception study. Several important definitions and concepts will be presented to gain at least a surface knowledge of man's perception of his surroundings.

Saarinen (1969, p. 10) cites Osmond and Izumi (1957) as the definers of the concepts of "sociofugal" and "sociopetal" spaces. According to Saarinen, "The nature of the organization of space will affect behavior that takes place there, with 'sociofugal space' drawing people apart and 'sociopetal space' drawing people together (1969). It is therefore easy to see that a goal of environmental design would be the creation of spaces
Figure 1. Nested Set of Environments from J. Sonnenfeld, 1969. (Saarinen, 1969, p. 6)
and physical forms which would incorporate these ideas into a logical and consistent whole.

According to Moller (1968, p. 32) there is a dynamic exchange between the human personality and the environment in which it functions. He concludes the following:

1. Structural space has a profound effect upon individual emotional states, individual personality, and is in turn affected by these

2. Structured space has an important and pervasive relationship to group psychology - to patterns of communication and interaction among individuals

Going even further, he later adds, .....No space should be considered a static and self-sufficient entity: its dynamic relation to personalities and to other spatial elements... must be kept constantly in view. And put into practical terms this means that planning of any of the physical elements of the environment - road, parks, houses or any other buildings, and the exterior spaces they form - should reckon with their inevitable relations to the whole system, and should reckon as well with the changes that will occur in the life of the people who will use them. (Moller, 1968, p. 119)

In summary, very little is yet known about specific solutions to spatial and form problems in environmental design. However, the basis is being laid for just such theories with more intensive research being conducted. As the literature has revealed, there are very complex relationships involved in man's perception of his environment. Therefore, it is important that such factors are kept in mind in all design and development areas.
Land Use Compatibility

Land use is a term coined since the advent of extensive planning efforts. It is apparent that wise and coordinated land use design will yield compatible functions in land forms and utilization. Also, the environment is maintained and improved and financial resources are spent in a better manner. Other benefits of sound land use are good spatial arrangements, easily programmed facilities and services, and the avoidance of unnecessary duplication of expensive institutions and utilities.

From the Existing Conditions Survey and Analysis for Bulloch County, Georgia, prepared by the Altamaha-Georgia Southern Area Planning and Development Commission in 1973, comes several items which summarize the importance of good land use planning.

Land use planning recognizes that the following relationships should be sought:

1. Appropriateness of existing and proposed land uses with natural features

2. Appropriateness of existing and proposed land uses with the various community services and facilities which now exist and are contemplated for the future

3. Appropriateness of existing and proposed land uses with various elements of the transportation systems which now exist and/or contemplated for the future

4. Appropriateness of existing and proposed land use in the context of community, municipality, county, and/or regional trends and needs

5. Compatibility of existing and proposed land
use with other land uses both existing and contemplated for the future.

In addition, there are less tangible relationships which should be considered. Among these are the social fabric, ecological balance, and the vitality of the community. In Appendix B there is an outline table of land use compatibility factors showing positive and negative combinations of usage.

There are natural feature characteristics which preclude many types of development due to inherent shortcomings of the natural environment to support intensive human utilization. The two most important areas are flood plains and sections where the soil type characteristics are poor for development.

Flood plains are better left unspoiled for two reasons. They are: (1) extensive damage to property during times of flooding; and (2) they form the natural storm drainage system which protects the environment. Certain soil types are antagonistic to intensive urban and institutional use because of weak engineering characteristics such as compatibility, shrink-swell, and permeability and because of high water table levels.

As can be seen, land use compatibility is a complex subject. From this theoretical viewpoint just advanced and the data base to be accumulated and compiled, this study will attempt to assess and delineate guidelines for development as put forth in the objectives of this study.
This section has served as a brief overview of the problems and methods. More detailed and advanced technical data and procedures will be brought forth and used when warranted in the chapter containing the data analysis.

Goals for Campus Development

Several of the studies done by the Altamaha-Georgia Southern Area Planning and Development Commission in recent years have included sections providing philosophical and theoretical bases for a respective study. Two such planning surveys were the Water and Sewer Systems Plan and Capital Improvements Program and the Areawide Biennial Development Program (1973).

Of particular interest in these two studies were the sets of goals which were included and whose adoption was urged on an areawide basis. These goals are easily extrapolated to the local situation of the campus area environment and the future development plans. The following nine goals are therefore adopted as being logical and applicable to the campus development plan. Reference may be made to the Appendices C, D, E, F, and G for specific suggestions for these goals.

I. AESTHETIC GOAL
To relate the roles of science, technology, and art more precisely thus enriching and deepening the lives of all citizens by striving to improve the quality of man's environment and the visual impact of man's environment.

II. GOAL OF CAMPUS IDENTITY
To foster campus development with appropriate
focal points and fabric so as to lend character, identity, and individuality to communities and to keep them within the human scale.

III. LAND USE GOAL
To provide for an orderly relationship, in proportion and distribution, of a wide variety of land uses within the area.

IV. FACILITIES, SERVICES, AND PUBLIC UTILITIES GOAL
To provide services, facilities, and utilities of the quantity desired, when they are needed for the campus population.

V. PHYSICAL AND MENTAL HEALTH GOAL
To provide a system which insures that an optimal level of physical and mental health exist for every individual.

VI. SOCIAL DEVELOPMENT GOAL
To provide a system of service for reinforcing the capacity of individuals for effective adjustment and social enrichment.

VII. PROTECTION OF PERSONS AND PROPERTY
To provide a system in which the lives and property of individuals and the institution are protected from illegal acts and from natural and man-made disasters.

VIII. NATURAL ENVIRONMENT GOAL
To provide a system which insures the proper utilization of the natural environment.

IX. TRAFFIC, COMMUNICATION, AND CIRCULATION GOAL
To provide a system which facilitates the orderly and efficient movement of individuals, goods, and information.

(Altamaha-Georgia Southern Area Planning and Development Commission: Areawide Biennial Development Program, 1973.)

A serious commitment to these or similar goals with a concomitant analysis of all future development in their spirit will result in a Georgia Southern College campus which is beautiful, orderly, functional, and efficient with a minimum of waste, crowding, and un-
The Environmental Imperative

Much has been said and written in recent years about the precarious state of the environment. No attempt will be made here to recount the works related to the field or to deliver another persuasive oratory on the perils mankind faces as his surroundings are destroyed and his natural resources depleted. Rather, this section is an effort to set forth the basic premises on which this study is to be conducted.

The following excerpts are borrowed from Ian McHarg's *Design With Nature* (1969, p. 104). The basic premise of this study is stated in its entirety as follows:

The basic proposition employed is that any place is the sum of historical, physical and biological processes, that these are dynamic, that they constitute social values, that each area has an intrinsic suitability for certain land uses and finally, that certain areas lend themselves to multiple coexisting land uses.

Once it has been accepted that the place is a sum of natural processes and that these processes constitute social values, inferences can be drawn regarding utilization to insure optimum use and enhancement of social values. This is its intrinsic suitability. For example, flat land with good surface and soil drainage is intrinsically the most suitable land for intensive recreation, while areas of diverse topography represent a higher value for passive recreation.

The social values represented by the natural processes more often than not are inherently suitable for a multiplicity of human uses. Flat well-drained land
is suitable for intensive recreation as it is for commercial-industrial development. Areas of diversity and high scenic interest have a high social value for conservation and passive recreation, at the same time being highly desirable locations for residential development. These apparent conflicts can be resolved in a number of ways. Because of their scarcity and vulnerability, certain resources may represent such high value for conservation that other uses should be excluded. Multiple uses of some areas may be permitted if it is assured that intrinsic values are not compromised. Yet in other cases where two uses are coequally suitable, it remains with society to make the choice. (McHarg, 1969, p. 104)

Rationale for the Study

In McHarg's plan for The Valleys near metropolitan Baltimore, he made several assumptions and deduced a set of propositions which served as the rationale for the study and resultant plan which followed. These propositions serve well for the present study of the campus area and are hereby adopted in full for the rationale motivating this thesis. They are as follows:

1. The area is beautiful and vulnerable
2. Development is inevitable and must be accommodated
3. Uncontrolled growth is inevitably destructive
4. Development must conform to regional goals
5. Observance of conservation principles can avert destruction and insure enhancement
6. The area can absorb all prospective growth without despoliation
7. Planned growth is more desirable than uncontrolled growth, and more profitable
8. Public and private powers can be joined in partnership in a process to realize the plan (McHarg, 1969, p. 82)

Summary

In conclusion, the theories, philosophies, and rationale presented in this chapter will serve as the background of this thesis. A concentrated effort will be made to present conclusions and design proposals congruent with the preceding material which are offered as standards in the field of environmental design.
CHAPTER III - REVIEW OF RELATED MATERIAL

Introduction

The range of literature in this field is like the field itself—broad, complex and far-reaching. Although there is a fair amount of literature in the broad subject of planning and design, the ecological approach advanced by McHarg (1969) is fairly new and not well documented. The very fact that the science of ecology has only come to prominence in the recent past has a great deal to do with the scarcity of materials. There are signs that this situation is changing at an increasing pace. Demands for more materials readily applicable to the field situations encountered will lead to a developing literature background for ecological design. Apparently, it is only a matter of time before this is a reality.

The major difficulty with the literature is basically the same one which faces the future of environmental design. That is, the synthesis and coordination of hereto-fore unrelated material into pliable knowledge directly applicable to a problem situation has not occurred to an appreciable degree as of yet. In dealing with reference works related to projects of this type, one has
to contend with the bothersome task of correlation, collaboration, and cross-referencing to collect needed data, techniques, and verification of results.

Organization of Related Fields

There are, as stated before, numerous works on various topics related to the field of planning. The majority of topics which are documented to some extent appear in the following list.

1. community planning and building
2. urban design (architectural)
3. urban design (landscape)
4. site planning and design
5. landscape architecture
6. transportation planning
7. community facilities planning
8. urban engineering
9. land use planning
10. zoning
11. environmental design
12. town planning
13. city and regional planning
14. economic development
15. street design
16. urban visual environment
17. parks and recreation planning
18. related scientific fields such as:
   a) urban geology
   b) urban geography
   c) hydrology
   d) conservation.
   e) structural analysis
19. related engineering fields such as:
   a) civil engineering
   b) highway engineering
   c) sanitation engineering
   d) communications
   e) power sources
20. water resources planning
   a) river basin development
   b) soil conservation
   c) erosion control
   d) flood plain control
e) water facilities design
f) lake and reservoir planning
21. industrial location analysis
22. agricultural development
23. forest management
24. city management
25. marketing research

As can be seen from this list, the field is exceedingly complex, another reason for its slow growth and development. It is expected to become even more complex as the human aspect of the urban system is researched and documented. As indicated in chapter two, the human component greatly complicates an already complicated situation with a myriad of undetermined relationships.

Important Works

Because of the wide range of material which is interrelated in the field, the literature review will be in two parts. The first part will treat some of the outstanding works summarily in a brief description of contents and importance. The second part will be a descriptive listing of less pertinent material under broad categories of classification.

One of the milestone works in the field is the Community Builder’s Handbook (1968) written by the Community Builders Council of the Urban Land Institute. Dealing specifically with the concept of total community (self-sustaining) development, it is a gold mine of principles and information. The book covers the subject
completely from market analysis, site selection and design all the way to actually selling the idea for profit. It should be required reading for anyone dealing in the field.

Paul D. Spreiregen (1965), AIA, wrote an excellent work called *Urban Design: The Architecture of Towns and Cities*. He deals with the actual artistry involved in designing the elements and relationships which make up the urban form. One of the real strengths of the work is the graphics employed by Spreiregen to convey the ideas and concepts with which he deals. Many of his ideas relate very closely with those of McHarg and the work is a good approximation of ecological design although it is not based on the scientific method and procedures used by McHarg.

To this author, one of the most stirring and beautiful concepts advanced in urban architectural design to date is the habitat concept by Moshie Safdie. His book, *Beyond Habitat* (1970), is a beautiful delineation of his ideas and designs for a very dense urban pattern but one in which every person remains an individual and has complete privacy when he desires. Complete with theoretical background, Safdie writes and illustrates his best ideas including the Habitat at Expo '67.

Although primarily concerned with the individual dwelling units known as houses, Richard Neutra (1971), in *Building With Nature*, gives direction to a complete design
harmony with nature. Easily applicable to urban forms, Neutra's ideas and design show such total harmony that it seems as though houses and communities just grow right out of the ground. Showing tremendous empathy with nature, Neutra seems to have taken several giant strides forward in designing in harmony with the environment.

A useful work from an engineering practice viewpoint is Lynch's Site Planning (1962). Complete with technical details, it describes the process of designing a comprehensive spatial and visual environment.

Wentzel's Site Selection and Development (1965) was interesting if for no other reason than that the following list appeared in it. Although it was originally intended for a somewhat narrow purpose, the credo advanced is beautiful and worthy of wholesale adoption across the entire field of planning.

**Purposes of Site Development**

1. To provide a setting where persons, as individuals and in community, may worship, study, and reflect in relation to themselves, other persons, God, and the natural order

2. To provide a setting which will offer the utmost of inspiration and interest with a minimum of distraction and interruption

3. To conserve and improve the natural resources and values of the setting for man's enjoyment and use in this generation and in the generations to come

4. To preserve the essential beauty of the natural order by fitting all necessary paths, roads, and structures into the landscape, picking up the lines
and colors of the setting

The Matrix of Man by Moholy-Nagy (1968) is one of the true classics in the entire field of planning. Written as a history, it probably provides as much insight into the development of cities and their structures throughout history as any book written on the subject. With the basic premise that cities are the natural habitat of man, the artist examines why cities developed the way they did and where they may go in the future.

Bacon's beautifully written and illustrated Design of Cities (1967) is very probably the best reference for acquainting one with the actual design of cities and all of the design elements which make up cities. Beginning with the basic artistic design properties such as scale, proportions, and harmony, Bacon explains them in detail and then gives illustrative examples of what each one means in the city. The concluding portions of the book do a beautiful job of design synthesis and tie all concepts together into a meaningful package.

Dealing mainly in spatial organization of the linear elements which make up a city, Dober in his Environmental Design (1969) examines the history and development of the urban pattern. He then looks at many alternatives possible given today's circumstances, and attempts to outline the common denominators which will govern urban design regardless of the alternatives society may pursue. A much
needed work, it illustrates just how far we still have to go.

The author has long been sensitive to a relationship between architectural forms, spatial patterns, and human behavior. It is very gratifying to come across a work which derives right at the heart of the matter. Such a work is Moller's *Architectural Environment and Our Mental Health* (1968). Faced with the fact that more buildings will be built in the next ten years than have ever been built before, it is certainly time we looked at this problem and the related one of man's mental health and his natural surroundings.

A related work with a searching insight is Vickery's *Anthrophysical Form* (1972). Combining architectural sensitivity with anthropological fact and method, Vickery takes a look at various urban forms and projects some conclusions about one future environment which are well worth noting.

Fred Smith's *Man and His Urban Environment* (1973) is just about the best approach to analyzing the theoretical and behavioral basis of city life. Another of the "must" references, the book uncannily penetrates the problem of man in his cities and outlines the basic needs inherent in his existence in an urban environment. Several passages are reproduced in Appendix H.

The background of this entire study is Ian McHarg's
Design With Nature (1969). Its brilliant perception and analysis of the environmental conflicts within the urban situation provide a basis for perhaps the most far-reaching design innovations to date in man's quest to build a pliable, harmonious civilization. Framed by scientific method and fact, McHarg's design techniques (1969) provide us with the means to restore and maintain an equilibrium with the natural environment. This work will form the basis of a new and exciting approach to city and regional planning which will lead us to an environment based on beauty, harmony, and stability.

Summary of All Materials

The classification categories for the descriptive listings of literature are as follows: A. Basic Principles of Planning; B. Engineering; C. History; D. Philosophy; E. Environment and Ecology; F. Techniques and Technicalities; G. Visual Environment; H. Human Environment; I. Basic Data. The following is a listing of the references under each category. This listing technique is merely intended to show the divisions of the literature according to a functional scheme devised by the author. Therefore, only authors and titles will be included and other pertinent information will be left to the bibliography.

A. Basic Principles
   1. The Architect and the City, Whiffen
2. Town Design, Gibberd
3. Green-Belt Cities, Osborne
4. Toward New Towns for America, Stein

B. Engineering
1. Site Planning, Lynch
2. Transportation Engineering, Paquette

C. History
1. The Urban Pattern, Simon and Gallion
2. The Building of Satellite Towns, Purdom
3. Cities in Evolution, Geddes
4. Matrix of Man, Moholy-Nagy

D. Philosophy
1. An Organic Architecture, Wright
2. Lived-in Architecture, Boudon
3. Beyond Habitat, Safdie
4. Genius and the Mobocracy, Wright
5. Team 10 Primer, Smithson
6. Marcel Breuer, Papachristou
7. The City of Man, Tunnard
8. The City of Tomorrow, Le Corbusier
10. Arcology, Soleri
11. Man and His Urban Environment, Smith

E. Environment and Ecology
1. Building With Nature, Neutra
2. Site Selection and Development, Wentzel
3. Environmental Design, Dober
4. Design With Nature, McHarg
5. The Paradox of Earth and Man, Young

F. Techniques and Technicalities
1. The Community Builders Handbook, Community Builders' Council of the Urban Land Institute
2. Urban Land Use Planning, Chapin
3. Zoning, Bassett

G. Visual Environment
1. Urban Design--the Architecture of Towns and Cities, Spreiregen
2. The Aesthetics of Contemporary Architecture, Ragon
3. Communities for Living, Chapin
4. City Planning According to Artistic Principles, Sitte
5. Modern Civic Art, Robinson
6. The Image of the City, Lynch
7. On the Art of Designing Cities, Peets
Summary of Related Materials

Although the literature on ecological design is not extensive, there is an abundance in related fields. This is due to the width of the field. The planner deals with a tremendous range of techniques and information in his work and a summary knowledge of all is necessary for a truly comprehensive planning process and results. Based on the review of available materials, this study will attempt to achieve a synthesis of separate materials and knowledge to develop a truly comprehensive environmental analysis and design for Georgia Southern College.
CHAPTER IV - METHODOLOGY

Introduction

The methods and procedures in this study are basically those of a design methodology. Such processes usually begin with the recognition of a need or want and variously proceed through information collection, problem identification, ideation, evaluation, creative synthesis, modeling, experimentation, and presentation of a solution.

This chapter will begin with an overview of major procedures, and then review the specific processes for environmental analysis. The method of synthesis to be used in arriving at conclusions for design decisions will be described and incorporated into the steps necessary for the developed plan.

The technique to be used in presenting the various sections will be a combination of flow chartings and listing methods. Such a procedure will allow the greatest clarity as a verbal paragraphal description frequently tends to confuse the complexities involved. It will be the stated purpose of this chapter to "leave tracks" such that a serious minded researcher could duplicate this study in its entirety in another situation or replicate
the results found in this thesis.

Appendix I is intended to show the major steps necessary to carry out any study of this type. It should be realized that this is in reality a system of procedures and thus cyclic and given to continuous analysis, feedback loops and iterative processes. The outline, of course, is a gross oversimplification. More specific programs will be elaborated on in later sections.

Specific Procedures for Data Collection and Analysis

In Appendix J, there is a listing of the broad scope of environmental factors which would be considered in a comprehensive design situation. Every factor listed would not necessarily be included in every study to be done, but only in those instances where each respective factor is applicable. Included with every component are areas into which basic data can be compiled and base maps drawn. In a complex large-scale study project it is imperative that all such basic maps be constructed as are pertinent to the situation. As a project becomes less complex and on a smaller scale there are degrees of need for such a comprehensive treatment of basic data. It is possible that factors can be combined and fewer maps constructed on small scale studies.

Upon the compilation of this basic data, the next step in environmental analysis is the construction of
derivative maps. Useful derivative maps are listed as follows:

1. Physical properties map
2. Biotic assemblages map
3. Current land use map
4. Mineral and energy resources map
5. Active processes map
6. Water systems and man-made features map
7. Rainfall, surface salinity, and stream discharge map
8. Topography and bathymetry map

(Young, 1974)

A detailed description of the basic data factors which are included in each derivative map is given in the series of Appendices K, L, M, and N.

The compilation of the eight derivative maps concludes the basic task of environmental analysis for a study area. The next step is the synthesis of the data into forms which give direct readings as to intrinsic suitabilities for various uses.

**Synthesis Methods**

To begin the section on synthesis, it is necessary to develop a key concept. A resource capability unit is a physical area that reacts uniquely to a combination of human activities, and that can be mapped for geological and biological characteristics. These map units show the environmental carrying capacity of any area for different environmental needs or activities (Young, 1974).

Following is a flow chart representing the synthesis procedure involved in land use planning and environmental
STEP 1- Determination of typical potential usages
   a) Residential
   b) Industrial
   c) Institutional
   d) Recreational
   e) Agricultural
   f) Commercial
   g) Conservation
   h) Facilities
      (i) utilities
      (ii) amenities

STEP 2- Mapping of resource capabilities (units) for each prospective land use
   *This step may involve an evaluation scale based on graduations of severity, intensity, or importance to indicate relative value or capacity. These may be shown on the maps by tonal scales, color changes, or alternate shading schemes.

   *Examples of factors contributing to suitabilities for various land uses are given in Appendix 0.

   Lands usually remain natural only because (1) they are valuable as resources, or (2) they are unsuitable or uneconomic for development. This is considered a less than optimum situation. Many areas of land are intrinsically suited to be left undeveloped but, because of convenience or economic pressures, they are developed. The process outlined in this chapter is a method by which such lands can be identified and not subjected to normal development.
STEP 3 - Combination of additive factors of related possible land uses such as residential-commercial-industrial-institutional and recreation-conservation.

STEP 4 - Compilation of composite map for total development and land utilization scheme using a pre-emptive method based on concurrence of complimentary factors and on relative degree of importance in evaluating conflicting factors.

STEP 5 - Development of method for illustrating logical design suitabilities in a clear, concise and pleasing manner.

This method is designed to bring out those features of the land where development, whatever type is contemplated, is compatible and where it should be avoided. It abandons absolute economic values which enables the inclusion of all important factors which defy pricing and cost-benefit analysis. Because the primary, secondary, and tertiary values for land use become apparent those areas of unitary, complementary, and competing suitabilities become obvious to the layman.

Development of the Total Plan

Restatement of the problem:

The need for an analysis of the total environmental system of the area around Georgia Southern College and the development of a comprehensive land use and environmental design plan for said area.
STEP 1 - Environmental Analysis:
As outlined in previous sections pertaining to geology, ecology, man-made facilities and aesthetics

STEP 2 -
   a) Point out misuses of land
   b) EPA Impact Statement
   c) Develop land-use plan based on environmental analysis and intrinsic suitability indicated

STEP 3 - Make recommendations for solutions to specific problems:
   a) Approved unbuilt structures
   b) Environmental abuses
   c) Parking and traffic

STEP 4 -
   a) Develop alternatives to present plans
   b) Propose functional and aesthetic designs for environmental improvement

STEP 5 - Evaluation in terms of theoretical background of study and the recognized principles of land use planning

STEP 6 - Confirmation that the total design scheme satisfies the adopted goals of the study
STEP 7- Compile in presentation form

For the sake of clarity, an outline of material which is required in environmental impact statements by the Environmental Protection Agency is included in Appendix P.

The purpose of this chapter has been to delineate the processes for environmental analysis and design. These outlines are of a general nature and could be used as a guide for anyone who desired to conduct a study of a similar nature. This study will use only those portions of data and procedures which are directly applicable to the situation encountered at Georgia Southern College and the surrounding area.

Processes for this Study

The actual collection of information, organization of data, analysis, and composite evaluation involved in a research study, especially one such as this which deals in the environmental and design-planning fields, is a tedious process. As materials are collected, sorted, resorted, and analyzed again the general patterns of important facts, trends, systems, and procedures are gradually recognized and sifted out into a meaningful structure of knowledge and order. In this study the process was repeated several times.

The preceding sections delineated a broad, compre-
hensive system for the collection and analysis of basic and derivative data. It was stressed that the intensiveness and the geographical scale in which a particular study was conducted would determine the completeness with which data source maps and the resultant derivative maps would be compiled and used. The particular purposes of the respective analysis and design would also place parameters on the complexity of the investigation.

With this reasoning, it was deemed necessary and more efficient to arrange the basic data and derivative factors into a more convenient form. As was illustrated in Appendix I, there are four areas of basic data analysis. They are (1) environmental, (2) man-made factors, (3) historical, and (4) human interaction. These remain unchanged. A fifth area, purely descriptive and included only for completeness of data, is the analysis of the regional setting.

The scale of the study, being of a small and localized nature brought about the realization that many of the basic data and derivative factors were either (1) common to the entire area, or (2) not applicable to the setting at all. Therefore, after much sifting and reorganization, it was recognized that many of the maps were not needed as a paragraphal or tabular explanation of a great deal of data would suffice instead. After much examination, the factors from the basic data and deriv-
atives were seen to fit into a few functional categories.

The basic area of environmental analysis included all basic data factors and source maps as well as all eight derivative factor maps. It was in this major area that the greatest amount of reorganization took place. The discovery was made that all the information elements included in the environmental analysis could be grouped into the following categories of ecosystem functions.

1. physiography
2. climate and meteorology
3. geology
4. soils
5. hydrology
6. biotic assemblages

The data on land use were shifted into the area of man-made factor analysis.

The organization of the data analysis will have several distinguishing characteristics. The order of analysis for each major category will be as follows with descriptive notes included where needed:

A. Historical analysis
B. Analysis of regional setting
C. Man-made factors analysis
D. Environmental analysis
   *each sub-factor will have an outline of the material to be covered at the beginning of each of the six sections
E. Human interaction analysis

Each major section will begin with a summary or outline of the material to be included. Maps and illustrations will be used and included where necessary.
Outline of Data Analysis
applied to this study

I. Historical Analysis
*includes 1 map:
1. physical plant now and proposed additions for GSC

II. Regional Setting Analysis
*includes small inset map

III. Man-made factors analysis
*includes 1 map:
1. land-use relationships of general area

IV. Environmental analysis
* includes 4 maps:
1. physiography
2. soils
3. hydrology
4. biotic assemblages

V. Human-interaction analysis
*includes 1 map:
1. traffic patterns and focal centers

VI. The following land usage patterns are deemed necessary
for the campus:
1. Residential and amenities
2. Institutional and utilitarian
3. Recreational
4. Conservation

Resource capability units from environmental factors are mapped showing intrinsic suitabilities for development or non-development or limited development.
Land capable of residential-amenities and institutional-
utility usage is hereafter classified as developable land. Land of recreational capabilities will be marked for limited development. Finally, suitable land for conservation (including field laboratory situations) will be considered non-developable.

A gray tonal scale will be used to map environmental factors into the three divisions of development potential. A system of transparent overlays will be made to illustrate these factors.

VII. Analysis of resulting composite overlay for areas suitable for various land uses

VIII. Identification of problems and misuses

IX. Summary of data analysis

This chapter concludes all materials preceding the actual collection of field data and the consequent analysis and design. All information and techniques necessary to proceed with a study of this type have been included. The next step is to carry out the proposed study.
CHAPTER V

FINDINGS (ANALYSIS AND EVALUATION)

Historical Analysis

The historical analysis of this study can most easily be accomplished by a series of outlines and a map. A chronological outline of dates, events, and pertinent notes will begin with the creation of Statesboro and continue until the present time in Georgia Southern College's history. A map will be used to illustrate the present physical plant of the college as well as that portion proposed in the latest plan adopted by the college.

Outline of History (City)

1803 - December 19: Town of Statesboro created by legislative act
   - slow growth to 1890's
1866 - first charter of city granted
1889 - second charter granted
1893 - big fire destroyed most of city
1894 - Bank of Statesboro organized
1903 - first industry (cotton seed oil) established
   - during this period, Statesboro recognized as leading Sea Island cotton market in the world
1912 - third city charter
1929 - first tobacco market opened
   - created flourishing agricultural market which is still here today
1945 - U.S. Highway 301 began to grow as important north-south route and tourist business which it brought is still important

Outline of History (College)

1906 - created by act of legislature
- one of ten agricultural and mechanical schools
- school given 300 acres free land, and $25,000 in cash from the city
1908 - February 7: first opened
- served on an elementary and secondary level
- also had special course for teachers
1924 - August 24: Georgia Normal School created by legislative act
- developed rapidly to status of four-year college
1929 - June: B.S. in Education first conferred upon members of graduating class
1929 - summer: South Georgia Teachers College created by legislature
1939 - Board of Regents change the name to Georgia Teachers College
1958 - Master of Education degree authorized
1959 - December 9: Board of Regents changes name to Georgia Southern College
1960 - six-year program in teacher education initiated
- since then seven more graduate degrees have been authorized
1969 - college officially reorganized into four schools and one independent division with thirteen major degrees now offered
1969 - graduate school established

The enrollment has increased steadily through the years to its present level of approximately 6,000 students. A period of stabilization and, possibly, a slight decline is foreseen for the future.

The college has undertaken a series of planning efforts over the past decade. The original plan was
completed in 1963 with subsequent revisions in 1966 and 1969. The 1969 revision is still the adopted scheme for future growth. In map one are shown those buildings, etc. which now exist and those facilities which are proposed for the future.
MAP 1

KEY

- existing structures
- proposed future structures
- approved unbuilt structures
- existing traffic facilities
- proposed traffic facilities

NUMERICAL CODE

1. Administration Building
2. McCroan Auditorium
3. Deal Hall
4. Lewis Hall
5. Veazey Hall
6. Hendricks Hall
7. Family Life Center
8. Information and Security
9. Alumni House
10. Home Management Houses
11. Classroom-Office Building
12. Classroom-Office Building
13. Classroom-Office Building
14. Visual Arts Building
15. Continuing Education & Student Services
16. Language Arts Building
17. Scientific Research Building
19. Classroom-Office Building
20. Classroom-Office Building
21. Education Building
22. Marvin Pittman School
23. Library
24. Classroom Building
25. Water Tank
26. Infirmary
27. Carruth Building
27-A. Carruth Annex
28. Band Building
29. Foy Fine Arts
30. Williams Center
31. Herty Building
32. Anderson Hall
33. Rosenwald Library Annex
34. Rosenwald Library
35. Hollis Building
36. Cone Hall
37. Sanford Hall
38. Brannen Hall
39. Hanner Building
40. Earth Science Building
41. Physics & Math Building
42. Biology Building
43. Home Management House
44. New President's Home
45. Dormitory
46. Dormitory
47. Dorman Hall
48. Dormitory
49. Landrum Center
50. Olliff Hall
51. Winburn Hall
52. Administrative Annex
53. Dormitory
54. Dormitory
55. Dormitory
56. Dormitory
57. Plant Operations Offices & Warehouses
Regional Setting

The following is excerpted from the Statesboro Future Land Use. It is an excellent analysis of the regional setting.

A municipality, community, or even a college campus today does not exist independently of the region in which it is located. The improved communication's system and transportation network, the rising standard of living, increased leisure time, and other developments have all contributed to the trend away from self-sufficiency and relative isolation. The physical geography of a locality also links it to the region. A stream basin, for example, extends beyond political boundaries and is itself a logical planning entity.

The City of Statesboro is a secondary growth center, located in Bulloch County in southeast Georgia. The City is located in the Ogeechee Drainage Basin and is approximately 50 miles west of Savannah, Georgia.

The Savannah Metropolitan Area is the regional employment center, retail and wholesale trade center, and communication center for Statesboro, Bulloch County, and surrounding counties.

The City of Statesboro is very dependent on U. S. 301 for its tourist industry. Upon completion of Interstate Highway 95, the City is expected to see a marked decline in tourist business. U. S. Highway 80 and Interstate Highway 16 are major routes between Statesboro and the port of Savannah. Upon completion of Interstate Highway 16, travelers will have a much better route to Macon and Atlanta.

(Statesboro Future Land Use and Major Thoroughfare Plan, Altamaha-Georgia Southern APDC, 1974)

The campus community is a tertiary growth center, directly tied to the City of Statesboro, yet growing in its own directions and impetus. U. S. 301 and Georgia 67 tie the campus to the rest of the city.
LOCATION MAPS OF THE CAMPUS
Man-Made Features Analysis

The man-made factors which have been incorporated into the campus area environment are of two varieties, permanent and mobile. The permanent type consists of:

1. buildings
2. utilities
   a) water
   b) electricity
   c) gas
3. streets and roads
4. parking lots
5. amenities
   a) tennis courts
   b) baseball fields
   c) basketball courts
   d) lakes
   e) swimming pools

The mobile type consists of:

1. automobiles
2. motorcycles
3. bicycles
4. construction vehicles

Referring to map one, a knowledge of the locations of buildings, roads, parking lots, and amenities can be developed. Fortunately, foresightedness on the part of the college has placed all utilities (except the water tank and two pumps) underground. Maps of these three systems are not included as they do not play a direct role in the environmental analysis of the present situation. However, recommendations may be made concerning future development on the basis of the present analysis.

Referring to map two, the land use relationships of the general area and of the college become apparent. As would be normal in a campus situation, there are four
major types of land use on the college property. These are:

1. residential (dormitories)
2. recreational
   a) intramural
   b) intercollegiate
3. conservation
   a) greenbelts
   b) flood plains and drainage basins
   c) wildlife refuges
4. institutional
   a) administrative
   b) utility
   c) office space
   d) classrooms
   e) research facilities

The color coded key on the map provides references to locate each land use.
MAP 2

KEY

- Residential
- Religious
- Commercial
- Institutional
- Recreational
- Conservation (agriculture, forests, flood plains)
Environmental Analysis

This section of Chapter V is intended to show the analysis of the physical and biological environments of the campus area. There are six subdivisions of this analysis. They are:

1. physiography
2. climate and meteorology
3. geology
4. soils
5. hydrology
6. biotic assemblages

Each subdivision will contain a listing of factors to be considered. Items 1, 4, 5, and 6 will also include maps necessary to show important factors and interrelationships.

Physiography

The region in which the campus area is located is part of the middle Coastal Plain. The campus is mostly nearly level to gently sloping. Basically, the area consists of broad sand ridges dissected by small drainage basins and streams which are tributaries of Little Lotts Creek. Four such dendritic drainage patterns carry water away from the campus.

Elevations range from 200 to 250 + feet above mean sea level. Two topographic (plain) maps following this discussion show the contours of the land and the two scales (950 feet = 1 inch for smaller scale map and 600 feet = 1 inch for larger scale map) which are used in the
Slopes range from 0 to 12 per cent. Referring to map three, relief of the campus is shown through a system of colors. Places where the color bands are narrow represent high percentage slope. Portions of the map colored purple, red, orange, and brown represent the sand ridges of the area. Yellow, green, and blue portions represent the drainage basins with streams bisecting them.

Looking closely, it is possible to pick out the streams, lakes, and, also, spot elevations across the terrane. Referring back to map two, a knowledge of land use in relation to the physiography can be obtained.

As mentioned, following are two unretouched topographic maps of differing scales and a colored relief map. All maps used in the analysis are from the same base map. It is possible to correlate all factors by cross-referencing due to the common base map.
MAP 3

KEY

- less than 200 feet above mean sea level
- 200 to 210 feet
- 210 to 220 feet
- 220 to 230 feet
- 230 to 240 feet
- 240 to 250 feet
- above 250 feet
Climate and Meteorology

The climate of this region is classified as humid subtropical. Moderate in nature, it is affected by the southern latitude, proximity to the Atlantic Ocean, frontal activity, tropical depressions, the jet stream and hurricane activity. The important facts can be clearly illustrated in list form. The major factors are:

A. yearly averages
B. seasonal variations
C. winds
D. important facts

A. Yearly averages:

1. Rainfall
   a) 45 inches
   b) yearly variations between 35 and 55 inches
   c) highest on record is 71.31 inches in 1929

2. Humidity
   a) morning - 85-90%
   b) afternoon - 50-60%

3. Temperature - 66 degrees yearly average

B. Seasonal variations:

1. Summer
   a) warm humid
   b) 50% of total yearly rainfall
   c) 80 degrees average temperature
   d) temperature above 90 degrees 3 out of 4 days
   e) highest humidity
   f) minimum temperature 70 degrees
   g) 3 to 6 days 100 degrees + yearly

2. Fall
   a) lowest humidity
   b) mild, stable
   c) extended dry periods
   d) susceptible to hurricanes
   e) greatest flood occurred in fall
   f) 60 degrees average temperature
   g) first freeze about November 17
2. Winter
   a) 51 degrees average temperature
   b) 26 days a year of freezing temperatures
   c) 2 or 3 day cold spells alternating with cold weather
   d) high humidity
   e) 8 degrees in December 1962 is lowest temperature on record
   f) rainy

3. Spring
   a) 64 degrees average temperature
   b) last freeze March 10
   c) cool, erratic weather
   d) low humidity

C. Winds:
   1. Average velocities
      a) Summer - 7 m.p.h.
      b) Winter - 10 m.p.h.
   2. Prevailing direction - westerly

D. Important Facts:
   1. Jet stream has recently swung further south causing tornado activity in spring and summer
   2. Hurricane season is late summer and early fall
   3. All seasons are susceptible to severe thunderstorms
   4. All seasons are susceptible to floods
   5. There is a 250 day growing season

The interaction of climate with the other environmental factors is a dynamic, complex process. Climatic factors react significantly with the area's soils, geology, biology, and hydrology to make the region the unique entity that it is.
Geology

The geological analysis of the environment will be concerned with 16 factors. These can all be considered common to the entire area, eliminating the need for a map of geological factors. The items to be analyzed include:

1. lithology
2. kind of bedrock
3. depth to bedrock
4. isopachous geology
5. surficial materials
6. seismic risk
7. substrate
8. rock stability
9. resources
10. subsidence
11. trace substances
12. rock permeability
13. geologic strength
14. potential waste disposal
15. excavation ease
16. equipotential surfaces

The area rests on the Hawthorne formation, a layer of sediment deposited by ancient seas in the Miocene Age. The formation is made of silts and clays formed from marine deposits. Lithologically speaking, it is very acidic with little hard rock formations.

There are some layers of isopachous, or equal thickness, geology as there are older sediment layers in conformed and non-conformed layers beneath the Hawthorne. The substrate below the B horizon of the soil is made of impervious clays. The permeability of the parent material below the C horizon is also low.
Although there is no real bedrock in the area, there is a hard pan about 100 feet below the surface. This surface probably forms the upper edge of a layer of limestone.

Structurally speaking, there is high stability and geologic strength due to the sandy clay type of subsurface material. Subsidence is no real problem except under extreme and rare conditions. The area is on the fringe of an earthquake center and may be subject to tremors. Excavation is relatively easy in the entire region.

Surficial materials are the soils of the Tifton-Fuquay-Pelham association formed from the Hawthorne parent material. These contain traces of iron and various clays and gravels. Other geologic resources are the ground water supplies of the area. The region is not the best for potential waste disposal because of relatively impermeable soils and subsurface materials.

The Ocala-Suwanee-Tampa limestone aquifer supplies the water for the region. There is an equipotential surface about 90 to 100 feet above mean sea level under the surface of the area. This is approximately 100 to 170 feet below the surface. Appendix Q shows a generalized geological profile for this region.
Soils

The soils section of the environmental analysis is supplemented by map four which shows the soil types of the campus area. There are twelve soils found on campus property and about seventeen in the general area. The ones which are present on campus are included with their abbreviations in the following list.

1. Ardilla loamy sand (AqA)
2. Cowarts loamy sand 2 to 5% slopes (CqB)
3. Cowarts loamy sand, eroded 2 to 5% slopes (CqB2)
4. Cowarts loamy sand 5 to 8% slopes (CqC)
5. Dothan loamy sand (DaB)
6. Fuquay loamy sand 0 to 2% slopes (FsA)
7. Fuquay loamy sand 2 to 5% slopes (FsB)
8. Lakeland sand (LpD)
9. Leefield loamy sand (LsA)
10. Pelham loamy sand (PlA)
11. Tifton loamy sand 0 to 2% slopes (TqA)
12. Tifton loamy sand 2 to 5% slopes (TqB)

The soil properties which are important for this study are presented in the following list.

1. stability
2. foundation suitability
3. moisture content
4. electrical resistivity
5. shrink-swell potential
6. drainage
7. corrosiveness
8. erosion rates
9. acidity
10. water table
11. permeability
12. slope
13. formation
14. parent material
15. compactibility
16. runoff
17. tilth
18. percolation rate
19. trafficability
In the subsequent discussion soil types will be indicated by their abbreviations which have been given. This is done in the interest of time and space.

The basic parent material is the Hawthorne formation for most of the soils. Some of the younger soils, such as the Fuquay series, were formed from the Okefenokee formation. The forming process for all soils in the study is sedimentation.

All twelve soils are low in natural fertility, have good tilth (except LpD and P1A which are poor in tilth), and high to very high acidity. Low shrink-swell potential, high electrical resistivity, low corrosiveness (except AqA and LsA which are medium and P1A which is highly corrosive), and moderate permeability (except FsA which is moderately rapid and LpD which is rapid) are characteristics of the soils.

Most of the soils have good drainage except LpD which is excessively drained. AqA, LsA, P1A are all poorly drained. Moisture content of the soils is moderate in all but four soils. FsA and FsB have moderately low content while LpD has a low content and the P1A association has high moisture content. Erosion rates are low except for CqB, CqB2, DaB, and TqB with moderate rates and CqC with a severe erosion rate.
Soil compactibility is good except for LpD which is poor and P1A which is fair. Trafficability is all fair to high except for P1A which is poor. Percolation rates are all slow to moderate.

Data on slope, water table, depth, runoff, stability, and foundation suitability will be given with each soil type as they are listed in the following sequence.

1. **Ardilla loamy sand (AqA)**- 0 to 2% slopes, water table is 15 to 30 inches below the surface, 8 to 20 inches deep, slow runoff, high stability and foundation suitability

2. **Cowarts loamy sand (CqB)**- 2 to 5% slopes, water table is below 60 inches, 6 to 10 inches deep, moderate runoff, moderately high stability and foundation suitability

3. **Cowarts loamy sand, eroded (CqB2)**- 2 to 5% slopes, water table below 60 inches, 4 to 7 inches deep, moderate runoff, moderately high stability and strength

4. **Cowarts loamy sand (CqC)**- 5 to 8% slopes, water table below 60 inches, 6 to 10 inches deep, moderately rapid runoff, moderately high stability, strength

5. **Dothan loamy sand (DaB)**- 2 to 5% slopes, water table below 60 inches, 8 to 20 inches deep, moderate runoff, moderately high stability and strength

6. **Fuquay loamy sand (FsA)**- 0 to 2% slopes, water table below 60 inches, 20 to 40 inches deep, slow runoff, moderately high stability and strength

7. **Fuquay loamy sand (FsB)**- 2 to 5% slopes, water table below 60 inches, 30 inches deep, slow runoff, moderately high stability and strength

8. **Lakeland sand (LmD)**- 5 to 12% slopes, water table below 48 inches, 40 inches deep, rapid runoff, low stability and strength
9. **Leefield loamy sand (LsA)**- 0 to 2% slopes, water table 15 to 30 inches, 20 inches deep, slow runoff, high stability and moderate strength

10. **Pelham loamy sand (P1A)**- 0 to 2% slopes, water table less than 15 inches, 20 inches deep, slow to ponded runoff, moderate stability and strength

11. **Tifton loamy sand (TqA)**- 0 to 2% slopes, water table below 48 inches, 10 to 12 inches deep, moderate runoff, high stability and strength

12. **Tifton loamy sand (TqB)**- 2 to 5% slopes, water table below 48 inches, 10 to 12 inches deep, moderate runoff, high stability and strength

An application of this data to the map units will indicate the suitabilities for development, limited development, and non-development.
**KEY**

AqA - Ardilla loamy sand

CqB - Cowarts loamy sand 2 to 5% slopes

CqB2 - Cowarts loamy sand, eroded 2 to 5% slopes

CqC - Cowarts loamy sand 5 to 8% slopes

DaB - Dothan loamy sand

FsA - Fuquay loamy sand 0 to 2% slopes

FsB - Fuquay loamy sand 2 to 5% slopes

LpD - Lakeland sand

LsA - Leefield loamy sand

P1A - Pelham loamy sand

TqA - Tifton loamy sand 0 to 2% slopes

TqB - Tifton loamy sand 2 to 5% slopes
Hydrology

The hydrological analysis is concerned with many factors. Among them are the items in the following list.

1. rainfall frequency
2. rainfall amount
3. evapotranspiration
4. water supply (surplus and deficiency)
5. runoff
6. depth to water
7. aquifer and recharges
8. channelization potential
9. salinity
10. drainage basins
11. surface drainage
12. solid sediment
13. dissolved sediment
14. flood frequency
15. flood plains
16. storm surge and drainage
17. streamflow channels
18. low water
19. riparian lands
20. marshes
21. equipotential surfaces
22. pollution sources
23. rapid deposition
24. limnology
25. lakes
26. active processes

Items 5 and 11 were discussed in the analysis of soils. Items 6, 7, and 21 were covered in the geological section. Items 10 and 17 are part of the physiography and were covered there.

Riparian lands are those adjacent to a flowing stream and can be discerned from any of the maps. Marshes are important in the biotic analysis and will be looked at there. The water supply of the college is plentiful because of the Ocala aquifer.
Rainfall frequencies and amounts are given in the following list of monthly variations.

<table>
<thead>
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<th>Inches</th>
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<tr>
<td>February</td>
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<tr>
<td>March</td>
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<tr>
<td>October</td>
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<td>November</td>
<td>2.0</td>
</tr>
<tr>
<td>December</td>
<td>2.8</td>
</tr>
</tbody>
</table>

Active processes involve rapid deposition, solid sediment, and dissolved sediment. Rapid deposition is occurring in areas of new construction and roads with solid sediment being deposited in the drainageways leading from the areas. Dissolved sediment shows up in the limnology of the lakes which are short of oxygen content and high in pollution. These pollution sources are streets, construction materials, and automobile wastes. Soil salinity is low.

Low water levels in periods of drought result in dry stream beds and lake levels 12 to 15 inches lower than normal. Because of soil types and the deposition problem, the potential for channelization is moderate to low.

No data are available on flood frequency. Flood plains are shown on map five and are divided into twenty year, one hundred year, and maximum potential flood plains.
Drainage patterns are shown by the arrows.

Consideration of storm surge and drainage yields several facts. There is a time lag of 3 to 10 hours before overbank flooding occurs along Little Lotts Creek. There is a lag of 1 to 3 hours before the other streams reach this state. On most of the campus, floods remain out of banks for one day. Maximum rate of rise is from one-half to three feet per hour depending on intensity of rainfall. Heights of rise vary from 2 to 8 feet and the time required varies from 6 to 24 hours. Duration of flooding can be from 10 to 50 hours.

Evapotranspiration was probably a normal cycle at one time. Several factors have resulted in an altering of the water cycle of the immediate campus area. The lakes, assorted soils, and the vegetation cover are responsible for the evapotranspiration on the campus. A lessening has occurred, however, due to construction, erosion which exposes bare soil and deposits inferior types over other soils, and pavement of roads and several new parking lots. Excavations along with the above factors have increased surface runoff, decreased moisture content of the soils, and thereby altered the natural water cycle.

It is obvious how important the hydrology of an area is in relation to development. Hydrological variables must be considered in order to achieve a viable plan.
Appendix R gives an illustration of the natural water cycle and Appendix S contains a discussion of hydrology in relation to environmental design and planning. These appendices are included for completeness and clarity of concepts.
Biotic assemblages

There are twelve items to be considered in the analysis of the biotic environment. They appear in the following list.

1. animal communities
2. plant communities
3. biotic provinces
4. agriculture lands
5. forest lands
6. wildlife preservation areas
7. scenic value
8. biological resources
9. greenbelts
10. plant distribution
11. vegetation
12. marshes

The animal community in the campus area is inhabited primarily by bobwhites, doves, squirrels, and rabbits as well as many nongame birds such as bluebird, catbird, mockingbird, waxwing, blackbird, cardinal, meadowlark, sparrow, towhee, chickadee, grackle, bluejay, titmouse, and woodpecker. Further afield are foxes, opossum, raccoons, skunks, deer, wild turkeys, wild ducks, wild hogs, otters, and bobcats. It is unlikely that any of these last animals would be found in the general campus area due to the level of development and the intrinsic natures of these animals.

Plant communities are a variety from large trees to small grasses. Among the larger trees are the pines-slash, loblolly, long-leaf, and sand, several types of oaks, sweetgum, yellow poplar, and pecan. The smaller
trees include willows and redbuds. There is a variety of shrubbery including azaleas.

The biotic provinces are those usually found in the Tifton-Fuquay-Pelham soil association. The distributions follow the normal patterns governed by the soil types which vary from ridges to drainage basins. There are only a few sections of agricultural land in the general campus area.

Forest lands are abundant providing wildlife cover, scenic value, and greenbelts. They are essential for protecting the various biological resources including components of the natural food chain which preserves the balance of nature. Forests also help maintain ground water supplies and the water cycle.

Marshy lands are prevalent in the low areas between the ridges. They are important hydrologically and contain plant and animal communities distinctively their own.

Catfish are the main type of fish in the lakes with bluegill and an occasional bass also present. These are endangered due to several factors outlined in previous sections.

Map six illustrates the major biotic provinces with stream channels, marshes, lakes, forests, and scenic areas denoted. General in format, the map provides an overview of the biotic assemblages of the general campus area.
MAP 6

KEY

- Biotic provinces (forests, wildlife cover, greenbelts)
- Lakes and stream flow
- Marshes
- Agricultural lands
- Scenic value
- Wooded areas
Human interaction analysis

There are many relationships which the human population has with its environment and the surrounding populations and their environments. Types of interrelationships include economic impact, traffic patterns, living conditions, aesthetics, and behavior patterns.

The campus community has an economic impact on the city of Statesboro of over 24 million dollars a year. This amounts to a great deal of purchasing power for the college population.

Traffic patterns are indicated on map one by the road and parking lot relationships. Map seven, which follows this discussion, shows behavior patterns of the local populace in relation to the topography and certain key focal points which are also shown. By referring to map one, a great deal of information can be obtained about the relations of the buildings, roads, physical features, and natural environment to the human uses.

A discussion of living conditions and the aesthetics of the campus will be included in the last chapter in the section on problems. Special attention should be paid to the relationship between map seven and the other six maps in this chapter. There are several facts which become apparent about the relationship between all the components of the total environment. These factors will be brought out and recommendations made for future develop-
ment and the correction of present problems. Attempts will be made to relate the patterns of activity logically to the environmental imperative.
MAP 7

KEY

Focal and activity centers
Human traffic patterns
Summary

The purpose of this chapter has been to provide the background of analysis necessary for the real purposes of this entire study. The pertinent environmental facts have been discovered, analyzed, and presented in the preceding sections.

The next steps to come include the compilation of the composite development synthesis and the identification of problems and environmental misuses. Recommendations will be made concerning specific problems, the general land use plan, and conclusions drawn from environmental data. A summary of results to be expected from these recommendations will be included.

Design alternatives for the campus and aesthetic proposals will be presented in the conclusion of the study. The next chapter will therefore begin the process of synthesis.
CHAPTER VI

CONCLUSIONS AND RECOMMENDATIONS

Composite Environmental Plan

The purpose of this chapter is to demonstrate the attainment of the stated goals and purposes of this study. The background necessary for this accomplishment has been laid out in the preceding chapters. The analysis of pertinent factors was laid out in chapter five.

Using the results of the environmental analysis and synthesizing them into composite form gives the total land use suitability plan and map sought by this study. This map is obtained by the utilization of a preemptive method. Considering the fact that the soils, hydrologic and biotic factors present varying suitabilities for the three levels of development, it is only a matter of careful attention to fact to arrive at a composite development map.

There are four assumptions which were made before constructing the development map. They are explained in the following list.

1. All lands which were subject to flood damage were automatically classified as non-developable

2. All land where the Pelham loamy sand soil type is
found were classified non-developable

3. All land with well-developed biotic communities were deemed semi-developable

4. Soil types subject to erosion or of slow permeability were placed in the semi-developable category

All other lands were considered developable and are indicated by orange on the composite map. These areas are considered to have no restrictions to development of any kind.

Semi-developable sections should be given sensitive treatment due to their proximity to non-developable lands and the drainage basins which they include. Specific considerations will be outlined in a later section.

It should be pointed out and remembered that there are other land uses which could possibly be incorporated into each of the three development classes if the proper consideration, engineering techniques, and tasteful design are brought into play. The plan set forth is by no means rigid. It is, instead, an attempt to introduce an awareness of important items to those who are directly involved in campus growth.
MAP 8

KEY
- developable land
- semi-developable land
- non-developable land
Review of Previous Plans

Upon reviewing the development plan of 1969 and comparing this to the composite environmental data, several problems come to light. Since most of the data used in this thesis is of rather recent vintage, it was most likely unavailable to the group who prepared the 1969 plan. Therefore, they most certainly were unaware of several environmental factors.

Referring to map one of this study or to the map prepared in the 1969 plan, it is easy to see that proposed buildings 11, 12, 13, 14, 15, 16, 17, 18, 54, 40, 45, and 46 are located in areas considered non-developable by this study. There are also a few proposed structures in semi-developable areas, but with proper attention, these would have little deleterious effect upon the environment.

Summary of Problems and Recommendations

There are several overriding considerations which have become apparent in this study. They are presented in general form in the following list.

1. Development should be avoided in areas of possible flood damage

2. Development should be avoided on Pelham loamy sand because of corrosiveness, drainage, and water table problems

3. Preservation of the major biotic communities of the campus, especially those in the semi-and non-developable areas
4. There is a need for a full-time steward or groundskeeper to tend to environmental problems and guide development. If this is unfeasible, some type of committee situation would possibly work instead.

5. Dumping of waste materials on campus property should be avoided because of soil types and hydrologic factors.

6. A constant supply of fresh water with air content added by bleeding should be developed for the lake system.

7. Filling of marshes and low-lying areas directly in the drainage pattern of the campus should be avoided.

8. Specific hydrological recommendations include:
   a) avoid blocking drainage basins
   b) avoid obstructions to stream flows and possible flood flows
   c) cutting a minimum of trees in semi-developable areas to keep transpiration up and storm flow down
   d) avoidance of excavation where possible to keep sedimentation to a minimum
   e) restrict paving from stream bottom and low-lying drainage areas because of the effect this has on infiltration, lowering groundwater levels, and pollution
   f) keep channelization of streams to a minimum because of surface runoff and erosion characteristics of certain soil types

9. Specific soil recommendations include:
   a) limit landscaping and other activities which involve extensive earth movement on CqC soils
   b) avoid extensive traffic on LpD soils because of inability to support a vegetation cover well
   c) introduce erosion barriers where needed especially in uncovered areas around the lakes and the Newton Building
   d) plant cover vegetation needs to be planted in campus areas where erosion and sedimentation occur extensively

10. Specific biotic recommendations include:
    a) encourage the growth of food plants for the wildlife on campus such as bobwhite, dove, rabbit, and squirrel
b) fertilize the lakes to encourage the algae which forms the bottom link of the aquatic food chain
c) provide areas to stimulate cover growth for wildlife habitats

Areas requiring special care because of special environmental factors are named in the following list.

1. Newton Building and surroundings including parking lots
2. Eroded soils on the sand ridge surrounding the Administration complex
3. Playing fields behind the Manner complex
4. The wooded areas at the front of campus adjacent to U. S. 301
5. The drainage basin below the lakes on the southwest portion of campus

The problems in these areas can be handled by following recommendations in this study and by abiding by natural rules concerning soil types, hydrology, and the biotic communities related to them. In summary, the preceding recommendations will result in a campus environment in harmony with the natural setting and beautiful as well.
Design Alternatives and Aesthetic Proposals

Proposals from this study can be grouped into four functional categories. These are:

1. Environmental aesthetics
2. Housing
3. Transportation
4. Institutional development

The proposals included under item one go hand-in-hand with the creation of a well balanced environmental system. Map nine will demonstrate the locations and design schemes of many of these proposals. It is stressed that these designs are dependent on the adoption of the environmental land use patterns developed earlier. The proposed items for environmental aesthetics are listed next.

1. The creation of the lake system shown on the map below the existing lakes
2. Building an island in the larger of the existing lakes
3. Development of a wildlife refuge area in the non-developable areas in the southwest portion of campus
4. Building an arboretum in the non-developable lands east of the Biology Building
5. Use of the lake system as an aquatic life research area
6. Establishment of a park type environment around the lake system including trails paved with crushed rock rather than asphalt
7. Building of an amphitheater-plaza in the area between the Administration Building and Williams Center
One particular problem which confronts the college is that of housing. Lack of desire to live in campus dormitories has resulted in changing policies over the past few years. The long waiting lists for surrounding apartment complexes would tend to support the supposition that campus living facilities leave something to be desired in one way or another. Discussion with assorted students indicate the reasons for the trend away from campus housing are threefold. The reasons include (1) sterility or drab appearance, (2) lack of room and personal privacy, and (3) lack of flexibility in living arrangements such as eating place choice and scale of social interaction.

The proposal of this study is the adoption of smaller-scale housing by the campus. This would necessarily be done on a small scale to begin with and increased as the feasibility was proven.

The design concept chosen in this study is the village system made up of small units (8-15 occupants per structure) tied closely in the same area with abundant biota. These villages could be developed on a basis of 300 to 600 students per village. The key to making such a system economically feasible is the selection of structural methods and materials. Among the possible methods for village units are the following items.

1. Pre-cut houses such as those of the Lindal
2. Styrofoam construction which has recently been developed and is capable of tremendous flexibility in design

3. Geodesic dome structures which are probably the most economical and also the strongest building system ever devised

4. Gunnite, or sprayed on concrete which is also capable of great flexibility, strength and economy

Possible sites for these villages will be shown on map nine. It must be stressed that the adoption of such a scheme must be done in accordance with the environmental parameters of the area. The method for treating transportation problems in such a village system will be treated in the next few paragraphs.

The circulation and parking situations of the campus have been under constant scrutiny by many persons in the past two years. There has been an almost continuous increase of traffic congestion on campus in the past few years. The usual response to the problem has been to pave more parking lots. As indicated earlier, this creates several environmental problems including faster runoff, erosion, pollution, and the removal of biological resources.

This study advances two main proposals as solutions to these problems. They are (1) the construction of multi-layered parking lots, preferably in locations at central and fringe areas of the campus, and (2) the adoption
of some system of campus transit, such as tram trolleys or railroad. This system should also include bikeways for student and faculty convenience who do not use the parking and transit facilities. Map nine will include possible locations of parking structures and transit routes. It must be added that the tying together of housing, institutional, and transportation systems can be accomplished by the functional grouping or clustering of buildings rather than a haphazard selection of site choices.

The dialogue in this chapter has progressively gotten more subjective as it moved along. This is necessarily so as the proposals made have been less and less supported by the facts uncovered in the analysis and more and more aesthetic and hypothetical in nature. The proposals for institutional development will be briefly discussed with this trend in mind.

Most of the preceding ideas can be realized through the cooperation of the college with private interests and industries on a financial and institutional basis. There are shortages of trained personnel in Georgia and the southeast in several areas such as the printing industries, housing, recreation, and land management and development. Cooperation with these industries in supplying manpower and expertise could result in joint development programs and financial rewards for Georgia Southern College.

In closing this section, it is herein stated that
MAP 9

KEY
- Lake
- Multi-layered parking lot
- Amphitheater
- Arboretum
- Village housing site
- Aquatic life research area
- Wildlife refuge
- Campus transit route
- Bikeway route
this discussion was included to offer alternatives to plans found lacking by the results of this study. The obligation was accepted that if criticism is offered, it should be supported by reasonable substitutes.

Summary

In conclusion, it is felt that the study has accomplished those objectives which were set down in the beginning. The parameters of land use policy, aesthetic relations and human interaction have been dealt with. Finally, it is hoped that some good will come from this, and that perhaps some parts of the recommendations will be implemented. The author sincerely hopes that the environment land development plan (map eight), the system of new lakes, and the multi-layered parking lots will be adopted and come to fruition.
APPENDIX A

THE GROWTH OF PLANNING
The concept of the planning process has undergone a remarkable and desirable evolution. The first city planning endeavors in this century were largely confined to projects for groups of buildings—architecturally imposing if not especially meaningful—surrounding ornate plazas and fountains. At this time, planning was little more than a hobby, and was thought to be a good thing for those communities that could afford it—but hardly essential. With the coming of the depression and the war years, however, the public began to realize that planning had a practical contribution to make. When great public works projects were undertaken to alleviate the effects of the depression, it became obvious that these improvements must conform to a rational pattern, and the philosophy of planning broadened to meet the challenge. The concept was again expanded and planning was even more evident in the defense program brought on by the Second World War. By the end of the war, the country found itself face to face with an unparalleled population explosion and a resulting expansion of urban communities. A means had to be found to deal with the legitimate desire for urban expansion without bankrupting the community in the process. This need was met, and is still being met, by the use of planning processes.

In some cases, unfortunately, the need for planning was recognized only after the most undesirable kinds of development had taken place; many communities were forced to accept the idea of planning because they literally had no alternative. Regardless of the cause, it came to be realized that planning provided the only means of considering comprehensively the great variety of problems facing a developing community. As a result, most municipal officials now accept planning as a normal and desirable function of local government.
APPENDIX B

LAND USE COMPATIBILITY

RELATIONSHIPS
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**Chart shows cross factor relationships**

NOTES: D = Desirable Land Use  
Q = Questionable Land Use  
U = Undesirable Land Use

*(Existing Conditions Survey and Analysis for Bulloch County, Georgia, AGS-APDC, 1973)*
APPENDIX C

AESTHETIC GOALS
To relate the roles of science, technology, and art more precisely thus enriching and deepening the lives of all citizens by striving to improve the quality of man's environment and the visual impact of man's environment:

1. Historic buildings and sites should be preserved and incorporated into the overall community structure so as to maintain cultural ties with our heritage.

2. All man-made developments should be related to natural features and cultural conditions. Woodlands and mature trees should be preserved and stream valleys, should be saved and treated as major design elements.

3. Land development plans and architectural design characteristics should be encouraged to seek interesting variety while maintaining a central unity. Monotonous, dull sterile development should be avoided.

4. Incompatible land uses should be buffered from the community, and their otherwise adverse affects will be rendered inoffensive through proper location of such uses and appropriate site design.

5. Roadways should be designed with positive landscaping ideas in mind and they should provide sufficient right-of-way widths to permit adequate landscaping treatment. The establishment of scenic roadways will be encouraged.

6. Adequate utility systems and services should be provided to meet future demands and they should be handled in such a manner that they do not detract from the quality of the visual image. Lines should be installed below ground wherever possible and all surface and above surface utility facilities should be harmoniously integrated into the area's landscape and should be attractively designed.

7. Attractive and well-related streetscapes will be encouraged in recognition of their importance in the everyday life of the people. Unified appearance should be fostered to maximize the visual impact for both the pedestrian and the motorist and to avoid a cluttered appearance.
APPENDIX D

GOALS OF CAMPUS IDENTITY
To foster campus development with appropriate focal points and fabric so as to lend character, identity, and individuality to communities and to keep them within the human scale:

The character of a community transmits recognition and organization of its physical elements to the mind of its beholder. When the image is clear, even the new arrival is able to orient himself and recognize reference points within the total community fiber. Community image includes such qualities as architectural appearance and land use arrangements which evoke strong mental images. Such images let the observer and resident identify and remember the area, and they can exert stabilizing social and psychological influences.

1. Land uses should be located in a manner and at a density which leads to the establishment of a campus core.

2. Cultural facilities and programs should be encouraged so as to provide all citizens with the opportunity to enrich and broaden their lives and to foster a closer relationship between the individual and the campus.

3. Open space and low density areas should be spatially distributed so as to aid in delineating the environment.

4. Land developments should be discouraged where these developments through their nature or location tend to detract from the geographic or functional identification of separate areas.

5. The development of areas will be so timed and staged as to facilities, services, public utilities, and other supporting land uses and so as to permit the development and implementation of plans which will lead to the development of areas with their own individuality.
APPENDIX E

LAND USE GOAL
To provide for an orderly relationship, in proportion and distribution, of a wide variety of land uses within the area:

1. Open space lands will be fostered in recognition of the vital role they play in the overall structure of the area. It is noted that institutional and recreational uses provide an essential service to the residents of the area and contribute significantly to the enhancement of the land development pattern of the area.

2. The various forms of land use will be encouraged to locate in a manner to produce the most beneficial and advantageous series of interrelationships. Compatibility of land uses will be sought and land use buffers introduced where incongruous uses would otherwise exist. All forms of land uses will be related to existing cultural as well as natural features so as to attain a desirable relationship.

3. Imaginative land developments will be encouraged where they support the desired goals.
APPENDIX F

FACILITIES, SERVICES AND PUBLIC UTILITIES GOAL
To provide services, facilities, and utilities of the quality and the quantity desired, when they are needed for campus population,

1. Campus facilities, services, and public utilities should be evaluated in areas of the region already developed and a detailed program prepared which outlines the necessary steps to provide them where they are not now adequate.

2. The provision of campus facilities, services, and utilities should be integrated with each other and with other forms of land development with respect to both timing and physical relationship.

3. Land, air, and water of pollution should be eliminated by the provision of appropriate campus facilities, services, and public utilities and supported by appropriate regulations.
APPENDIX G

TRAFFIC, COMMUNICATION, AND CIRCULATION GOAL
To provide a system which facilitates the orderly and efficient movement of individuals, goods, and information:

1. Movement of traffic should be improved by widening narrow roads, eliminating hazardous conditions, and improving areas of traffic congestion. The construction of entirely new facilities should be encouraged only in instances where improvements to the existing system cannot be made that will be adequate to meet present or future needs.

2. A workable balance between roadway and transit systems should be maintained and fostered. A desirable relationship between the circulation system and the land use development patterns should also be maintained and encouraged.

3. Access should be improved to areas of potential development by encouraging the reorientation of the existing road network public transit routes.
APPENDIX H

EXCERPTS FROM

MAN AND HIS URBAN ENVIRONMENT
We must start with the recognition that man is normally a gregarious creature, and therefore cannot be coaxed, urged or driven out of the city. But the city is man-made, and can be changed. Among innumerable reports by practical planners as well as academic specialists, there seems to be general agreement on at least one proposition—the modern urban world is one for which society has made no preparation. The city has to originate, contain, nourish, and constantly renew its institutions, and its institutions must be integrated extensions of the nature of the urban-locked man, who for generations has lived in an unsympathetic urban environment and has been unable to adjust to it. The city, whether anyone likes it or not, is the natural habitat of civilized man. People want to be where the action is. What is needed is a new, integrated system involving the government at all levels, private enterprise, and the people.

There are no quick, easy political or financial solutions to the problems of man and his urban environment; we cannot "fix" or buy an end to the human complexities, and the influx of almost limitless funds more often than not only compounds the situation. Obviously, we need a far more penetrating analysis of causes than anyone has yet undertaken. The real crux of the problem is that we do not know enough yet to be sure what it is that we are trying to do. What we really need is a clear delineation of the base causes of urban problems cleansed of emotional, ideological and punitive distractions.

We need to know with some degree of scientific accuracy and with a great deal of insight why man's nature and the urban environment have so many sharp points of antipathy. And we must recognize that man's nature has been with him for a long time, and will not change easily. It is the city that must adjust—at least far more than it is able to at the present time. We start with one important assumption: that no urban institution, however hallowed time and tradition may have made it, is inviolable. Change for the sake of change futile and often self-defeating; but productive change in order to reach a sound objective may well be the wave of the future.

We have never learned successfully to build, shape or control the orientation of the cities, though they have been with us since civilization began. As a result of basic ignorance, we are so inundated with urban confusion that we do not really know what our pro-
blems are, though we are saturated with their consequences. Every day we discover new side reactions from our efforts to eliminate those consequences; then we hastily seek remedies for the side reactions. What is really needed is insight and a determination to isolate those points at which the city fails us, and to do it, as the saying goes, without fear or favor. It won't be easy. In all spheres, we must bend our efforts to raising the standards of moral conduct. From the beginning, there has been a discrepancy between man's performances in the moral and intellectual fields. Technology, which is an intellectual feat, has unfortunately outrun man's performances, thereby creating what can only be called a morality gap. This seems to be one of the most crucial issues of our time, since without morality we can have no society. We need to go back to the drawing board.

The important step is to isolate and clearly establish (insofar as humanly possible) man's basic urban-related needs. These must be distinguished from his "wants", which are limitless, and moreover the "wants" of one group invariably conflict with or impinge upon the "wants" of others. "Needs" are fundamental. "Wants" are embellishments--which in the contemporary scene misdirect far too much effort.

The physical attributes of the city, the design of its institutions, and the pattern of its management should have these nine concerns at the heart of their specifications:
1. Livable shelter
2. Effective urban services
3. Reasonable security
4. We must provide hope for personal and community improvement
5. People need a source of income, a sense of belonging
6. We need to reduce the waste that increases living costs and frustrates citizens
7. We should take a fresh look at cultural and recreation facilities
8. Face the transportation problem
9. A minimum of pollution and ecological disruption

We need new technologies to overcome the problems, and we need a certain amount of growth to economic stability and a controllable pattern of growth are fundamental requirements. These must be made compatible with the protection of the environment.

It becomes increasingly evident that what we need—and what we lack—is comprehensive, integrated
Urban System that combines the physical design of the city with the pattern of its direction and management. We must question why a city can't be created like any other work of man, with a long-range plan, clear objectives, a workable program for implementation, and a point at which the community would be finished, completely done. Without planned, orderly growth, land is wasted, and urban land is a precious commodity, limited in supply. Population density in a planned town can easily be double or triple that of most suburbs—or of some cities—and still provide better facilities, more facilities, more living space and far more relaxed comfort and natural beauty. Very often, the problem is not too many people, but people badly distributed.

The cities of the seventies will need better planning, more discipline, and new and deeper operational dimensions if society is to save itself—and this will require that the public sector and private enterprise find a formula to work together which will harness the assets and wealth-generating capacities of enterprise and yet permit ample freedom for social and managerial direction in its growth. The value of land must not determine what is to be built upon it; this must be determined by intelligent land use planning; and this requires that land value must be controlled by some device more manageable and durable than market pressures or fragile building restrictions. (Smith, 1973, pp. 10-55.)
APPENDIX I

PROCESS CHART FOR MAJOR PROCEDURES
Overview of Major Procedures

Recognition of the need for a solution to an environmental design problem area

Collection of information

Environmental Analysis
Man-made factors analysis
Historical Analysis
Human Interaction Analysis

COLLECTION OF BASIC DATA
Geology
Biology
Climate
Structures
Utilities
Roads
Past growth
Past plans
Behavior patterns

IDENTIFICATION OF MAJOR PROBLEMS

IDEATION SEARCH
IDEATION SEARCH

Design Proposal No. 1
Design Proposal No. 2
Design Proposal No. 3

EVALUATION OF ALTERNATIVES

Selection of Alternative

CREATIVE SYNTHESIS AND DESIGN

MODELING
Simulation
Testing

EXPERIMENTATION

PRESENTATION OF THE PLAN
APPENDIX J

ENVIRONMENTAL FACTORS

USEFUL IN LAND USE PLANNING
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<td>Active processes maps</td>
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(Keith Young, U. of Texas, *The Paradox of Earth and Man*, 1974)
A. Physical properties maps:

1. Geologic strength
2. Soil stability
3. Suitability for foundations
4. Moisture content
5. Electrical resistivity
6. Shrink-swell potential
7. Drainage
8. Corrosiveness to metal
9. Depth to bedrock
10. Kind of bedrock
11. Hydrology
12. Subsurface geology
13. Physical resources
14. Erosion rates
15. Soil characteristics
16. Flood conditions
17. Detailed topography
18. Surficial geology
19. Subsidence
20. Surface sediments
21. Storm drainage
22. Pollution sources of ground and surface water
23. Waste disposal
24. Water supply
25. Water table
26. Slope
27. Lithology
28. Permeability

B. Mineral and energy resources maps:

1. Surficial materials of resource value
2. Potential resources
3. Resource-producing areas
4. Resource-oriented land use
5. Resource installations
A. Biotic assemblages maps:

1. Animal communities
2. Plant communities
3. Biotic provinces
4. Agricultural lands
5. Forest lands
6. Wildlife preservation areas
7. Drainage basins
8. Areas of scenic value
9. Potential resources (biologic)
10. Freshwater marshes
11. Salt marshes
12. Oyster reefs

B. Topography and bathymetry maps:

1. Topography
   a) contours
   b) hachures
   c) colors
2. Physiography
3. Percent slope
APPENDIX M

LAND USE, WATER SYSTEMS
AND MAN-MADE FEATURES
DERIVATIVE FACTORS
A. Current land use maps:

1. Residential
2. Industrial
3. Institutional
4. Recreation
5. Agriculture
6. Forests
7. Wildlife preservation
8. Greenbelts
9. Historic sites
10. Population density
11. Resources
12. Freshwater marshes
13. Salt water marshes
14. Plant distribution

B. Water systems and man-made features maps:

1. Natural water systems
   a) drainage basins
   b) surface drainage
   c) marshes
   d) lakes
   e) bays
   f) estuaries
   g) depth to groundwater
   h) aquifers
   i) aquifer recharge areas
2. Man-made water systems
   a) reservoirs
   b) irrigation systems
3. Urban areas
   a) residential
   b) industrial
APPENDIX N

HYDROLOGY DERIVATIVE FACTORS
A. Active processes maps:

1. Erosion
2. Rapid deposition
3. Flooding
4. Surface drainage
5. Tidal inundation
6. Storm surge inundation
7. Wind strength and direction

B. Rainfall, stream discharge, and surface salinity maps:

1. Flooding
2. Precipitation
3. Runoff
4. Salinity
5. Depth to groundwater
6. Aquifers
7. Aquifer recharge areas
APPENDIX O

SUITABILITY FACTORS FOR
VARIOUS LAND USES
**CONSERVATION** - the following factors make an area most suitable for conservation

1. Features of historical value  
2. High-quality forests  
3. Unique geological features  
4. Unique physiographic features  
5. High-quality marshes  
6. Streams  
7. Water-associated wildlife habitats  
8. Scenic land features  
9. Scarce ecologic associations  
10. Scenic water features

**RECREATION** - the following are salient factors for designating land for recreational use

**(I) Passive Recreation**
1. Unique physiographic features  
2. Scenic water features, streams  
3. Features of historic value  
4. High-quality forests  
5. High-quality marshes  
6. Scenic land features  
7. Scenic cultural features  
8. Unique geologic features  
9. Scarce ecologic associations  
10. Water-associated wildlife habitats  
11. Field and forest wildlife habitats

**(II) Active Recreation**
1. Bay beaches  
2. Expanses of water for pleasure craft  
3. Fresh water  
4. Riparian lands  
5. Flat land  
6. Existing and potential recreation areas

**RESIDENTIAL** - these factors make an area suitable for residential usage

1. Scenic land features  
2. Riparian lands  
3. Scenic cultural features  
4. Good bedrock foundations  
5. Good soil foundations

**COMMERCIAL-INDUSTRIAL**
1. Good soil foundations
2. Good bedrock foundations
3. Navigable channels

*The most restrictive factors which preclude residential and commercial-industrial developments are:

1. Slopes
2. Forested areas
3. Poor surface drainage
4. Poor soil drainage
5. Areas susceptible to erosion
6. Areas subject to flooding

(McHarg, 1969, pp. 110-113)
APPENDIX P

ENVIRONMENTAL IMPACT STATEMENTS
These statements are to discuss:

1. The environmental impact of the proposed action

2. Any adverse environmental effects which cannot be avoided should the proposal be implemented

3. Alternatives to the proposed action

4. The relationship between local short-term uses of man's environment and maintenance and enhancement of long-term productivity

5. Any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented
APPENDIX Q

GENERALIZED GEOLOGIC PROFILE
<table>
<thead>
<tr>
<th>PERIOD</th>
<th>AGE</th>
<th>GEOLOGICAL FORMATION</th>
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Source: Final Environment Statement for Edwin I. Hatch Nuclear Plant, U.S.A.E.C.
APPENDIX R

THE NATURAL WATER CYCLE
APPENDIX S

HYDROLOGICAL FACTORS RELATED TO ENVIRONMENTAL DESIGN
There are four interrelated but separable effects of land-use changes on the hydrology of an area: changes in peak flow characteristics, changes in total runoff, changes in quality of water, and changes in the hydrologic amenities. The hydrologic amenities are what might be called the appearance or the impression which the river, its channel and its valleys, leaves with the observer.

Runoff, which spans the entire regimen of flow, can be measured by number and by characteristics of rise in streamflow. The two principle factors governing flow regimen are the percentage of area made impervious and the rate at which water is transmitted across the land to stream channels. The former is governed by the type of land use; the latter is governed by the density, size, and characteristics of tributary channels and thus by the provision of storm sewerage. The volume of runoff is governed primarily by infiltration characteristics and is related to land slope and soil type as well as to the type of vegetative cover. It is thus directly related to the percentage of the area covered by roofs, streets, and other impervious surfaces at times of hydrograph rise during storms.

As volume of runoff from a storm increases, the size of flood peak also increases. Runoff volume also affects low flows because in any series of storms the larger the percentage of direct runoff, the smaller the amount of water available for soil moisture replenishment and for ground-water storage. An increase in total runoff from a given series of storms as a result of imperviousness results in decreased ground-water recharge and decreased low flows. Thus, increased imperviousness has the effect of increasing flood peaks during storm periods and decreasing flow between storms.

Land use in all forms affects water quality. A major effect of urbanization is the introduction of effluent from sewage disposal plants, and often the introduction of raw sewage, into channels. This effect can be measured by the balance and variety of organic life in the stream, by the quantities of dissolved material, and by the bacterial level.

Finally, the amenity value of the hydrologic environment is especially affected by three factors. The first is the stability of the stream channel itself. A channel, which is gradually enlarged owing to increased floods caused by urbanization, tends to have unstable and unvegetated banks, scoured or muddy channel beds, and unusual debris accumulations. The second factor is the
accumulation of artifacts of civilization in the channel and on the flood plain: beer cans, oil drums, bits of lumber, concrete, wire—the whole gamut of rubbish of an urban area. The third factor is the change brought on by the disruption of balance in the stream biota. The addition of nutrients promotes the growth of plankton and algae. A clear stream, then, may change to one in which rocks are covered with slime; turbidity usually increases, and odors may develop. As a result of increased turbidity and reduced oxygen content desirable game fish give way to less desirable species.

(Leopold, 1972)
BIBLIOGRAPHY


11. Corps of Engineers: Flood Plain Information- Lotts Creek and Mill Creek- City of Statesboro, Georgia, Department of the Army, Savannah, Georgia, 1973.


