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1980 KILL DEVIL HILLS LAND USE PLAN

Prepared for the Town Board,
the Planning Board and the
Town Administration by
Coastal Consultants, Ltd.
11/15/80

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INTRODUCTION

This land use plan is designed to deal with development problems during the coming ten years, 1980-1990. The Plan is organized into four parts: Section One consists of the policies governing future decisions by the Town. Sections Two and Three consist of technical reports prepared by the consultants, whereas Section Three contains other information required to meet state guidelines for preparing land use plans to comply with Coastal Resources Commission standards. Section Four contains the public participation element used to produce the plan.

The material in Section One has been referenced so that the reader can find support information in the other sections. The reader will note that the policy section closely follows the format of the technical information and of the questionnaire.

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Section One: Policies

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GENERAL OBSERVATION

The Town of Kill Devil Hills is a beach community on the Outer Banks of North Carolina. Although its permanent population is less than 1,800 people, its summer population swells to nearly 13,000 overnight visitors and residents. Kill Devil Hills is predominantly ocean oriented. Recent development has tended to locate near the Sound. Kill Devil Hills has considerable natural resources. These include the Sound, adjacent marshland, fresh water ponds with valuable wildlife, large dunes along the soundside, and the ocean and its beaches. Kill Devil Hills is nearly completely subdivided. Opportunities to protect many environment features must rest with the voluntary actions of residents, visitors and developers. The Town is growing at a rate between 8 and 13% per year. This growth rate will probably cause the Town to be completely developed by 1990. Redevelopment will probably not occur until after 2000 due to the fact that considerable open space exists to both the north and south of Town.

GROWTH

Policies Considered

(1) Increase growth rate to 15 or more percent; (2) Keep growth rate of 1970s, namely 8 to 13%; (3) Limit growth rate to under 8%; (4) Limit growth rate to a number which reflects the capacity of the present facility system without major, costly additional expenditures; (5) Adopt a no growth policy.

Discussion

Townspeople want to restrict growth to a level which will not require major, costly addition expenditures. (Questionnaire, pp. 5-6) The Town has approved several new subdivisions and partially approved plans for additional motels on the beachfront. The Regional Sewer System may not be as expensive as the respondents to the questionnaire believed it to be. (Environmental Considerations, pp. 17 f.) Except for sewer, facility capacities appear to be sufficient to handle 13,000 additional overnight visitors and residents.

Policy Selected

Retain growth rate of the near past, namely the 1970s. Plan to construct and improve facilities and services to meet the demands of 13,000 additional residents anticipated to move to the Town by 1990.

Implementation

Adopt other policies consistent with this overall policy. (See additional policies in this Section.)

ENERGY SHORTAGES AND MARKET FACTORS WHICH COULD AFFECT THE GOAL OF REACHING THE SELECTED GROWTH RATE

Policies Considered

(1) Assist private sector in finding suitable financing for favored development; (2) Take measures to assure a sufficient quantity of gas will be available for motorists who reach the Town; (3) Develop a mass transit system to diminish the reliance on the auto for persons who have reached the Town; (4) Take no action.

Discussion

Past relationships between energy shortages, tight money and Town growth seem to support the conclusion that no long term effects on the building rates will result from short term energy shortages or tight money. (Population, pp. 11-15) Traffic congestion and associated hazards on the Bypass justify the Town supporting some measures that will reduce problems there. (Transportation, pp, 8-14) The public does not strongly support expenditures for mass transit. (Questionnaire, pp. 14-15) Therefore, mass transit should be pursued only if the system pays for itself.

Policy Selected

The Town will support efforts begun by the Town of Nags Head aimed at providing mass transit for the beach communities on the northern Dare County Outer Banks. This support will probably continue as long as the system is self-supporting.

Implementation

Cooperation with the Town of Nags Head in finding further sources for the project. Administrative assistance from the Town to the Town of Nags Head.

Comment

As a result of implementing this policy in the current planning year, a mass transit system was established during the summer of 1980.

CONSTRAINTS TO DEVELOPMENT

Policies Considered

Determining that none, some or all of the following deserve local government action which would make them a constraint to development. (1) Flood hazard areas, (2) Areas with soils considered unfavorable for the use of septic systems, (3) Wetlands, (4) Wooded lands and especially, Nags Head Woods--dunes, ponds, wooded areas (bay forest, mixed hardwood forest), marsh, hammocks, etc., (5) Oceanfront dunes.

Discussion

Kill Devil Hills is currently nearly completely subdivided. Large lot sizes for sensitive environmental features are not possible. Standards designed to diminish damages from flooding are being enforced. (Current Plans, p. 4) Flooding is only a partial constraint to development in that it increases the costs of building. Since the regulations have been in effect during the 70s, one can conclude that the regulations have no significant effect on the growth rate. The soils on the Outer Banks have severe limitations for development relying on the use of septic systems. (Environmental Considerations, pp. 6-15). Environmental damages are probably limited to pollution of the Sound. This damage can probably be avoided if developers and builders use large lot sizes on lands close to the Sound. Nearly all land adjacent to the Sound is already subdivided. The Coastal Resources Commission currently limits the use of development within 75 feet of the Sound. The Commission (C.R.C.) also protects wetlands from development. Permits are required for development in both areas.

A large portion of the Woods is subdivided; roads have been built and lots have been sold. A significant portion of the built-on lots have retained their natural vegetation, despite the absence of Town regulations requiring cover requirements. The respondents to the questionnaire favored protection of environmental features, preservation of open space, use of large lot sizes and minimum cover requirements. (Questionnaire, pp. 8-11) The Board of Commissioners is reluctant to increase governmental regulation unless it is absolutely necessary.

Development along the oceanfront is limited by the C.R.C. to those instances where a flood hazard setback is observed and the primary dune is not disturbed.

Policy Selected

The following are deserving of additional action by the Town of Kill Devil Hills which would make them constraints to development: areas with unsuitable soils for septic systems. It is Town policy to limit development on such soils, as mapped by the consultants and representing soils determined to have limitations by the Soil Conservation Service. The Town supports the enforcement of septic system regulations as enforced by the County Health Department. The Town will continue to participate in the Federal Flood Insurance Program. It will continue to enforce a flood hazard ordinance with accompanying building standards so long as the program is in effect. The Town encourages property owners to retain the natural wooded condition of their property as a shelter for wildlife and to prevent erosion. The Town does not wish to designate the Woods within the Town limits as an

Area of Environmental Concern. The Town supports C.R.C. policies and regulations protecting the marshlands along the Sound. The Town favors the maintenance of existing policies on the fresh water pond which constitutes the back-up water source for the Town. The Town supports policies of the C.R.C. that will protect the dune system along the ocean, however, it does not support setbacks adopted for the sole purpose of anticipating erosion during the next thirty years.

Implementation

The Town will retain its flood control ordinance. The Town will work with the County Health Department. The Town will continue to enforce its building code, zoning ordinance, subdivision regulations. The Town will take an active role in policy development of the C.R.C. (whenever possible the Town Administrator and members of Board of Commissioners will attend the meetings). The Town will enforce C.A.M.A. regulations by keeping in effect an implementation and operation plan and by designating a local permit officer as required under that statute.

WATER AND SEWER FACILITIES

Policies Considered

(1) Participating or building a public sewer system to handle growth anticipated during the next ten to twenty years;
(2) Encouraging small package plants for handling household wastes and commercial wastes--such systems to be located in areas with poor soils for septic systems and in areas of dense motel and/or restaurant development; (3) Delay decision until further studies can be completed; (4) Leave the decision totally to State and Federal agencies.

Discussion

Additional motel development will provide a secure source of revenue for future services. Motels yield higher revenue per acre than do single family structures. (Housing, pp. 24-28) Existing subdivisions, when developed, may damage the Sound and surficial aquifer--lot sizes are not sensitive to what we currently know about the filtering capacity of soils for handling domestic wastes. The State supports increasing the level and revenue from tourism. The Federal Government is recently considering limiting development by limiting services and facilities on the barrier islands. The Town had participated in the Dare Beaches Water and Sewer Study and preliminarily backed the plan to build a regional sewer system for the towns of Manteo, Nags Head and Kill Devil Hills. A plan to study package treatment systems would take too long, significant lead time has already been spent on the regional sewer system. A sewer system needs to be completed as soon as possible.

Policy Selected

The Town supports the building of the regional waste treatment facility. This project should be begun and completed as soon as possible.

Implementation

The Town will investigate methods of raising the funds necessary to construct the local collector system and pay for its share of the facility costs as soon as the project seems likely to receive State and Federal approval. The Town will probably submit a bond raising proposal to referendum. In implementing the construction of the local sewer system, the Town will extend lines to areas with poor soils and dense populations first and then to other areas.

Note

In the event the Regional Wastetreatment Facility is abandoned, the Town will study the feasibility of using package plants.

Interim Policies

Interim policies designed to discourage the building on lots with poor soils were considered but rejected. (Public comments to the preliminary draft and proposed interim policies were so harsh as to demand their removal.) The Town desires that this problem be solved by the construction of a public sewer system.

Comment on the Water System

The Water system has sufficient excess capacity to meet demands to 1990. The Regional Water Distribution System was completed during the summer of 1980; its capacity and ability to expand should enable

the Town to be assured of sufficient quantitites of water for local distribution to 1990. The fresh water pond will be used as a back-up water supply.

HURRICANE EVACUATION

Policies Considered

(1) Treat hurricanes as an unusual natural occurrence which should be planned for but which do not demand the kind of public expenditures to insure lives and safety beyond the extent to which they are currently protected; (2) Take such measures as are necessary to evacuate the Outer Banks when threatened by hurricanes; (3) Restrict the measures in number two above to only planning measures that do not involve public expenditures; (4) Limit growth to amount that can be evacuated safely.

Discussion

The chance of a hurricane striking the Dare Outer Banks appears to be about 1 in 10 in any year. A hurricane or major storm will probably require evacuation as there are not adequate shelters in existence on the Outer Banks to accommodate even a small proportion of the population. The likelihood of a successful evacuation is related to the warning time. By 1985 the population on the Outer Banks from Ocracoke to Corolla needing to exit using routes US 64 and US 158 will have exceeded the bridge capacity on the road network, even given reasonable early warning (48 hours). (Transportation, pp. 1-8) Despite Department of Transportation Plan providing for four lane highways in Currituck to the bridge over the Currituck Sound and the six laning of the Bypass, no plans exist to increase the bridge over the Sounds to four lanes, or to build another bridge.

Policy Selected

The Town requests the State Department of Transportation to plan, engineer and build another bridge across the Currituck Sound. The Town requests the County to update its hurricane evacuation plan to account for problems identified in the technical report to this Plan (See Transportation, pp. 1-8).

Interim Policy

In the event that a plan to increase the bridge capacity is not forthcoming from the State by 1985, the Town will work with other Dare Beach communities and the United States Park Service to place limits on growth.

Implementation

The Town will write letters of request to the County and State, and assist them in their efforts to implement these policies. The Town will prepare ordinances to implement the interim policy in case it should become necessary.

TRANSPORTATION NETWORK: BYPASS

Policies Considered

(1) Request that State build four lane road on Bypass right-of-way; (2) Request State build feeder roads along Bypass; (3) Build a new two lane road along the Sound; (4) Restrict commercial access to the Bypass; limit new streets entering Bypass; eliminate left turns on Bypass; (5) Establish system of one-way pairs.

Discussion

Traffic levels on the Bypass currently exceed design standards. The Thoroughfare Plan of 1973 calls for building a six lane highway on the Bypass right-of-way. D.O.T. states that feeder roads would be too expensive because the right-of-way would need to be enlarged. One-way pairs are unacceptable to the Town because they would increase the level and speed of traffic on the beach road which is heavily used by pedestrians for beach access. (Transportation, pp. 8-17) The respondents to the questionnaire support a four lane highway; they oppose restrictions and one-way pairs. (Questionnaire, pp. 11-12) State budgets for highway improvements appear dismal.

Policy Selected

The Town supports the Thoroughfare Plan (1973) and requests the State to implement the plan as soon as possible. The Town will place a low priority on paving streets that are currently only paper streets in such a way that access would be directly to the Bypass, except where to not do so would result in no reasonable access to the Bypass in the area.

Implementation

The Town has requested the State D.O.T. to place the plan to six lane the Bypass on its improvements program for the next ten years. The Town will develop a policy on street connections to the Bypass. The details of the policy will be included in the management tools study in 1980-1981.

Interim Policies

In the event that funding for this project is not provided by 1985, the Town will set up a Task Force to study the problem and make recommendations.

TRANSPORTATION NETWORK: LOCAL ROADS

Policies Considered

(1) Pave local roads pursuant to a priority list, the priorities reflecting policies of the Town concerning which areas it wishes to see developed first (reflecting problems with soils for septic systems of lots adjoining the roads, of foundations for the road itself); (2) Pave local roads when the majority of the people on the street are willing to pay for 50% of the costs; (3) Require new subdivisions to build roads to Town specifications.

Discussion

Kill Devil Hills currently requires roads in new subdivisions be built to Town specifications. Current policy also calls for property owners to share in the costs of new streets designed to serve them. The respondents to the questionnaire indicated a desire to see greater spending of tax monies for paving the streets. (Questionnaire, p. 15).

Policy

The Town will continue its policy of paving local roads when a majority of the people on the road or street are willing to pay 50% of the costs of the paving. The Town will study alternatives to this policy in its revision of the management tools in 1980-1981.

Implementation

None required, except to study the matter further with concrete proposals in the management tools study in 1980-1981.

HOUSING MIX

Policies Considered

(1) Maintain low density housing mix of past ten years; (2) Shift housing mix to a greater percentage of motel units; (3) Shift housing mix to encourage more condominiums.

Discussion

A housing mix that would result in higher densities would create the best tax base and greatest net revenues to the Town. (Housing, pp. 24-27) The respondents to the questionnaire indicated a strong desire to retain the family beach atmosphere (limiting high density) and to increase the amount of open space. (Questionnaire, pp. 7-11)

Policy Selected

The Town desires to provide for a future housing mix which is approximately 75% single family and 25% motel units. Middle densities will be largely discouraged.

Implementation

The Town will review its zoning ordinance to determine if it can adjust zones and densities to accomplish this policy. Programmed for management tool study, 1980-1981.

RECREATION AND BEACH ACCESS

Policies Considered

The Town considered the following facilities to determine which ones should be provided at public expense: (1) marinas and boat access, (2) parking for beach access, (3) bathhouses, (4) playgrounds, (5) tennis courts, (6) indoor ball courts, (7) ballfields, (8) picnic facilities, (9) jogging and walking paths, (10) bikeways, (11) meeting hall.

Discussion

In 1979 the Town adopted a beach access plan. (See Current Plans.) The respondents to the questionnaire indicated a need and desire to have parking provided for beach access. They also showed some support for bikeways and jogging paths. (Questionnaire, pp. 13-14) Recreation on the Dare beaches is strongly tied into beach use. Approximately two to three acres of parking will be needed to accommodate the 1990 population, if mass transit is unavailable. Only a few of the beach access points are maintained by the Town.

Policy Selected

The Town will plan to provide adequate beach access facilities for the general public and especially for overnight residents of the Town. More specifically, the Town will attempt to improve and maintain all the beach access points within its jurisdiction within the next ten years. The Town will develop a plan to acquire any additional land needed for parking. The Town will cooperate with Nags Head towards the goal of achieving an acceptable mass transit system.

The Town will work with Nags Head and private organizations, including Nature Conservancy, to develop jogging and walking paths and bikeways.

Implementation

The Town Administrator will investigate the adequacy of existing Town property for use as parking in connection with beach access for both the ocean and sound. He will also prepare a schedule for improving beach access points during the next ten years. The Town will work with Nags Head on grantsmanship leading to the funding of bikeways, jogging and walking paths. Some motel development (30% of new units) have been encouraged in order to provide greater opportunities for the general public to use the beaches.

BEACH AND SHORELINE EROSION

Policies Considered

(1) Encourage projects aimed at preserving the existing beach, including groins and jetties; (2) Encourage the projects depending on how much local, state and federal monies are involved in the project; (3) Discourage these projects.

Discussion

Projects designed to stabilize the ocean beaches and prevent further erosion are expensive. Further State money for such projects seems dubious. Private erosion control actions usually interfere with the public's right to the beaches. They also affect the property rights of adjoining landowners. The building of steel and concrete structures along the oceanfront inevitably will require beach stabilization or acceptance of severe damage to property and consequential loss of tax revenues. (Beach Dynamics, pp. 1-4)

Policy Selected

The Town is opposed to private and governmental actions that would attempt to stabilize the beach rather than allow it to migrate. The Town is opposed to bulkheads, jetties, groins, and the like along the oceanfront. The Town will not spend local tax monies to protect private landowners from problems due to ocean migration. The Town encourages motels to locate west of the beach road.

Implementation

The Town will rely on consistency review and existing C.R.C. and D.N.R.C.D. policies to implement policies towards building jetties and

groins. The Town will amend its zoning ordinance to remove features requiring bulkheads along the oceanfront. The Town will review its zoning ordinance to allow new motel zones west of the beachroad, and perhaps to curtail the possibility of motel development along the ocean, or some sections of the oceanfront. The Town will investigate the possibility of adopting different open space requirements for oceanfront and non-oceanfront property in the goal of fostering motel development beyond the reaches of the migrating beach.

DUNEPLOWING, REBUILDING AND REVEGETATING THE DUNES, BULKHEADING THE ESTUARINE SHORELINE

Policies Considered

(1) Encourage such actions; (2) Discourage such actions; (3) Require or prohibit such actions.

Discussion

The Town has always allowed duneplowing and other actions, even if it considered such actions as futile, provided the actions were not undertaken in such a manner as to damage a neighbor's property. The Town encourages the bulkheading of soundside and canal property. This type of bulkheading will reduce sedimentation in the canals and Sound, increasing water quality and limiting expenditures by private individuals to maintain boat access.

Policy Selected

The Town encourages the building and rebuilding of the dunes. Such action will require a C.A.M.A. permit. The Town supports the individual private landowner's decision towards duneplowing, provided such actions are not detrimental to the property rights of adjacent landowners or to the public's right to the beach. Again, a C.A.M.A. permit is required for duneplowing, limited to emergency situations only. The Town encourages the bulkheading of property along canal lots and adjacent to the Sound where such property is experiencing erosion and where natural barriers to erosion are limited or non-existent.

BUILDING HEIGHTS

Policies Considered

(1) Limiting building heights to an amount that could be served by Town fire equipment; (2) Limiting height in entire Town to 50 feet; (3) Limiting height near airport to 50 feet to provide greater safety there, but allow unrestricted heights outside of normal flight patterns and anticipated deviations therefrom.

Discussion

Kill Devil Hills has traditionally viewed the height limitation as a capacity factor; maximum allowable height under the zoning ordinance is 50 feet. Modern sprinkler systems would reduce need of Town firefighting equipment being able to reach structures above 50 feet. Strong winds especially during hurricanes and storms pose concern over the ability of tall structures to withstand the forces of nature. Elevations above 50 feet in the flight path of an airport or near an airport may be hazardous for pilots navigating landings and takeoffs.

Policy Selected

The Town will retain its current 50 feet height limitation for structures.

Implementation

Retain height limitation in the zoning ordinance.

COMMERCIAL AND RECREATIONAL FISHING.

OFF ROAD VEHICLE USE.

Policies Considered

(1) Regulating conflicts between commercial fishing and bathing and sport uses; (2) Not regulating the same.

Discussion

The conflicts between fishing, ORVs, and other beach uses are not as great as they could be. Kill Devil Hills does not have any fisheries. Retail houses where fish are sold are permitted under the zoning ordinance and restricted in terms of location. Commercial fishing on the beaches usually occurs in the fall when there is least likely conflict with beach use for bathing and swimming. The Town has several access points to the beach which are suitable for use by commercial four-wheel vehicles. The Town regulates the use of off-road vehicles for recreational use and prohibits that use from May to September. The Town is not aware of any means to regulate commercial fishing uses to prevent conflicts, even if they were to become more significant.

Policy Selected

The Town would probably not support State or local regulation to deal with conflicts between various beach and surf users at this time.

Note

The Town separates surfing uses from bathing uses.

Implementation

None required.

AGRICULTURAL, FORESTRY AND INDUSTRIAL USES.

Policies Considered

(1) Encouraging or discouraging these uses; (2) Restricting or prohibiting these uses.

Discussion

None of these uses is really significant in size or contribution to the Town. Only the land in the Woods is probably capable of being used for agricultural purposes; the immediate use of this area appears to be for residential development and conservation. The Woods are suitable for forestry purposes; they have been cut at various times in the history of development of the island. This use will conflict with residential use and desire to protect the marshlands from disturbance. Some industrial uses are currently existing in the Town (cement plant); some areas are zoned for light industry, although these areas have been developed with mobile home parks.

Policy Selected

The Town opposes the commercial cutting of the Woods. The Town does not consider agricultural purposes likely. The Town considers additional industrial development a possibility with other businesses in the Town.

Implementation

Direct regulation at the local level of commercial forestry or agriculture is not deemed possible because of legal restrictions. The Town relies on consistency review. Industrial uses are limited through the zoning ordinance; these zones will be reviewed together

with regulations encouraging or discouraging industrial use during the study of management tools during 1980-1981.

COMMERCIAL DEVELOPMENT

Policies Considered

(1) Encourage commercial development along the beach road and the Bypass as allowed by the current zoning ordinance; (2) Encourage the greater concentration of commercial development in the northern and southern sections of Town (slight shift in pattern); (3) Attempt to restrict commercial development.

Discussion

The zoning ordinance provides for commercial development along a large portion of the Bypass and the beach road. Many of these areas are already developed as residential; some are still vacant lands. Commercial development is heaviest in the southern section near the Nags Head limits (Sea Holly Square, many restaurants, some motels), with a smaller area of development in the northern section of Town. Strip commercial development along the Bypass will interfere with the functioning of this highway. Aggregating commercial uses in the already developing southern section of Town would probably yield the greatest benefits to the Town in terms of service, diminished interference with residential uses, and conflicts with the highway system.

Policy Selected

The Town will attempt to review its zoning ordinance and to revise it to reflect a policy of attempting to provide more centralization for the commercial zone.

Implementation

The Town will consider amendments to its zoning ordinance. The review of the management system is planned for the 1980-1981 fiscal year.

AECs, POLICIES OF THE COASTAL RESOURCE COMMISSION

Policies Considered

(1) Complete support of current and future policies of the Commission; (2) Limiting that support.

Discussion

The Town disagrees with several recent decisions of the Commission, especially on ocean setbacks on the basis of 30 year erosion rates and regulation of land adjacent to the Fresh Water Pond. The Town is opposed to nomination of land known as the Woods as an area of environmental concern. The Town does not feel that such area is a complex natural area. Furthermore, residential use is the highest and best use of much of this land. The Town supports C.R.C. regulation of the marshlands and the purchase of land having environmental significance by the Nature Conservancy. The Town notes the need for public access to lands held for public purposes.

Policy Selected

See Policies on Constraints To Development.

ENERGY FACILITIES; UTILITY TRANSMISSION LINES

Policies Considered

(1) Designating areas suitable for pipelines, substations or possibly even powerplant; (2) Requesting State to require powerlines and other transmission lines, especially telephone and cable, to be placed underground; (3) Retaining current situation.

Discussion

The development of off-shore oil along the Outer Banks appears inevitable. The delivery of that oil to on-shore facilities requires land transport and port facilities. Ample areas of undeveloped land not presently being used for high intensity recreational uses are available for transmission or pipelines for oil and natural gas. The Outer Banks would be more attractive from an aesthetic viewpoint if telephone and other overhead transmission lines were placed underground. Such a placement should also improve service; the salt air probably causes more problems for the utilities (popping, crackling, breaking).

Policy Selected

The Town is opposed to energy facilities, including pipelines, docking facilities, plants, and substations locating within the Town. The Town is not opposed to the reasonable location of facilities necessary for the transmission of electricity for serving residents of the Outer Banks, however, the Town prefers that transmission lines be placed underground.

Implementation

These policies should be implemented in consistency review.

HISTORIC PRESERVATION; ARCHAEOLOGICAL PRESERVATION

Policies Considered

(1) Study or encourage the study of two sections of beachfront to determine the historic significance of beachhouses located there; (2) Allow such initiatives to come totally from the private sector; (3) Cooperate with State in identifying and providing for the preservation and removal of items of archaeological or historic significance; (4) Not adopt a policy.

Discussion

Most of the beachouses of likely significance are privately owned by the persons who originally built or purchased them. Many of the houses do not seem to be intensively used. (Population, pp. 1-2) Some of the houses are believed to be in need of substantial improvements. Significant tax advantages are provided by the United States to owners of structures which qualify for designation to the National Register. The Town would benefit from restoration and maintenance of this district culturally and financially. Infringement from motel use is currently provided through density control in the zoning ordinance.

The Town is not aware of any areas likely to contain items of archaeological or geological significance. The Town does not consider the soundside dunes of geological significance. Archaeological review often delays construction, yet serves a valuable purpose from a state perspective.

Policy Selected

The Town will study the older houses along the oceanfront, with the consent of the owners, to determine if these houses could be nominated to the National Register. The Town will support the completion of studies currently pending with regard to the Lighthouse Station. The Town will notify the State Department of Natural Resources and Community Development in the event that it learns of the discovery of items of archaeological or historical significance.

Implementation

Preliminary study by the Town to be undertaken within next five years of beachfront structures of likely historic significance. The zoning ordinance will be reviewed to determine if additional restrictions on development in areas where these houses are located are needed. Letters will be sent to the State in the event archaeologically important items are encountered.

COMMITMENT TO STATE AND FEDERAL PROGRAMS

Policies Considered

(1) Commitment to receiving State and Federal monies and assistance; (2) No commitment.

Discussion

State and Federal programs have enabled the Town to study problems with beach access and capital facility programming. They have assisted in the provision of water availability for the Town's residents; they are a necessary ingredient in providing public sewers, increasing the capacity of the highway system, improving the local roads, etc.

Policy Selected

Generally speaking, the Town supports Federal and State programs. When necessary the Town will assist these agencies in finding spoil sites, in acquiring right-of-ways, etc.

Implementation

Directives will be forthcoming to the Town Administrator on a case by case basis.

TOURISM

Policies Considered

(1) Encourage tourism by providing for growth; (2) Discourage tourism; (3) Extend season for tourism.

Discussion

Tourists are the backbone of economic well-being of the community. The policies of the Town are inseparably united with encouraging tourism and the recreational uses of the Town's natural resources, both ocean beaches and the Sound. The increasing emphasis the public places on recreation will inevitably extend the length of tourist season. The Town knows of no way in which it could really affect the vacation habits of Americans so as to extend the season into the winter months.

Policy Selected

The Town encourages tourism. It encourages a level of growth and provision of services necessary to accommodate anticipated demand from all sectors of the population to the year 1990 (See Growth policies). The Town supports and approves of extending the length of the tourist season.

Implementation

This policy is implemented through the network of other policies concerning growth and development.

PUBLIC PARTICIPATION

Policies Considered

(1) Encourage public participation; (2) No policy.

Discussion

During the planning process in this land use plan, the Town held a public forum to determine the issues of importance to the citizens of the Town. It canvassed viewpoints and attitudes of identifiable interest groups connected with the Town. The Planning Board used a scientific random sample procedure and an issue-oriented questionnaire to sample public opinion (both residents and seasonal beach users). The attitudes were analyzed in a sophisticated manner to reveal groupings of attitudes. The Planning Board held over twenty meetings which were attended by the press, representatives from State and Federal agencies and private individuals. Summaries of the technical papers and comments of the Planning Board were regularly reported in the local newspapers. The consultants participated in radio interviews and notices were put on television. The Town Board reviewed the plan publicly on five occasions including two work sessions with the Planning Board. This type of intensive public discussion is probably not possible except in the development of the land use plan. However, the Town desires to encourage the continuance of public participation and the constant updating of its land use plan.

Policy Selected

The Town will encourage the public to participate to the maximum extent possible in the governing of the Town.

Implementation

The Town directs the Planning Board to set aside regularly scheduled meetings to discuss land use issues. The Planning Board and Town Administrator will continue to advise the public of the nature of items being considered by the Town at its meetings. They will cooperate with the press and prepare releases for bringing the public up-to-date on government activity.

SECTION TWO: TECHNICAL PAPERS

Chapter I Population

Chapter II Psychological Constraints: Values and Attitudes, the Questionnaire

Chapter III Environmental Constraints Relating to Water and Sewer

Chapter IV Other Environmental Constraints

A. Beach Dynamics

B. AECs

C. Fragile and Hazard Areas; Natural Resource Areas

D. Woods

Chapter V Transportation System

A. Hurricane Evacuation

B. Road Network

Chapter VI Housing Analysis

Chapter VII Recreation Analysis

Chapter VIII Cultural Resources

Chapter IX Carrying Capacity

CHAPTER ONE

POPULATION ANALYSIS

The proper place to begin the planning process in a beach community in North Carolina is with the study of its population. It is the changes in population that place demands on facilities, that pose conflicts with the environment, with health and safety, with recreation.

This particular study will seek to focus on viewing population in terms of its natural increase and the carrying capacity of the land, the housing stock and facilities which could limit or restrict the achievement of this growth. Growth may be limited by the inability to evacuate the town in the event of a hurricane, or the inability to move traffic effectively from one part of the town to another, or the inability to provide additional water for drinking or bathing, or the inability of the environment to accommodate effluent from septic systems, etc.

Measuring Population

In most communities in the United States the permanent population does not differ substantially from the population or inhabitants of the community at any time during the year. Because it is necessary to understand population in order to assess growth and impacts on housing, transportation and the environment, much attention has been paid to methods to determine the permanent population. In the North Carolina

beach community there is a considerable difference between the peak summer population and the permanent population (both in numbers and composition). To fully appreciate the effects of growth we must concern ourselves with the peak population and with the difference between peak and permanent population. Peak population may frustrate our capacity and cause irreversible damage to health, safety, the environment or certain facilities. The strong differences in population may make the delivery of services and facilities difficult and costly.

The best method to measure the population of a community is through a direct head count. Regrettably we are not aware that any direct count of population during the peak season exists in Kill Devil Hills. Certainly this is an undertaking which the town should pursue in the future. To measure population in the absence of this data, we resorted to measuring the evidence of population--the number of houses occupied, the size of the units and the use of water.

Housing Information

During the months of December and January 1979-1980, we surveyed the entire town of Kill Devil Hills. We mapped the location of every building in town. We attempted to identify its use--residential, commercial housing (motel and cottage court), and uninhabited structures (restaurants, government buildings, etc.). This breakdown is useful in that it shows daytime and nighttime use. We also attempted to establish the number of bedrooms in each residence and the number of rooms in commercial housing.

In order to portray this information in a more meaningful manner, we artificially divided the town into eight (8) sections. These sections are as follows:

#1 The Beach Road from the Nags Head line to Prospect Avenue (both sides)

#2 The Beach Road from Prospect Avenue to the Kitty Hawk community (both sides)

#3 Between the Beach Road and the bypass, including the property immediately adjacent to both sides of the bypass, between the Nags Head line and Prospect Avenue

#4 Between the Beach Road and the bypass as in #3 above between Prospect Avenue and Kitty Hawk community

#5 Remaining land west of the bypass and south of the Wright Memorial

#6 Remaining land west of the bypass but between the Wright Memorial and 5th Street

#7 Remaining land west of the bypass but between 5th Street and Bickett Street

#8 Remaining land west of the bypass north of Bickett Street to the corporate town limits.

TABLE 1

RESIDENTIAL AND COMMERCIAL HOUSING UNITS

Section	Residential (By Bedroom)							Commercial				Total
	MH	2	3	4	6	8	10	12	T	CC	M	
#1	0	23	21	38	32	6	2	3	0	8	16	149
#2	0	39	72	61	28	18	0	3	0	4	8	243
#3	0	61	173	52	7	0	0	0	0	0	1	294
#4	0	156	278	56	2	0	0	0	0	0	0	492
#5	71	57	111	80	6	0	0	0	0	0	0	325
#6	0	50	123	45	12	0	0	0	0	0	0	230
#7	0	140	200	36	4	0	0	0	0	0	0	380
#8	0	5	87	18	2	0	0	0	0	0	0	112
Total	71	531	1065	386	103	24	2	6	0	12	25	2225

MH-mobile home; T-townhouse; CC-cottage court; M-motel

Relating Water Use to Population

In order to establish a meaningful relationship between water use and population, we focesed sharply on motels. Motels offered us the opportunity to observe hundreds of people under similar conditions. Furthermore, because they were under one management or administration, they afforded us the opportunity to probe for unusual uses.

The motel managers and owners informed us that they reached peak population in the last week in June and sustained that population constantly to the first week in September. The maintained that the average occupancy was in excess of 3 persons per unit; that at least half of the units were inhabited by children. Water for pools and outdoor showers was provided from private wells. By reading the records on water usage for the period June 15 to September 15, 1979, we surmised that water use ranged from 11,500 gallons to 22,000 gallons per unit, with an average of 14,600 gallons. In the 93 day period covered by the

water records, we expect that the typical motel unit experienced full occupancy at the average summer rate on 85 of those days.

TABLE 2

MOTEL WATER USE AND OCCUPANCY

Gallons/Unit Season	Day	Varying Rates of Occupancy 2.5	3.0	3.5	4.0
11,500	135.2	54	45	38	34
14,600	171.8	69	57	49	43
17,500	205.9	82	69	59	51

In selecting a water usage rate and occupancy rate for the residential sector we were inclined to increase water slightly to account for amounts used in food preparation, cleaning of dishes and a minimal amount of care washing and lawn watering. From the data we examined relating water usage in residences to proximity to the ocean, we began to suspect that water use may be greater as one moves closer to the beach. (Our current data was too sketchy to establish a correlation but this relationship needs to be probed in the future.)

In order to check our presumption about residential use, we examined some 50 units throughout the town together with all the units on three distinct streets. From this information we noted that the average residence used 14,700 gallons during the june 15 to September 15 period. Despite a broad range in the amount of water use by each residence, we found that the span seemed to concentrate around two points, 13,000 gallons (nearly 60% of the units) and 28,000 gallons (about 20% of the units). Our small sample seems to suggest that as

many as 10% of the units are occupied only infrequently during the summer.

Town Water Uses (Flows): Peak, Average and Minimum

If we examine the town's total delivery or sales of water for each day during the same summer season, we can get a view of the flow of population, of peak as opposed to average demand. We selected two days, one during the week and one on the weekend, in order to compare ranges. The average daily supply of water by the town from July 27, 1979 to August 23, 1979 amounted to 950,000 gallons per day.

TABLE 3

WATER SALES AT SELECTED TIMES IN PEAK SEASON

Day		Gallons (1000s)	% of Avg.	% of Peak
June	3rd Wednesday	634	67	58
June	3rd Saturday	801	84	73
July	1st Wednesday	903	95	83
July	1st Saturday	883	94	81
July	3rd Wednesday	907	95	83
July	3rd Saturday	884	93	81
August	1st Wednesday	912	96	83
August	1st Saturday	1062	118	97
August	3rd Wednesday	926	97	85
August	3rd Saturday	1000	105	91
September	1st Wednesday	552	58	51
September	1st Saturday	722	76	66

Perhaps, the most noteworthy feature about the above data is its absence of significant fluctuation. The difference between the average and peak or low points shows a range of less than 10%. This information is meaningful because it establishes that the residential home or cottage population is fairly constant throughout the summer months of

July and August. If we assumed that 80% of the units were occupied during the peak days in the summer, then that percentage was maintained during other days in the peak season. Similarly, if the percentage of the units on the peak day were 50%, occupancy during the other days of the summer was at that same rate. Although it is possible that more units were occupied at lower rates of persons per house on peak days than during the rest of the summer when fewer units were occupied at greater densities (or vice-versa), this phenomena seems unlikely. Another possibility that persons would use less water on peak days seems also unlikely. The remaining problem is to establish the percentage of occupancy. The town should consider undertaking a survey in the peak summer days to determine what percentage of the residential units are occupied. In the meantime, we have chosen to accept the suggestion of several realtors and developers that 80% seems reasonable.

We can calculate the residential occupancy through the following steps. We can determine the water used by the commercial housing sector by multiplying the number of units (1237) by the gallons per day used by each unit (171.8). We can tally the amount of sales to restaurants and major non-housing users and by providing an allowance for other users estimate the commercial and governmental sector. Next, we can estimate the total sales to areas outside the town boundaries by determining the percentage of residential units in these areas over those in Kill Devil Hills. By adding together these sums we can determine the amount of water available for residential units in Kill Devil Hills. These computations are as follows:

TABLE 4

COMPUTATION OF RESIDENTIAL WATER USE

Average Daily Sales During Peak Month	950,000 gallons
Less: Commercial Housing	212,516
Commercial Other	77,419
Average Daily Residential Sales	660,065 gallons
Less: Sales to Residential Units Outside Town Limits (13.4% of all units)	88,449
Average Daily Sales to Residents of Kill Devil Hills (1979)	571,616 gallons

Since the number of residential units (not including motels and cottage courts) was 2,188, the average water use by such units during a day in the peak season was 261.2 gallons. As we noted from a prior page, the average daily use of residences west of the bypass suggests a rate of 196 gallons. This is based on a presumption of 75 days occupancy from June 15, 1979 to September 15, 1979. The difference in these two averages seemed to be due to one of two reasons; either higher water use per person as one lives closer to the ocean or higher water use with an increase in the number of bedrooms in house (most 4 bedroom or larger units were found in sections 1 and 2). Although logic tells us that the number of residents should increase with the size of the dwelling, there does seem to be some statistical evidence (although not persuasive due to the small sample) to suggest that closeness to the ocean may affect water use.

For purposes of completing the model, let us assume that the number of persons per dwelling is directly related to the number of

bedrooms. Thus, a four bedroom unit could be expected to house twice the number of persons as a two bedroom house. This number may need adjustment as we noticed from water records that a high vacancy rate occurred in many of the older larger houses on the oceanfront.

The total number of bedrooms within the town of Kill Devil Hills is 6842. This figure would establish an average daily water use of 83.5 gallons per bedroom. From our motel study we determined that the motel residents used between 49 and 57 gallons per day. The residential range should be between 55 and 70 gallons per day. Using an average figure of 63 gallons per person per day, we are able to arrive at an average of 1.3 persons per bedroom (remember this was using a presumption of 75 days occupancy). The following is a determination of population in each sector:

TABLE 5

POPULATION BY HOUSING TYPE

Section	Residential								Commercial			Total
	MH	2	3	4	6	8	10	12	T	CC	M	T
#1	0	61	81	202	255	64	27	48	0	714	2426	3878
#2	0	104	287	325	303	192	48	0	0	70	1033	2362
#3	0	162	690	277	56	0	0	0	0	0	88	1273
#4	0	414	1109	298	16	0	0	0	0	0	0	1837
#5	189	152	443	426	48	0	0	0	0	0	0	1258
#6	0	133	491	239	96	0	0	0	0	0	0	959
#7	0	372	798	192	32	0	0	0	0	0	0	1394
#8	0	13	347	96	16	0	0	0	0	0	0	472
Total	189	1411	4246	2055	822	256	75	48	0	784	3547	13433

Because many land use standards and information about health and the environment are often given in terms of density, we have expressed this population in this manner in the chart below.

TABLE 6

POPULATION DENSITY PER SECTOR

Sector	Population	Square Miles	Persons/Square Mile
#1	3878	.315	12629
#2	2362	.281	8405
#3	1273	.395	3222
#4	1837	.502	3659
#5	1258	2.349	536
#6	959	.666	1440
#7	1394	.239	5832
#8	472	.399	1183
Total	13433	5.146*	2610

*This number does not include the area in the Wright Memorial. Differences with other surveys may be due to changing shorelines and methods of computation.

Population Projection

Population projections for 1990 can be determined in several ways. One method is to project the curve from the water usage into the future. This method assumes that the capacity per unit does not change (this excess is at least 0.7 per bedroom). Also, this method must rely on the water uses not reflecting increased conservation measures. A second method is to project the rate of growth through extending the rate of new building starts. In any event these factors should be tempered by market factors which can be determined, such as decreases from unavailability of gasoline for transportation, high interest rates and inflation which affect building and spending, increased importance of leisure time and recreation, propensities in the national market toward townhouse development, etc.

An analysis of the water sales of the town of Kill Devil Hills allows us to watch the growth rate during the past 12 years.

TABLE 7

KILL DEVIL HILLS WATER SALES 1968-1979 (MAXIMUMS)

Month	1979	1978	1974	1968	r74	r78	r68
January	325	412	204	247	11	--	03
March	479	463	245	186			
May	849	667	691	550	04		
June	877	811	608	400			
July	1030	1026	710	411			
August	1093	967	754	519	13	08	07
September	1038	(NA)	(NA)	443			
October	771	(NA)	508	(NA)			
Peak 5 day	1020	(NA)	689	(NA)	08		
30 day ave.	950	848	(NA)	(NA)		12	

From examining the above chart it is apparent that the rate of growth as measured by increases in water sales exceeds 8% per year for the past five years. This rate has been sustained since 1968 (probably with the averaging in of two poor growth years around 1974s

In addition this growth rate increased dramatically in 1979. At the rate of 7% per year, the population of Kill Devil Hills will double in population in slightly over 10 years. At a rate of 8% (which represents the minimum population over the best five day period), the population will double in 9 years. At a rate of 12% or 13% the population will double in about 6 years.

An analysis of housing starts since 1975 shows the following

TABLE 8

NEW HOUSING STARTS 1975-1979

Year	# Starts	r75
1975	110	N/A
1976	118	N/A
1977	163	8.7
1978	208	9.3
1979	210	9.5

From this analysis we are able to tell that the number of buildings in Kill Devil Hills in 1974 was 1379. Since then the rate of growth in the housing stock has averaged 9.5% per year.

By combining our information on trends over the past five and ten years, we can predict (based on a continuation of past trends) that if the population is allowed to continue at its past rate of growth that the 1990 population will reach the following limits:

TABLE 9

POPULATION PROJECTED TO 1990

	1980	1990	Increase
Minimum Peak Population*	14422	31137	16715
Average August Day Population	13433	29000	15567

*The minimum peak population is the minimum population sustained over a five day maximum period. We seek to know this number since this is a number which represents the capacity of our water and potential sewer system. Once can't get aroung this number by extra storage or decreased time in filtering.

Projected Population and Housing

A rough idea of the impact of this population on the land can be obtained if we continue the trends of the 1970s with regard to housing mix and location. From our housing inventory we have noted that new residential and commercial housing opportunities (since 1975) have been limited to mostly three and four bedroom houses. By comparing our housing survey with the survey developed by the town in 1977 we were able to determine that the following sections seem to be experiencing rapid growth:

#3 between Carolyn Street and Dean Street;
between Ocean Bay Boulevard and Woodmere Avenue;
#4 at the south end of Sir Walter Road;
between Wilkinson Street and Helga Street;
#6 north of Wright Memorial to Indian Drive.

All areas are experiencing moderate growth.

We expect that future growth will continue the trends of the past five years, however, due to a number of new subdivisions in sections 5 through 8, we expect these areas to grow at a stronger rate than in the past. Several subdivisions west of the bypass, however, appear to be stagnant. It also seems inevitable that the next ten years will place a considerable amount of pressure on redeveloping the beach road sections.

If we assume that future residents will continue past trends, then we expect that the future housing mix will look something like the following (some adjustments for trends):

TABLE 10

PROJECTED FUTURE HOUSING MIX

MH	2	3	3	4	6	T	CC	M	Total
3	10	55	15	15	5	5	2	5	100%

(Percentage of persons living in each housing type)

If we express this information into the number of housing units anticipated for each type of housing between 1980 and 1990, we find the following:

TABLE 11

HOUSING UNITS ADDED BETWEEN 1980 AND 1990 BY TYPE

Unit Type or Size	# New People	# New Units (not bedroom)
Residential: Mobile Home	467	180
Residential: 2 bedrooms	1556	598
Residential: 3 bedrooms	8562	2195
Residential: 4 bedrooms	2335	449
Residential: 6 bedrooms	778	100
Townhouse	778	199
Cottage Court	311	97
Motels	778	243

Much of the rest of this Land Use Plan will address whether this growth and its locational trends are appropriate for the town of Kill Devil Hills.

Conclusions

The population for planning water, sewer and many services should be 29,000 (1990), 13,433 (1980) and 15,567 anticipated new arrivals. The market would place most of these persons in single family housing. current zoning allows for mobile home use in one zone (LB1). Most mobile units are in RA6 at present time.

Kill Devil Hills has a strong rate of growth which is not particularly sensitive to fuel availability, and only sensitive in the short term to economic difficulties (high interest rates). The Town's growth is steady and high.

The average house uses 250 gallons per day. The regional water system is capable of meeting 1990 demands.

The Town's population during the summer does not exhibit strong variations in number of residents. Most services will be satisfactorily used if the demand for the service is there to begin with.

For altitudes of this population see next section.

CHAPTER II

VALUES AND ATTITUDES OF PERSONS OF KILL DEVIL HILLS: RESULTS OF RANDOM SAMPLE SURVEY OF CITIZEN ATTITUDES TO LAND USE RELATED ISSUES IN KILL DEVIL HILLS[1]

The public participation element focused on a survey of citizen attitudes dealing with issues brought out in the public forum. The survey was designed to measure the strength of attitudes, both against each other and in terms of a willingness to pay. Furthermore, the survey is designed so that profiles of interest groups are ascertainable. Lastly, a number of checks within the survey allow one to measure consistency and gaps in the public's information.

The questionnaire was delivered to 250 persons selected through random sample out of all property owners and voters in Kill Devil Hills. Out of 250 surveys, 75 were returned to the consultants within the time set out. In addition, the questionnaire was made available to the general public. Although many of these were returned and reviewed by the town, only the results of one random sample are tabulated in this analysis.

Conclusions

Before we analyze the results in detail, we should attempt to extract the larger picture.

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[1]Note: Questionnaire and results of forum included in Section Four.

1. Property owners and residents strongly favor restricting growth to a level that will not force them to provide public sewer within the next ten years. This feeling is even stronger in residents.

2. Respondents strongly favor preserving the environment and open space. However, there is a general lack of awareness as to what are environmental features and how they can be protected.

3. There is only a mild demand for recreational facilities.

4. The respondents are not particularly sensitive to costs and taxes in their decision-making. They give higher priority to protecting the environment, preserving the social atmosphere they desire, curng their problems and convenience than they do to taxes or costs.

5. The people want to spend money on local roads to bring them up to par. Non-resident property owners show strong support for more services, especially for water, sewer, hospital and parking for beach access.

The Details: Interest Groups

Of the 75 returned questionnaires, we observed a fair and expected cross-sample in the returns. Concerning residency, our split was as follows:

TABLE 1

Residing	Raw Score	(%)
Permanent Resident	11	15
Non-Resident Real Property Owner	47	63
Regular Seasonal Visitor	11	15
Occasional Seasonal Visitors	2	3
Other	3	4

Since the questionnaire was only sent to persons who were registered voters or taxpayers, most persons who described themselves as seasonal visitors belonged to one of the first two groups.[1]

Our respondents showed the following "interest" identifications:

TABLE 2

Occupation	(Raw Score)	(%)
Commercial & Motel	5	7
Sports Fisherman & Boaters	9	12
Beach User	34	46
Retiree	13	17
Other	13	17

In analyzing the above information, the first choice placed in the answer space was presumed to be the principal relationship. Note that although commercial interests from only a small part of the democratic whole, the importance of these interest groups in decision-making requires they be accounted for outside this attitude survey.

We asked respondents to identify their political relationship to Kill Devil Hills. These results show:

[1]Note. Your consultants in preparing this analysis have attempted to avoid unnecessary judgments and spurious remarks, yet one must realize that in any sample you will find: (a) people who do not understand the basics of citizenship or property ownership and (b) people who despite "trying hard" get confused because they lack sufficient information to make consistent decisions. Despite this handicap we have always been pleasantly surprised at the good faith, honesty and the general desire of the people to participate if asked to do so.

TABLE 3

Political Relationship	(Raw Score)	(%)
A. Active voter in KDH elections	9	
B. Eligible to vote, but not active	7	
C. Not eligible to vote	57	

Of the 16 persons who said they were eligible to vote only 10 identified themselves as permanent residents; the other 6 identified themselves as non-resident real property owners--a probable inconsistency.

The questionnaire also asked people to identify with which area of the town they were most interested. Although over 30% showed an interest in two or more areas, preferences appear to support a strong interest in the beach.

TABLE 4

Area	(Raw Score)	(%)
Beach	39	78
Sound	4	8
Bypass	5	10
Other (and multiple answers)	23	

Details: Growth

The first substantive question we asked the respondents was designed to test their willingness to provide for a very expensive service in the light of growth and attendant environmental consequences. We found that 39 of 72 persons who replied to the question desired to have the town participate in building a public sewer system. This response was sensitive to some interests.

TABLE 5

	Favor Building Sewer (Raw Score)	(%)	Oppose Building Sewer (Raw Score)	(%)
Permanent Resident	4	43%	7	57%
Other	35	57%	26	43%
Non-Residents Intending to Build	14	70%	6	30%
Commercial	2	40%	3	60%
Retiree	7	58%	5	42%
Sports Users & Others	30	54%	25	46%
Overall	39	54%	33	46%

In conclusion, the group most likely to oppose expensive future improvements are those who have already moved to the beach, whereas those who are of the urge of moving and fear their decision will be impeded by the lands of the facility are most willing to see the facility built. Commercial interests often refuse to pay for environmental costs because they are not quantified in the market place.

We next provided the respondent with a different outlet then "decided to build or not build" the facility. We allowed them the option of slowing the growth rate and hence delaying the decision. The respondents felt the Town should adopt the following attitude toward growth.

TABLE 6

Attitude to Growth	Raw Score	%	Cumulative
Increase projected rate	4	6%	38%
Accept natural growth	23	32%	
Hold growth to below amount which will require sewer	23	32%	63%
Slow growth	22	31%	

The responses show a strong desire to restrict growth to a level below that will not require building a sewer system. There was a healthy consistency between persons who favored accepting the natural growth rate and building public sewers. As in the previous answer, the residents were most in favor of restricting growth.

TABLE 7

ATTITUDE TO GROWTH - NATURAL RATE

	Increase	Accept	Hold (facility)	Slow
Permanent Resident	0 (0%)	1 (9%)	7 (64%)	3 (27%)
Other	4 (2%)	22 (27%)	16 (27%	19 (32%)

Details: Housing Mix

Perhaps the least understood aspect of planning to the citizen involves the relationship of housing mix to the environment and the tax base. People are generally less aware of subtle shifts in this area than any other. They will also hold to clickees and personal perferences even when these preferences conflict strongly with other values they cherish.

During the past five years, Kill Devil Hills has not had any significant motel or cottage court additions. Since the Town has never had any significant townhouse development, there has occurred a sharp shift toward single family development. Preliminary studies seem to indicate that differences in the type of housing do not seem to influence the type of inhabitants on the beach.

Our prefactory material indicated that past development emphasized a mix of housing types--motel and single family. The respondents indicated a strong desire to keep the past mix. (Difficulty in discerning if that meant, mix to '68, to '73 or to '80.)

TABLE 8

	(Raw Score)	(%)
Increase high density housing	6	9%
Increase low density	16	23%
Keep past profile	48	68%

In terms of a rationale for the above choice, we found a strong desire to continue the family beach atmosphere and to preserve the environment. Tax concerns seemed unimportant when compared to social and environmental costs.

TABLE 9

	(Raw Score)	(%)
Preserve family beach	41	57%
Preserve fiscal aspects of town	8	11%
Preserve open space and environment	23	32%

In order to test the success of informational programs relating environmental preservation to residential land use, we cross-tabulated persons who selected to protect the environment with those who desired to increase single family development and with those who wanted to slow growth.

TABLE 10

	Preserve Open Space	Preserve Family Beach	Protect Fixed Aspects
Desire and Increase single family development	2 (13%)	11 (68%)	3 (19%)
Other	21 (37%)	30 (53%)	5 (9%)

TABLE 11

	Increase	Accept	Hold	Slow
Protect Open Space	0 (0%)	4 (19%)	11 (52%)	7 (33%)
Other		21 (40%)	12 (23%)	15 (30%)

Details: The Environment

Next we wanted to test the people's perception of the importance of open space and the environment. We asked the people if they wanted to keep large tracts of open space, even if it meant purchasing them.

TABLE 12

	Yes	No
Preserve large tracts of open space, without purchase	58 (85%)	10 (15%)
Preserve even if town must purchase	33 (48%)	35 (52%)

Concerning where these tracts should be located, a strong response was associated with the beach area and vegetated areas.

TABLE 13

Location of Open Space	(Raw Score)	(%)
Beach	28	54%
Sound	4	8%
Interior Dunes	5	10%
Vegetated Areas	15	29%

As was expected, there was a poor awareness on the part of persons desiring to increase single family development on its effect on open space.

TABLE 14

	Yes	Preserve Open Space Only without Purchase	No
Increase Single Family	9 (60%)	4 (26%)	2 (13%)
Other	24 (48%)	21 (40%)	8 (14%)

We expected to find a sharp decrease in the desire to keep open space on the part of those who desire to develop at lower densities.

We then asked the people whether they wanted to protect sensitive environmental features and how they wanted to protect them. The pre-factory material to the environmental questions draw attention to the woods. Sixty-seven of 72 persons (93%) stated that they desire to protect the dunes in the woods and on the sound side. This score was the strongest response on the entire survey. This score is even more surprising in that one would expect stronger attitudes toward protecting the dunes on the ocean, the live oak forest, the quality of the sound, marshes, etc.

The strength of this response is gauged by examining the desire to use management devices to protect vegetation. Respondents were asked if they wished to see large lot zoning or cost requirements used to protect vegetated areas. The answers were as follows:

TABLE 15

Willing to Use Following Devices	(Raw Score)	(%)
No device	14	23%
Large lot zoning	34	49%
Limits to cutting cover	49	71%
Both large lot zoning and cover	29	42%
(Total Responses)	69	

Responses to environmental factors were not different for the various interest groups or to being a permanent resident versus non-resident property owner.

We also asked the people whether they wanted to see PUD style development as a means to protect the environment and preserve open space. Thirty-three of the 63 persons (53%) who answered favored the device. Ironically, those who wanted a particular housing mix because it preserved open space felt strongest against using PUD's. (Only 32% favored the use.) This score should be anticipated and reflects lack of awareness of the advantages from density transfer as well as association of PUD with low income housing.

A significantly large number of people were concrened with the amount of private or personal open space around their individual houses. (Thirty-three of 69 persons felt lot sizes were too small.)

Details: Transportation

In light of the recent attention being given to transportation issues--the future of the thoroughfare, internal roads and alternative modes of transportation--we decided to probe these attitudes. We asked the respondents to rank four alternatives to handling the problem of poor movement on the bypass.

TABLE 16

Alternative	Persons Selecting Alternative as: 1st Choice	2nd Choice	Last Choice	Weighted Score
Keep present situation	20	5	8	35
Four lane	21	13	4	104
Feeder roads	11	20	1	105
Two land sound road	4	7	5	-9
Restrict access; eliminate left turns	17	13	9	34

The last column above presents a weighted score which gears five points to the first choice, three to the second, and a -10 to the last choice. (See top of two pages hence.)

In terms of balancing factors in making a decision concerning transportation, the people showed a strong preference for considering two factors, namely the degree to which the problem would be cured and the costs to the taxpayers of the State and Nation.

TABLE 17

Most Important Factor	(Raw Score)	(%)
Degree of cure	29	41%
Time to cure	6	9
Costs to taxpayers	20	29
Personal inconvenience	7	10
Amount of cooperation needed from State	8	11

Ironically, one would expect that this balance would be reflected by a larger score for the alternative that called for restricting access, eliminating turns and the like (but this wasn't the case). A profile of those who acted on costs against the whole group explain the problem:

TABLE 18

	Alternative Chosen:				
Most Important Factor	Keep Present Situation	Four Lane	Feeder Roads	Sound Road	Restriction
Costs to taxpayers	9 (45%)	4 (20%)	3 (15%)	0 (0%)	4 (20%)
Other	11 (21%)	17 (33%)	8 (15%)	4 (7%)	13 (25%)

Our tax conscious citizens are not balancing the relative importance of the cure but are acting absolutely.

We should note that 33 of 69 persons (48%) favor a public transit for the beach. However, this response needs to be gauged by a basic willingness to spend for this facility. (As an ideally logical course, one would expect a strong environmental response to the associated to opposition to the sound side road, but only two of 23 persons who wanted to preserve open space over family beach selected the sound side road as their least favorite choice.)

Details: Recreation

In order to understand the people's satisfaction with recreational opportunities in Kill Devil Hills, we asked respondents to select from a list of facilities--those for which they felt there was a strong enough need to justify their being provided at public expense. We found the following. (Note: the responses indicate those who felt there was a strong enough need and a relative weighting giving four points to first choice, three to second, two to third, one to fourth choice.) Score of permanent residents in parenthesis. A score of 38 (6) showed a majority response.

TABLE 19

Recreation Facility	Number of Times Selected for Funding	Weighted Number
Marinas	25 (2)	80 (5)
Parking for beach access	45 (8)	145 (26)
Bath houses	13 (0)	30 (0)
Playgrounds	9 (1)	17 (2)
Tennis courts	9 (1)	21 (3)
Indoor courts	0 (0)	0 (0)
Ballfields	5 (1)	11 (2)
Picnic facilities	24 (3)	54 (7)
Jogging paths	27 (3)	69 (8)
Bikeways	33 (8)	90 (24)
Convention hall	10 (1)	27 (4)

In order to understand this table, we note that if 50% of respondents selected a facility for funding, it would score 38 (overall) or 6 (permanent residents only). Similarly, a weighted score of 75 (overall) of 11 (permanent residents only) would signify strong responses. Using this perspective we notice strong support by all respondents for parking for beach access. Some support seems likely for bikeways and to a lesser extent for marinas and jogging paths. The permanent residents gave strong support to parking for beach access and to bikeways. The majority of the people are unwilling to support more than two recreational projects. Lastly, the answers to this question must be balanced with responses to the general willingness to fund.

In response to whether the Dare beach communities north of the Oregon Inlet should join to form one municipality, 38 of 67 persons (56%) indicated their support.

Details: Funding

The culmination of questionnaires was an attempt to put all projects which are being considered for funding under "one roof." In this manner we hoped to gain some perspective on the willingness to spend for one project after having considered another more worthy project. We asked respondents to indicate projects they were willing to fund and their rank. We have expressed the results by indicating the number of times the project was chosen for funding and its relative weight. (We weighted first choices with four points, second with three points, etc.) The results are as follows: (resident score in parenthesis)

TABLE 20

Facility Being Considered	Votes for Funding	Weighted Number of Votes
Pave local roads	45 (10)	140 (33)
Improve water system	37 (3)	111 (9)
Build public sewers	29 (2)	96 (7)
Build recreation facility	8 (4)	15 (7)
Build regional hospital	35 (4)	94 (10)
Build public transit	10 (2)	22 (6)
Build parking area for beach access	30 (5)	72 (16)
Purchase open space	18 (4)	50 (10)

The majority of persons were willing to fund between two and three projects. Very strong response and hence priority is given to paving local roads. Other strong responses were given to improving the water system (no longer really a problem), building a regional hospital and a public sewer system. The permanent residents expressed a strong desire to pave local roads. In fact, without the support of permanent residents, this facility does not appear to have overwhelming support. Our own

analysis suggests this is a matter of local pride rather than need. Additionally, they might support the building of a parking area for beach access. They do not support a public sewer system.

Additionally, we should note despite the impending energy problems, there is no strong support for funding public transit. Surprisingly enough, there was a strong interest in the Town purchasing open space.

Comment

The questionnaire is designed to assist in decision-making and not simply to control decision-making. The results of this survey were followed fairly closely by decision-making.

A profile of the economy and of the residents and property owners of Kill Devil Hills is discernable from the background of the respondents. (Questionnaire, p. 2) Forty-six percent of the Town describe this principal relationship to the Town to be a beach user, 12% sport fisherman and about 7% commercial businessmen; 17% retired.

The permanent population resides largely in subdivisions west of the Bypass. Obviously, the principal business of the Town is tourism and especially that related to beach use and sportfishing.

The Town's decision to provide public sewer represents a desire avert risks to the Sound not necessarily apparent to those who replied to the survey. The people did support a sewer (close to 50%) and were not very sensitive to costs in general.

Open space policies were adopted (no purchase) and build at low densities, with low height. Density transfer was deemed infeasible in that only a few small tracts in the Town remain unsubdivided or not protected by purchase by nature conservancy.

The Town intends to change its zoning ordinance despite strong satisfaction because the ordinance will not succeed in implementing these policies and because of problems in the ordinance. Restrictions on cutting vegetation were rejected (discrepancy).

A four lane (six lane) road was approved for the bypass; a beach road--bypass, one way system rejected (consistent). Parking for beach access and increased access were adopted. The Town also backed proposals for bike paths, jogging, marinas.

The local road paving policy was felt adequate (reflects recent changes), the water system had already been improved.

CHAPTER III

ENVIRONMENTAL CONSTRAINTS RELATED TO WATER AND SEWER

Although a municipality may be under tremendous growth pressures, it may not be able to accept that growth. The capability to accept growth may be limited by the availability of vacant land in its jurisdiction, its willingness to rebuild at higher densities, or the population it can accept without environmental damages reaching unacceptable levels. In this section of the land use plan we would like to examine capacity limitations related to environmental degradation. First, we will discuss the capability of the soils for handling wastes from development using septic systems. Next, we will examine water quality in the Albemarle Sound and the Groundwater System. Third, we will analyze the relationship between the use of septic systems and sound and groundwater quality. Lastly, we will look at the costs of treatment alternatives.

Soils

The soils in Kill Devil Hills are generally unsuitable for septic systems. However, even accepting this conclusion, we still must note that there are varying degrees of unacceptability. The mapping of soils presented in this plan follows the recommendations of the Soil Conservation Service as to the capacity of various soil mapping units. A typical profile of soil units in Kill Devil Hills looks as follows:

TABLE 1

Location	Soil Unit	Depth	Perm.	Use
Frontal dune	Beach-foredune assoc.	0-6'	Rapid	VSevere
Beach road east	Newhan fine	6'	VRapid	Slight
and between	Newhan Corolla	(See qualification)		
highways	Duckston fine sand	1-2'	VRapid	Severe
Bypass west	Duneland	6'	VRapid	Severe
	Duckston fine sand	(See above)		
	Newhan fine sand	(See above)		
	Corolla fine sand	1-3'	VRapid	Severe
Soundside	Carteret soils	0-3'	Rapid	VSevere

(Note: "Depth" refers to depth to seasonal high water table; "Perm." refers to permeability; "Use" refers to suitability for septic tank and filter field; "V" before Rapid and Severe means "very." Soils graded as severe or very severe were judged unsuitable for septic systems and so mapped.)

In conclusion, we found that the soils that were most suitable for septic systems were found between the bypass and the frontal dune. However, even the more suitable soils pose special problems due to their extreme permeability which will allow effluent to be injected into the shallow aquifer.

By overlaying the map showing past residential growth with the map showing soils suitable for septic systems, we notice that the past growth utilized many of the more suitable soils and that future growth will probably utilize many of the more severe and very severe soils. Furthermore, past growth has occurred at distances farthest removed from the sound. (See maps on soils and development.)

Quality of the Albemarle Sound

The Albemarle Sound system includes (for purposes of this discussion) not only the Albemarle, Currituck, Roanoke and Croatan

Sounds, but also the estuaries and associated drainage of the Roanoke, Chowan, Perquimans, Little, Pasquotank, North, Alligator and Scuppernong Rivers.

The Albemarle Sound is a drowned river valley estuary. It has no direct outlet to the ocean but connects to the Pamlico Sound and Oregon Inlet through the Croatan and Roanoke Sound. Tides ranges are of small magnitude in most locations; winds play a major role in water circulation. The Sounds average dimensions are 55 miles by 7 miles. The central area of the bay is about 18 feet deep.

The Sound and its tributaries have proven to be exceptionally favorable habitats for anadromous fishes such as stripped bass and herring and serve also as nurseries and commercial and sport fisheries for a variety of shellfish and finfish. Dissolved oxygen is abundant in the sound year-round. The percent oxygen saturation is usually above 80 to 90 percent. There are few signs of eutrophication although nutrients necessary for algae blooms are abundant. Algae blooms and attendant fish kills have occurred in the Chowan River. The lack of algae growth is probably due to low temperatures, insufficient light and washout in the winter and high turbidity in the summer.

Considering freshwater inflow and saltwater intrusion, we note that the large drainage basin and the strong currents are making the Sound increasingly fresh water. The water budget for the Sound is as follows:

TABLE 2

Element	Drainage	Average Monthly Values in $ft.^3/sec.$ March	July	December	Ave.
Precipitation	933 mi^2	2900	5400	2600	3400
Inflow: Chowan	4943	8600	3000	4400	4600
Inflow: Roanoke	9666	10000	8000	8300	8900
Inflow: land	2817	5600	1900	1300	2900
Less-Evaporation	933	2200	4100	900	2600
Total Outflow to Pamlico	18359	25000	14000	16000	17000

The salinity of the Sound is usually at a minimum in March as a result of heavy spring runoff displacing saline water seaward, and is at a maximum in December, after relatively low freshwater inflows during the summer have allowed saline water to again advance landward. Wind tides prevent salinity stratification in the open sound. Typical salinity values appear as follows:

TABLE 3

Location	Salinity in Grams Per Kilogram December	March
Hertford to Columbia area	1	1
Elizabeth City to Alligator R.	3	2
Roanoke and Croatan Sounds	8	4
Near Oregon Inlet	18	11
(Sea water)	34.5	

Although as a whole the Albemarle Sound is biologically healthy, there are many potential water problems. Some areas have been closed to shellfishing due to high coliform bacteria counts. There have been several very destructive algae blooms. Large agricultural developments,

including livestock operations, will increase nutrient loads. Drainage canals may lower salinities below that necessary for developing shellfish. High levels of mercury and metals may damage the marine life.

The control over potential problems in the Sound rests in a collection of overlapping government controls. The Commission of Health Services sets standards for use of septic systems which are enforced by the County Health Department. The CHS makes regular reports on the quality of shellfishing. The Environmental Management Commission sets standards for wastes and water quality parameters. The EMC monitors water quality in each of the river basins discharging into the Sound. the counties and the municipalities therein are responsible for controlling land use and among other things for preventing high density development on unsuitable soils adjacent to the sound. Although man-made pollution from industry, commerce and residential development can be controlled by some layer of government; agricultural uses have been exempted by the State from almost all direct and indirect control.

In their 1979 Water Quality Management Plan, the N.C. Department of Natural Resources and Community Development noted that it is highly probable that many streams and coastal waters are degraded but undetected at this time due to a lack of water quality monitoring. DNRCD is concerned with several water pollutants, namely oxygen demanding substances, bacteria, sediment, nutrients and toxics. Wastes from all sectors of development pose demands on oxygen in the water--an essential to aquatic life. Generally a level of 5 mg/l of DO is required to sustain acceptable biological activity. Pathogenic bacteria can be found in both domestic wastewater and runoff from

animal feedlots. Pathogens which are most frequently transmitted through water are those which cause infections of the intestinal tract, namely typhoid, and paratyphoid fevers, dysentery and cholera. Livestock operations may cause bacterial contamination of shellfish. Also extensive ditching (agricultural, construction and residential) can cause bacteria to enter estuaries. Coliform bacteria standards for different classes of waters are as follows:

TABLE 4

Class	Standard (Colonies/ml.)
Class A-1 waters	50/100 ml
Class A-2 waters	1000/100
Class B and SB waters (fecal)	200/100 ml
Class C and SC waters (fecal)	1000/100 ml
Class SA waters	70/100 ml

As we noted before sediment loads have served an important function in the Sound, especially by interfering with photosynthesis and preventing algae blooms despite ample presence of nitrogenous materials. Sedimentation in the coastal area is largely the result of erosion from agricultural use (estimate of 80% from cropland, pasture, farmsteads, farm roads) and urban use and construction activities. Sediment in sound and streams disrupts the food chain. At moderate concentrations, fish cannot spawn; at high concentrations, gills of fish clog and they die. Sediments cover up bottom dwelling macroinvertebrates which are the primary source of food for fish. Fish may starve or move away. Nutrients (phosophorus and nitrogen) are required by plants in order

to grow. However if these levels become too high, algae blooms may occur. Excessive nutrient inputs may occur wastewater discharges, septic tank leakage and rainfall runoff from agricultural and residential areas. As was noted before, algae blooms have occurred in the Chowan River estuary. It was estimated that 85% of the nitrogen delivered to the Chowan came from non-point sources. The State uses "Chlorophyll a" to measure the amount of nutrients in the water. The proposed standard for salt water sounds is 40 ug/l.

Toxic substances reach the surface waters from wastewater discharge or runoff from agricultural lands or urban areas. These substances include those whose discharge is immediately dangerous to biological organisms (causes death) and those that interfere with biological processes over long periods of time (reproductive damage). Toxic substances can reach groundwater from ponds and lagoons. Mercury and zinc levels in the Chowan River estuary have exceeded existing and proposed standards. (Mercury standard .05 ug/l fresh water and .1 ug/l salt water.)

Groundwater System

In the Nags Head/Kill Devil Hills area there are six significant hydrogeologic units above a depth of 500 feet. These units include three aquifers and three confining units known as aquatards or non-aquifers. The uppermost unit is a water table or "unconfined aquifer" whichconsists primarily of sand with some shells and some interbedded clays and silty sands. The aquifer extends from the land surface to about 100 feet of Bodie Island. This aquifer is the source of water for many existing and commercial wells in the area. The uppermost

confined layer is the most significant aquifer in the region. It has been designated as the principal aquifer in the region. It has been designated as the principal aquifer by the Groundwater Division of the State DNRCD. The top of this aquifer is at about 200 feet at Nags Head/Kill Devil Hills and is about 45 feet thick. This aquifer appears to be more than adequate to meet the needs of the area for the foreseeable future.

Because of the high degree of permeability of the aquifer in most of the area, it has been largely flushed of saline water. The aquatards above and below the aquifer provide good protection from the encroachment of saline water. Rainfall on the mainland appears to be the source of recharge where the confining bed above the aquifer is absent, thin, or relatively permeable. DNRCD data suggest that the major center of recharge is on the west side of the Croatan Sound where the confining bed possibly terminates, and where the permeability and transmissivity of the aquifer are highest. From the recharge area the water moves beneath the Sound towards Roanoke Island and the beaches.

The Towns of Nags Head and Kill Devil Hills and the population center on Collington Island currently derive their water supply from a surface freshwater lake called Freshwater Pond located on the border of Kill Devil Hills and Nags Head. The waters of this pond are approximately 35 acres in size and are supplied by the upper unconfined surface aquifer.

Water Qualify of Surface and Groundwater System Immediately Adjacent to Dare County Beaches

Water quality classifications immediately adjacent to the Dare beaches vary from SA to SC. SA waters are suitable for shellfishing.

SB for bathing and recreation and SC for fishing. According to a report prepared for the Army Corps of Engineers by Enviroplan, Inc. in 1975, Shallowbag Bay is a spawning area for finfish, crabs and oysters and a nursery area for shrimp, primarily in the vicinity of Scarborough and Dough's Creeks. The N.C. Wildlife Resources Commission in 1976 reported that Buzzards Bay, Kitty Hawk Bay and Collington Creek all offer good fishing for large mouth bass, white perch and yellow perch. Other reports cite that the shallow freshwater marshes cover 2000 or more acres bordering Kitty Hawk bay and Buzzards bay. These areas are important as a nursery area for freshwater game fish. The areas adjacent to Nags Head and Kill Devil Hills (including Collington community) contain extensive wetland areas and are located within a rich estuarine complex.

Regretably a large portion of this area is now closed to shellfishing. In 1973 crabkills were cited in Kitty Hawk Bay and Collington Creek. High fecal coliform counts (in excess of 300 in many stations during March, in excess of 70 in summer) has resulted in the areas being closed to shellfishing.

Causes of Shellfish Closings

Due to the relatively small amount of land in the area in agricultural use, this use is not considered to be a significant cause of pollutants. A number of point sources in the Nags Head/Kill Devil Hills area discharge to the surface or the Sound. They are as follows:

TABLE 5

Package System	Capacity (MGD)	Flow (MGD)
Holiday Inn (subsurface)	.03	.03
Evans Seafood (subsurface)	.01	No data
Villas	.06	.05
Ocean Acres	.06	.08*
Ramada Inn (subsurface)	.03	.03
Sells Association (subsurface)	.007	NA
Cove Condominium	.03	
Sea Scape Development (subs)	.08	
Dunes Condominium (subsurface)	.03	
Daniels Seafood	.02	

With the exception of Ocean Acres, these point sources have not been considered as a significant cause of the pollution.

The Town of Manteo operates a .25 MGD secondary treatment facility which discharges into Shallowbag Bay. The facility is meeting secondary wastetreatment requirements for BOD removal and suspended solids. Despite meeting standards of EPA, this facility is still a major contributor to pollution in the Bay. (Shallowbag Bay is closed to shellfishing because of fear concerning a breakdown in the facility.)

The major cause of pollution in the Sound adjacent to the Dare County beaches has been attributed to septic tank failures. Septic tank failure is not limited to those that are cited for malfunctioning. In January 1979 45 of 459 private sewage disposal systems examined needed repair. Similar septic tank failure rates were documented in the past. Health department statistics indicate 53-68 septic systems are condemned each year and 104-115 are in need of repair or replacement.

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Other causes of pollution, especially fecal coliform count, may be from the duck and geese population in the Roanoke Sound, estimated by CHS to be approximately 42,100 in January 1979.

Septic Systems, Sound Quality and Land Use

Although a satisfactory model that would predict when septic tanks would cause the pollution of adjacent waters has not been developed, many studies point to some rather obvious conclusions. In Nassau County, New York a population density of 2000 persons per square mile has resulted in nitrification of surface and ground waters. In New Hanover County monitoring was performed on four tidal creeks to assess the impact of septic systems. Residential development on the creeks ranged from heavy (Whiskey and Bradley) to almost non-existent (Futch). Bacteriological and nutrient samples were obtained from these creeks during the period July to October 1978. Results showed the following:

TABLE 6

MONITORING RESULTS IN NEW HANOVER COUNTY

	Whiskey Creek	Bradley Creek	Futch Creek
Fecal Coliform	196	228	21
Total Coliform	3970	2452	66
Septic Tank Density (units/acre)	.367	.563	.036
Soils Rated Severe (% of study area)	78	70	10
Distance from water	(Closer in Whiskey Creek than Bradley)		

In still another study on the Surf City area, the State DNRCD was able to conclude that fecal coliforn survives in the soil in significant numbers for 32 days. In addition these colonies will travel tens of feet per day in soils. A range of up to 1000 feet may be possible.

The relationship between septic systems and high fecal coliform counts in adjacent water areas is also apparent from studying the CHS reports for waters adjacent to the Outer Banks. Areas south of the Washington Baum bridge to Ocracoke are basically unpopulated except for small communities on septic tanks. With but one exception (where there was cited a natural cause) the reports document that fecal coliform counts in excess of State standards are found where there is residential housing using septic systems. Interestingly, the highest fecal counts are found in the spring when the population is low but the land is wet and water table high, than in the summer.

In conclusion, septic systems (even when from a layman's perspective they are functioning properly) are a cause of pollution (fecal coliform and nutrients) in nearby water bodies. This

relationship appears to depend on the quality of the soils to remove bacteria, the distance of the system from the watercourse, the density of the systems and the capacity and quality of the system. The location of past population adjacent to the ocean (as opposed to the sound) has probably protected the sound from pollution. However, future development pressures will undoubtedly open up areas close to the Sound.

The level of fecal coliform will probably be directly related to the amount of development on septic systems on poor soils. The problems with high fecal coliform counts is not solely the elimination of shellfish as a source of sport and commercial food for man. Shellfish are collectors of bacteria and viruses. They are also part of food-chain for finfish. In addition, high fecal coliform counts may eventually close the area to finfishing and bathing as well.

Septic Systems and Groundwater Quality

Effluent from septic systems threatens to pollute the unconsolidated aquifer. Although this may not appear to be significant, studies have expressed some concern that contamination may pass through the aquitard and affect the quality of the principal aquifer--the sole water source for the region.

Sewage Treatment Alternatives

Several alternatives exist to the present handling of septic systems. Among these are: decrease density on areas with poor soils, decrease population in general, provide generous setbacks of septic systems from the sound and canals, increase the vertical separation to as much as 30 inches. (Vertical separation is the distance between the nitrification lines and the top of the water table.)

Alternatives to septic systems themselves include mounds, evapotranspiration beds, low pressure pipe, aerobic systems, land application and holding tanks. The alternative to the individual private system is a municipal, community or regional system. In 1977 Von Ossen studied four alternatives to a regional system for the Dare beaches. The alternative adopted by resolution by all municipalities concerned at that time involved a one plant system with ocean outfall.

The proposed waste treatment facility will have a design capacity of 3.4 mgd. This was based on a regional peak population of 37,200 people in 1980. Based on our studies of water use and population, we feel that the system would be capable of handling 52,300 people. The projected summer population (average, not peak) for 1990 shows 32,200 for Nags Head and 29,000 for Kill Devil Hills. Von Ossen projected 33% for other areas in the service region. Clearly, given current rates of growth, the 1990 population of the service area will approach 90,000 people.

An analysis of the approach used by the federal agencies in designing this facility leaves no conclusion but that it was designed to fail upon completion. The system was designed with the inference that it would be used as an ultimate growth control tool. Intentions appear to be that the system would be at real capacity upon completion and that further hookups would be prohibited. Since the system appears designed to fail, it seems important to understand the environmental costs attendant upon the failure of the systems to be able to handle the effluent being delivered to the plant. Here we must recognize the distinction between design treatment capacity and flow

capacity. A second alternative would recognize that to avert failure the municipalities could provide for additional capacity. This could be done either now or immediately upon completion of the plant. If it were done now, federal agencies would probably demand that an EIS be completed. If it were done (say in 1986 following completion) the entire costs of the addition (less perhaps 25% State share) would be borne by the municipalities. A third alternative would recognize a redesign of the plant in light of realistic population projections and with perhaps a modification of federal policies towards the barrier islands.

We would like to point out an interesting legal aside at this point. Although there is no case law in North Carolina on point, case law from other jurisdictions points to two conclusions; one that the State can enjoin a municipality from adding on additions to a plant that is operating with loads excess of its NPDES permit; secondly, a developer or private individual can enjoin a municipality from keeping him from making a hookup to a wastetreatment system, even where it is under restrictions by EPA or the State. In conclusion, this puts the municipality between the proverbial "rock and a hard place." (See Westwood Forest Estates, Inc v. Village of Souty Nyack, 23 N.Y. 2d 424 (1969) and Charles v. Diamond, 42 A. 2d 232 (1973).

TABLE 7

COST ANALYSIS OF ALTERNATIVE SYSTEMS

System	Cost	Comment
Mound System	$2500.00 (capital)	A raised septic system Aesthetic considerations
Evapotranspiration Bed System	$2500.00 (capital)	Unsuitable during wet season when MPN high
Low Pressure Pipe System	$1500.00 (capital)	Unsuitable where high meter table
Aerobic System	$5000.00 (capital)	Need expert maintenance
Land Application	NA	Need large land area; does not treat nutrient

From information supplied by Ocean Acres, one of two package facilities operating on the Dare beaches and serving a large number of residences, we concluded that the costs of such systems may have increased so substantially as to be extremely expensive, at least when compared with the regional systems. Because of a parking law suit with the State involving costs, we felt it inappropriate to detail this information.

Regional 201 Facility

In 1977 Henry Von Ossen and Associates completed the Dare County Complex 201 Facility Plan which provided for the construction of sewage disposal facilities for the Northeastern portion of the County comprised of the Dare Beaches region north of the Oregon Inlet. Alternative A which called for a joint project by the municipalities of Kill Devil Hills, Nags Head and Manteo (together with unincorporated areas of Dare County) was chosen by all participants.

The total capital cost of the proejct in 1975 dollars was estimated at $10,611,560. It is anticipated that EPA will fund 75% of the project in the amount of $7,482,407. The State of North Carolina will fund 12.5% of the nonfederal portion of the marine site survey for the ocean outfall and an additional 12.5% of the capital costs. The participating governments will have to fund 12.5% of the non-federal share. The annual costs for debt service, operation and maintenance will be paid for by means of user fees. It is anticipated that the local share of the marine site survey will be paid out of the general funds of each municipality. The collection system will be provided totally out of local monies.

TABLE 8

PROJECT COST 1980 DOLLARS

Capital Facility and Interceptors:		
Total Project Cost		$17,090,024.00
Less: EPA Grant (75%)	$12,817,518.00	
Water Bond (12.5)	2,136,253.00	
Local Share of Capital Costs		2,136,253.00
Annual Debt Payment (FMHA loan at 5% for 40 years)		123,903.00
Annual Operating and Maintenance		417,815.00
Total Annual Cost		541,718.00
Monthly local costs		45,143.00
Average Monthly Cost Per User (Based on 11,000 units)		4.10
Collection System:		
Total Project Cost		$ 6,000,000.00
Less: Water Bond Grant (25%)	500,000.00	
Connection Fee ($250)	916,667.00	
Local Share of Costs		4,583,333.00
Annual Debt Payment		304,500.00
Annual Operating and Maintenance		50,000.00
Total Annual Cost		354,500.00
Monthly local costs		29,547.00
Average Monthly cost per User		7.00
Total Monthly User Cost		11.10
Plus one time installation fee of $250.00		

Water System: Kill Devil Hills

The present water system in Kill Devil Hills was constructed in 1964. Average daily water pumped during peak months is 950,000 gallons per day. Population peaks during this time were as high as 13,433. The source of water for the Town is a fresh water pond and shallow well fields.

The Dare County Regional System is nearing completion and will soon be the supplier of water to the Dare Beaches. A 1,000,000 gallon elevated storage tank and a 1,000,000 gallon ground reservoir at the treatment plant site will store water from a series of wells into the primary aquifer on the Roanoke Island. Existing storage tanks and a newly provided tank will supply more than adequate storage for Kill Devil Hills. Estimates of peak water needs for Kill Devil Hills are: 1980, 973,665 gpd; 1990, 3,305,169 gpd. The 5 MGD present design capacity will meet the present needs of the Town. The projected expansion of the system to 8.4 MDG in 1990 should be adequate to serve Kill Devil Hills at that time.

In conclusion, Kill Devil Hills relies on groundwater system, especially the surficial quifer, for its drinking water. This part of the aquifer is sensitive to groundwater pollution, especially from septic tank effluent. The ability of soils to remove wastes from the septic systems varies with soil type. Kill Devil Hills has a considerable amount of poor soils with limited capacity in this regard. Because the regional water system is expected to be in operation very shortly, the Town's reliance on surficial aquifer will be relegated to only a back-up for the regional system which will use the "principal aquifer."

When the regional system (water supply) is operating, the Town's major concern with wastes placed in or on the ground will be with the effect such wastes will have on animal and plant life, especially in those areas where such life is significant and/or of high qualty and where the wastes would endanger the survival of the species. The two most environmentally significant areas are the freshwater and the sound. These systems both center around water quality. Nutrient loads (from septic systems) could make demands on dissolved oxygen, removing it from the water. Without sufficient oxygen most plants and animals cannot survive. Between State and local regulation, the Town has achieved some setback from the sound and protection of water source. But more is needed.

In order to protect the water quality of the sound, the Town must limit nutrients and pathogens from reaching that water body. Studies on the movement of pathogens show that they can travel up to tens of feet per day and live for 30 days in poor soils. Pathogens are directly related to shellfish closings.

If pollution of the sound is unacceptable, which the Town has decided it is, then the alternatives are either to restrict growth to a limit (density) that will not cuase pollution (density was one of the factors cited as a function of pollution in Nassau and New Hanover studies) or to technologically remove the limitation, by building sewage treatment facility-regional or several small package facilities) or using mounds, aerobic systems, etc. The most cost efficient, technological alternative appears to be a Regional 201 Facility. The Town has decided to limit development on poor soils as an interim measure until a technological approach is adopted, at which time limitations will only apply to areas within 500 feet of the sound.

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Water Quality

See DNRCD and Von Oesen reports cited above.

Septic Systems

See DNRCD report. Section: Water Quality and On-Site Wastewater Disposal.

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Waste Source and Water Quality Studies, Surf City, N.C., U.S. Environmental Protection Agency, 1975.

An Analysis of Septic Tank Problems and the Vertical Separation Issue in the Coastal Zone of North Carolina, Joseph H. Prater, III.

Conversations with Al Duda, J.F. Smith, Roy McCarter

Sewage Treatment Alternatives

See Von Oesen report cited above.

See also Prater report cited above (alternative systems).

Conversation with Robert Burnett of Von Oesen and Associates

CHAPTER IV

OTHER ENVIRONMENTAL CONSIDERATIONS: CONSTRAINTS

A. BEACH DYNAMICS

Scientists believe that the Outer Banks were a product of the rising sea elevation during the last ice age. Basically, as the sea level rose, the shoreline retreated until the shoreline was out near the continental shelf. Then, a ridge of sand dunes began to appear parallel to the beaches, formed by wind and tide. The beach received sand from the continental shelf through wave action. As sea level rose, dunes were breached and the area behind the ridges became flooded--the dunes became islands. Since then, both the mainland and the islands have migrated. Migration is related to sea level rise and the slope of the mainland. Accordingly, the horizontal island migration rates should be 100 to 1,000 times the rate of sea-level rise (namely 1 foot per century). The rate of migration is higher in the northern Outer Banks than the southern. The North Carolina coast experiences a much slower migration than we find in New Jersey or Maine.

The process of migration is not uniform, although most of the ocean beaches are eroding. The back sides of the islands can widen. The principal ways in which islands widen are (1) inlet formation and the forming of tidal deltas and (2) overwash. The maintenance of the bulk

of the island is through vegetation and retention of the sand. Habitation and the natural process favoring island stabilization are at odds--development seems to require stabilization of inlets, prevention of overwash and reduction in vegetation.

The methods used to stabilize the ocean beach include: (1) beach replenishment (2) groins and jetties and (3) seawalls.

Beach replenishment involves pumping or plowing sand onto the beach and building up the former dunes and upper beach. According to Orin Pilkey, most beach replenishment projects involve only the upper reaches of the beach--since they increase the slope of the beach, they increase the rate of erosion. Most sand for beach nourishment is taken from the sound, thus often increasing erosion on the beach side of the island. The costs of replenishments are high (over $1 million to replenish Wrightsville Beach in 1966) and the results very temporary.

Groins and jetties are walls built perpendicular to the shoreline. Jetties are often very long and intended to keep sand from filling in shipping channels. Groins are smaller and attempt to trap sand flowing in the littoral current. Although both are effective sand traps, they both work on the principle of "stealing from Peter to pay Paul," i.e., beaches upcurrent and downcurrent from groins will erode as the groined beach accretes.

Seawalls are built back from and parallel to the shore. Seawalls reflect wave action, and intensify currents steepening the profile of the beach. The long-range effects of seawalls can be seen in New Jersey and Florida. Pilkey relates a story of Cape May--once a sandy beach resort of pre civil war presidents and the country's most prestigious beach, now beachless, blockaded by a mile-long crumbling stormwall--a

community nearly "financially insolvent" and in fear of being submerged by the tide.

The Dare County Beach from South Nags Head to Kitty Hawk has recently experienced severe erosion in several spots following northeastern storms in late winter. This year, several houses were damaged as their foundation gave way on steep escarpments. Several others have been moved back from the ocean to prevent damage.

The ability to withstand a hurricane will to a large degree be a function of the moss in storage in the frontal dunes and the provision for overwash. Overwash areas are necessary to replenish the marshes and reduce the pressure on the dune system. On the other hand, a solid (high and broad) dune system is necessary to protect beachfront and nearby low elevation cottages. Prior to 1977, a large number of developments in Nags Head and Kill Devil Hills had removed primary dunes in front of their businesses and cottages. These areas and others where sand has moved following sand disturbance and lack of vegetation are in danger of becoming overwash areas and breaking points in a hurricane. Although future oceanfront developments are prevented by CAMA from disturbing the frontal dunes, the many already existing problem areas need to be identified and repaired.

Finally, areas that are extremely low in elevation are subject to overwash during a hurricane. This problem is aggravated to the dimensions of inlet formation possibilities where channels have been dug parallel to the sound, with the land contour on a narrow stretch of the island not protected by tidal deltas and marshlands. One such potential inlet can be readily identifiable, namely The Cove. Damage from inlet formation in this area could be more significant than the extreme loss

of property (several hundred homes are built in the subdivision and several hundred more possible). Losses could include separation of Northern Nags Head and Kill Devil Hills from Dare County Mainland, with attendant costs for new transportation to Manteo. It would seem prudent to explore possibilities for filling in the canals. (We should note that canals are frequently blamed by scientists for causing pollution of estuarine waters--each lot is technically within short distance to sound).

In terms of building on the Dare beaches, we recommend identifying and preserving several overwash areas, building up and vegetating the dunes. Secondly, we feel that those uses that are least likely to result in the necessity of a seawall to protect investment should be encouraged within 100 feet of mean high water on ocean. Also, uses that are allowed within the first 200 feet should involve an amortization of the use, such that the use will not remain after a certain time calculated to include the beach's migration. Thirdly, we concur with Pilkey in his recommendation that development be placed back from the shore, behind the dunes and on high ground.

B. AREAS OF ENVIRONMENTAL CONCERNS: TYPES, STANDARDS, USES

Areas of Environmental Concern (AECs) are areas designated by the State to be of special environmental or natural resource concern so as to warrant protection of the resource or of man from the resource. Kill Devil Hills has several AECs; other areas could qualify for nomination. AECs are protected through State permit letting (the CAMA permit: the minor permit is issued by Kill Devil Hills under an IGE Program for activity or development in the ocean hazard and shoreline AEC; the major permit is issued by the State). In any event, each AEC permit must follow the general standards set out in the statute as well as regulations developed to guide development in the designated area in accordance with the management objective. The statutory standards require development within AECs to be consistent with the land use plans.

Among the AECs in Kill Devil Hills are the ocean erodible area, the V zone or flood zone, the estuarine shoreline area, the wetland and the fresh water ponds. The first areas are part of the ocean hazard AEC, the next two of the Estuarine System AEC. The ocean erodible area is a safety zone and intended to prevent further development in areas which will probably be under water in the next 30 years. The zone protects persons from building follishly; it also may protect persons living outside the eroding area from being damaged by those in the area. The area is measured by multiplying the average annual erosion rate times the estimated life of the structure, 30 years, plus the one hundred year recession line. This measurement ranges from 60 to 120 feet, with the higher rate in the northern section of Town.

The V zone is the flood hazard zone as determined by the Federal Flood Insurance Program. This is the area likely to be inundated by the 1% storm. This area has been depicted on the Flood Hazard map; it follows the crest of the frontal dune where the elevation exceeds 15 feet in the ocean front; otherwise it reaches to SR1243. Development is restricted in this area to design standards set out in CAMA regulations, stated simply to building above flood elevation and with 8" diameter pilings to a depth of 4 feet.

The estuarine shoreline zone extends from estuarine water (mean high water mark) to 75 feet. The major concern of this zone is for protecting the estuarine system from pollution--both sedimentation and nitrification. Regulations severely limit the use of septic systems and removal of ground cover.

The wetland zone is defined by the presence of commonly found vegetation, particularly spartina and juncus. The wetlands are recognized as important to the food chain and the estuarine system. They are protected from development through limits placed on filling. Water related activities such as marinas are restricted by dredge and spoil placement requirements.

The fresh water pond is a municipal water source for both Nags Head and Kill Devil Hills. In order to maintain the quality of the source, the State has designated the area as an AEC and regulates development to prevent contamination of the water. Regulations require a setback and density requirement not to be exceeded in the use of septic tanks.

The full management objectives together with the regulations are set out in the State Administrative Code at 15NCAC7H. Further information can be obtained from the CAMA permit officer for the Town.

Areas of Environmental Concern and Land Use Plan

An overlay of the zoning ordinance with the AECs show that in the Ocean Hazard Area the following zones occur: RA3, RA4, RA5 and B. In the RA districts single and multi-family dwellings are allowed, also schools, clubs, churches, parks, playgrounds, home occupations, and guest houses. In the RA3, RA4, RA5 zones, these uses are expanded to include hotels, motorcourts, and auditoriums. The Town intends to redesign this zone during 1980-1. All permitted uses within the RA3 zone must be bulkheaded (seawall) to tie in with adjoining property owners (at 26 feet from property line on road). Standards are set defining the construction of the bulkhead and the use of pilings.

The Town notes that in the Estuarine Shoreline Zone the dominant permitted use is RA6 (single family, basic RA uses). The small exception are for two existing marina and boat access areas (one owned by State and one commercial, including a restaurant) which are zoned B. The Town has zoned the area in the Fresh Water Pond AEC and the Wetlands RA6.

The zoning ordinance is consistent with zoning and AEC or Land Classification in that the ordinance only establishes permitted uses which could occur provided State laws and regulations which are more restrictive can be complied with. An application of State AEC requirements for wetlands, for example, would result in a complete restriction on residential development in this area (although the State

regulations are, of course, development standards and do not eliminate the use cost only the technical means by which the use can be created). Such a result is not inconsistent with the zoning.

In a municipality where a zoning ordinance exists, the Town cannot eliminate uses from an established zone without redistricting and creating a new zone. Therefore, unless the zoning boundary is identical with the AEC or land classification, the uses for the zone will not be identical with the land classification and/or the AEC. Hence, the uses appropriate for the latter are the uses permitted by the former.

Kill Devil Hills proposes to redraw boundary lines for zones in keeping with natural features and constraints and set permitted uses for each zone during 1980-81. This should result in a "beachfront-erosion zone" and a "wetland zone" and a zone to protect the "water source." At that time, it is anticipated that motels and immovable structures will be eliminated from the first, development of any sort will not be permitted in the second and real residential use will be regulated by density in the third. The Town has no plans to make special restrictions on uses for the estuarine shoreline zone.

C. ENVIRONMENTAL AND AREA CONSTRAINTS: FRAGILE AREAS AND HAZARD AREAS

In order to determine land areas suitable for development, one needs to assess the major constraints to land development. Constraints arise from a desire to protect water supplies from contamination, to preserve w etlands, to protect property (and property values), to save lives, to protect wildlife, etc. Some of these values are established by the government and some by the private sector. The following environmental factors are treated as fragile resources or hazards wherein man and nature need to be protected from one another: water bodies, and water supply areas, wetlands (especially coastal wetlands, steep slopes (especially sand dunes, frontal and soundside), parks and recreation areas, woodlands, prime and unique agricultural soils, unsuitable soils for on-lot sewage disposal.

1. Lakes and Ponds. Lakes and ponds play an important part in the hydrological cycle--the circular path which water takes as it falls in the form of precipitation, penetrates into groundwater reserves, collects in water bodies and low areas and is evaporated by the sun or transpired by plants into the atmosphere.

In Nags Head and Kill Devil Hills area the fresh water ponds in the Nags Head Woods and the wetland areas therein collect rainwater directly and indirectly from soils in nearby land areas (the Woods). Water falling onto the ground seeps into the high water table and appears (in places) to be connected to the water quality of the Fresh Water Pond, the municipal water source (at present) for Nags Head and Kill Devil Hills.

Water is a natural constraint to development. Land areas near water bodies and which drain into them directly or indirectly via the groundwater (surficial aquifer) should be a constraint.

2. Wetlands. These areas provide a wide variety of functions. Wetlands recharge groundwater reservoirs; act as a sediment and nutrient trap in which eroded soil and wastes are filtered out naturally from water destined for human use; retain flood water during heavy rainfall; act as plant and wildlife habitats and provide the life-cycle for wildlife. The wetlands on the Nags Head and Kill Devil Hills soundside were determined to be an intricate part of the Dare County economy as many species of fish and wildlife spend at least part of their life cycle there. Coastal wetlands, regulated by CAMA as an AEC, and hence constrained, are defined as any marsh subject to at least occasional flooding by the tides. Most marshland adjacent to Nags Head and Kill Devil Hills is typified by the presence of Spartine alterniflora, juncus romericanus or scirpus spp.

Land uses in or adjacent to wetlands should be limited to conservation uses.

In mapping wetlands, we attempted to identify areas according to the guidelines and descriptions set out under Wetland AEC under CAMA. Interpretations were made from aerial photos. These interpretations were checked with other work done for the Town using different scales.

3. Flood Hazard Areas. The cost of property loss from floods and the cost of flood protection devices are so high that flood hazard areas are best treated as areas on which industrial, institutional, residential and commercial buildings should not be constructed. If, however, this action cannot be taken, development in these areas should

be permitted only in accordance with the requirements of the National Flood Insurance Program. The boundary used to delineate the flood hazard area is the 100 year flood plain. We mapped both areas designated as subject to high velocity winds and storm surge and the A zone, referred to above. We note the CAMA ocean hazard zone compliments this area (its regulations are described in AEC section). Kill Devil Hills cooperates in the flood hazard program. Although flooding is a constraint that in many places prevents development, here it is not. In accordance with the flood regulations residential construction is permitted where adequate flood avoidance measures have been taken, namely living quarters must be above the flood elevation, efforts must be taken to design sewage treatment system to make them flood proof. No development is permitted in the V zone. See map of flood areas.

4. Steep Slopes. Development on steep slopes accompanied by a disturbance of ground cover is a major cause of erosion. Almost all steep slopes in Kill Devil Hills are on the sand dunes. The dunes reach as high as ninety feet above sea level, although a number of dunes are in excess of forty feet. The shape and slope of the dunes are constantly changing. Most of the unvegetated dunes are moving in a southwestern direction. The ridges usually twist direction as they move. Moving sand dunes are a hazard which persons should consider prior to buying property. The soundside dunes have been mapped. The L district (Town zoning ordinance) offers some protection from this hazard as it promotes mobile uses. Development on the dunes is unwise as shifting sand makes a poor foundation for roads and even for houses. Development on dunes above 35 feet may be especially hazardous during storms, due to higher wind velocity and less protection from man-made

and natural features. We have mapped these areas using aerial photos and transfering reductions in topographical maps prepared for the Town.

5. Woodlands. The natural vegetative cover for most of the inner area is forest. Forests improve the macro-climate and are a major balancing effect upon the water regimen--diminishing erosion, sedimentation, flood and drought. The scenic role of woodlands is apparent, as is their provision of a habitat for game. Woodlands offer substantial potential for recreational use. The forest is a low maintenance, self-perpetuating landscape. Forests can be employed for timber production, water management, wildlife habitats, as airsheds, recreation or for any combination of these uses. Woodlands can be constrained by zoning ordinances and the marketplace. Often woodlands, although extremely important to the ecosystem, are not adequately protected.

6. Poor Soils for On-Lot Sewage Disposal. This constraint was fully discussed in the section on "Environmental Considerations Relating to Water and Sewer." We have mapped all areas identified by the Soil Conservation Service as severely or very severely limited for the use of septic systems.

7. Recreational Areas, Historic Areas. Kill Devil Hills has a major public park and historic site, namely Wright Brothers Memorial. The Town has a significant number of historic dwellings of 30 to 60 year houses along the beachfront.

8. Prime and Unique Agricultural Land. There is no land currently being used for agricultural purposes within the Town of Kill Devil Hills.

9. Mining Areas, Other Industrial Sites, Commercial Fishing and Fisheries. These uses are of only limited importance within the Town limits. The Town recognizes the importance of these uses in neighboring areas for serving residents and visitors to Kill Devil Hills. The Town currently has a cement plant, its one industrial use. Plans are for gradually phasing out this use (a non-conforming use under the zoning ordinance). Fisheries are not permitted under the zoning ordinance. The Town is cooperating in preserving these uses by taking measures to insure the quality of the Sound. (See Environmental Considerations Relating to Water and Sewer.)

10. Developed Areas. Areas already developed by residential, commercial or industrial uses are not available for further development. Furthermore, transportation uses eliminate roads and right of ways. Redevelopment is not likely within the planning period. Developed areas are mapped on the existing land use maps. Uses depicted on the map were labelled so as to distinguish certain sets of uses from other sets of uses, i.e., commercial (non-housing or residential uses) from motels and residences, residential--single family and multi-family from residential and commercial housing of high densities, such as motels and cottage courts. The combination of uses is helpful in identifying conflicts caused by high densities of people and uses of automobiles. Additional uses are identified on work maps so that further subsets are possible.

11. Zoning. Zoning is a partial constraint to development. Where the density of development is historically less than that provided by the zoning ordinance as where historically the Town has developed on

half acre lots and the zoning of the undeveloped land is at one acre, then you have a constraint.

Implication of Building Constraints

The interpretation of the environmental factors provides a basis for identifying areas where future development should occur. (See Carrying Capacity section.) Absolute constraints to development such as developed area, wetlands, streams, lakes, ponds (especially if they are water supply), development of interior lands, and developed areas when overlayed are dark in shade and should be completely removed from possible future development. Partial constraints, such as Woodlands, poor soils for septic systems, steep slopes (dunes), AECs (not wetlands), must be accounted for in terms of development prevented. This is a function of the degree or percentage to which development already attracted and not otherwise absolutely constrained can be accommodated. Computations are set out in the section on carrying capacity.

The maps showing all constraints are attached following this section. These maps have been reproduced on a single page for illustrative purposes. The actual scale of the maps is 1" = 800'. We have included these maps where the plans are intended for use by persons needing a very detailed scale. (Land classification map reproduced elsewhere.)

D. THE WOODS

The Nags Head Woods extend along the southern portion of Kill Devil Hills. The Woods is an important natural feature consisting of marshes and hammocks, bay forest, ridge ponds and other wetlands, forest and dunes. During recent years the Woods have been developed. Private developers have subdivided the lots, built roads and sold some of the lots. One large development Ocean Acres has built on the southernmost property; recently it extended its already developed subdivision (in the Woods) to the bay forest and marshland. Ocean Acres advertizes large home sites and attracts a large portion of year round residents. The subdivision is served by a 600,000 GPD package plant for waste treatment.

The Woods is important from a naturalist point of view in that it contains species on the rare and endangered list; it has unique transition areas. The Woods was also the homeplace of the area's first settlers, thereby giving it historical significance. Development in the Woods near or in the path of Run Hill or other large unvegetated dunes may be unwise. The dunes are moving in a twisting southwesterly direction and could bury houses and other structures in its path.

Various efforts have been made to protect the Woods from large scale development. However, at the present time the tracts still undeveloped lie either in private hands and were approved for subdivision, or are owned (options included) by Nature Conservatory. The existing subdivisions in the Woods are not unlike those of Southern Shores, i.e., much vegetation remains, roads follow contours and little cut and fill is widened. We suspect that the developer will have

trouble retaining the small ponds in that too much vegetation around them appears to have been removed. The unfortunate aspect to this development is not its style, for it has class, but the destruction of several of the most important aspects of the environment, particularly plants and wildlife and the fresh water ponds and wetlands (not coastal wetlands). The consultants felt that if the Town had a PUD ordinance they could have allowed development and yet preserved some of this environment (and perhaps discouraged access to the rest of the Woods). Kill Devil Hills has strongly opposed PUD development because they find the higher densities resulting from such development inconsistent with their desire to promote the family beach atmosphere.

In 1974 the Woods were designated as a National Natural Landmark. Designation in this program is similar to that under the State Registry. Through dedication the federal government recognized that the area has significant natural features and indicates its desire to see these features protected. Implementation of this policy is two-fold: the federal government enforces the policy by discouraging development. Reportedly FHA and VA loans for the sewer system were denied developers desirous of building in the Woods. Also, the policy is enforced having landowners within the designated area "register" their property, acknowledging its uniqueness.

The Nature Conservatory currently owns about 227 acres in the Woods, all in Kill Devil Hills. Most of this property lies near Run Hill, a large unvegetated dune. On the property map these tracts are the seven tracts near Ocean Acres subdivision. The Nature Conservatory intends to manage the property for educational use and low intensity recreation,

such as walking. It is not expected that hunting, fishing and camping will be allowed on Nature Conservatory property.

Note: In designating conservation areas the Town set aside wetland areas. It did not feel it was appropriate to single out property owned by non-profit corporations or single individuals who may currently desire the property be used for only conservation type uses.

CHAPTER V

CAPACITY OF MAN-MADE SYSTEM: TRANSPORTATION SYSTEM

The Dare County beaches are very sensitive to problems arising from their transportation network. As Mayor Bryan stated at the joint meeting of Kill Devil Hills and Nags Head with Planning officials from the N.C. Department of Transportation, "They (the tourists) are our bread and butter. We must be concerned about their safety." The problems of the Town of Kill Devil Hills are two-fold: one, the capacity of the bridge systems to handle an evacuation prior to a major storm or hurricane, and two, the ability of the bypass (and Beach Road) to move traffic from the Kitty Hawk area to Whalebone Junction (where NC 12 and 64 meet) efficiently and safely.

A. HURRICANE EVACUATION

The problems associated with hurricane damage appear more critical than those of an overcapacity highway system. A successful evacuation in the face of Camille was earmarked to have saved 50,000 lives. 6,000 persons lost their lives when a hurricane hit the Texas coast in 1900.

Hurricanes are a fairly frequent occurrence on the Outer Banks of North Carolina. Orin Pilkey notes that there is an 8% probability of having a hurricane striking the Dare beaches. The Dare beaches have been spared significant hurricane activity since the 1950's, when nine hurricanes struck the coast, two of the more noteworthy being Diane and Hazel. The Dare County beaches were relatively undeveloped during the major hurricanes of the 50's. In 1954, Hazel extensively damaged one of the few developed beach resorts at that time, Wrightsville Beach, destroying 89 buildings and damaging 530 (only 20 escaped intact). Storms along the Gulf Coast suggest that winds will topple tall buildings (motels) and floods will wash away buildings that are not built above storm surge or properly fastened. In any event, during a hurricane most persons will have to abandon their cottages or homes and seek shelter on the mainland or in hurricane shelters.

In the event a hurricane were to strike the Outer Banks during tourist season, approximately 100,000 to 150,000 people would have to be evacuated through Dare County. The reason for this is that the entire population staying from Corolla in Currituck County to Oracoke in Hyde County (both on the Outer Banks) must pass through the Dare beaches to reach the mainland. The two evacuation routes are Route 64 West from Nags Head through Kill Devil Hills to mainland in Currituck County.

Before discussing the capacity of the evacuation system, let us consider the shelters that are available. The Dare County Hurricane Evacuation Plan notes that Dare County shelters are extremely limited. Of the 32 shelters available, most can accommodate only between 50 and 300 people. Many of the stations may not be usable at all because of conflicting use for housing fire and emergency vehicles. The total capacity of all shelters is probably less than 3,500 people. Some shelters are not built to flood standards, let alone hurricane. Some private sites, particularly the Villas and Dunes Condominiums may offer suitable shelters.

The evacuation system has several problems. Route 64 West, which goes through Manteo, involves three bridges (one on the intercoastal waterway) and one causeway before reaching mainland. It is two lanes and because of its many long causeway and bridge sections, would not tolerate traffic along the shoulder. Route 158 North, which goes to Elizabeth City involves two bridges, one a drawbridge on the intercoastal waterway. It is two lanes on the bridges, although there are plans to four lane north of the bridge over the Currituck Sound. The causeway from Manteo to Nags Head on Route 64 is subject to frequent flooding and has become impassable during minor storms. Much of the mainland route through Tyrrell County, which is extremely unpopulated, with only two small motels, is subject to flooding. Neither however has flooded prior to past hurricanes striking.

Pilkey suggests that a proper elevation for surviving a hurricane is about 15 feet. However, heights in excess of 30 feet or unvegetated sites may also be a problem. Flooding will occur from the sound as well

as the ocean. A major hurricane may cut inlets through the Dare beaches; especially vulnerable areas may be near the 64 causeway, through the Cove subdivision and north of Kill Devil Hills. This possibility, together with the absence of housing in suitable "hurricane proof" locations, suggest a complete evacuation is advisable.

The ideal summer evacuation could count on moving all evacuees over a 48 hour period over the two evacuation routes at maximum capacity. According to Department of Transportation estimates, the maximum capacity of the road systems is limited by the bridges to 22,000 vehicles per day per each road. This is based on the premise that both lanes of traffic would be used in a one-way direction. No allowance will be made for emergency vehicles (except those that are already east of the bridges desiring to go west). Thus it assumes no wrecks or breakdowns--no need for ambulance or wreckers. Working at full capacity, with an average population of four per car, the entire population can be easily evacuated.

There are certain problems. From observations about the evacuations in Carmen and Camille, and insights from Pilkey, we note that the Carmen evacuation was fraught by an accident which tied up traffic for 19 miles. Pilkey reminds us that people do not act normally in emergencies. He observed that "excited drivers will cause wrecks, run out of gas, have flat tires." Furthermore, conflicts will develop over use of the draw-ridges. Not only will people in cars be seeking safety, but also so will people in boats. In addition, we should expect that many people will try to salvage personal property, driving off the second car brought to the beach, towing campers and boats. Similarly,

commercial vessels and persons with large sports craft will be seeking inland harbor for their vessels. The next result will be a demand to open the drawbridges and a low occupancy in vehicles with a poor flow rate. Add to this the likelihood that only a small percentage will evacuate during the first 48 hours (after all, relaxing a week at the beach has required a substantial outlay in costs which will not be parted with easily) because they fail to realize the danger and are skeptical from lack of past experience. Finally, we must consider the possibility of one of the bridges being damaged from collision by a boat that couldn't hold a course in rough waters, and the possibility that flooding will eliminate the use of the causeway to Manteo.

We would like to look at capacity with altered assumptions. First, let's assume:

(1) Only 25% of the people will evacuate in the period 48 to 24 hours before the storm is forecast to arrive.
(2) Average number persons per car will be two.
(3) One-way systems will be used.

Then, capacity is as follows: (10,000 people)

Shelters	3,500
Residences (high ground)	1,000
48-24 hours leaving over 64 & 158	25,000
24 hours to storm over 64 & 158	88,000
Total Capacity	117,500

Now if an accident occurs on one route during 48 to 24 hours, no problem. However, within the last 24 hours, capacity may be sizably reduced because the one-way system will not allow for easy removal of wrecks. Presuming one lane were eliminated for half the time period, capacity would be reduced as follows:

Wreck one-way system	- 12,000
Total capacity	105,000

If instead, Route 64 was lost to flooding during last 24 hours, capacity would be:

Flooding of causeway - Route 64 to Manteo	- 44,000
Total capacity	73,500

If capacity were diminished to accept boat traffic at drawbridges, capacity may be reduced 15 minutes on the hour or 25%.

Less: drawbridge use for boats	- 22,000
Total capacity	85,500

If capacity is reduced by wreck of drawbridge over intercoastal waterway in Currituck in last 24 hours, capacity would be

Less: one drawbridge from damage	- 44,000
Total capacity	73,500

In the event of combinations, such as flooding of causeway, and wreck on 158 North, and conflicts over use of 158 drawbridge, we find:

Wreck	- 12,000
Flooding	44,000
Conflict use	11,000
Total capacity	51,500

Or, if wreck of drawbridge north and flooding of causeway west

Flooding	- 44,000
Damage to bridges	44,000
Total capacity	29,500

It seems entirely possible to us that there will be a conflict in use between boats and autos for the drawbridge and an accident as well. We feel capacity is currently around 80,000. We should note that if a wreck occurs, a two-way system may have allowed you to evacuate more cars.

Since we had to evacuate 100,000 people, and our current capacity is 80,000 we are in excess of capacity. We can take several approaches to this problem. We can ignore the risks or select a high-risk scenario. We can seek to alter policy to effectuate an expansion of capacity: get a higher percentage evacuation on first day, build more shelters, make arrangements for use of private structures, floodproof the causeway, prevent use of drawbridges by boats during last 24 hours. The gains from these alternatives are all calculable. However, in any event, we can expect that normal growth in the next two years will render even the ideal situation at capacity. The costs of removing this constraint are the costs of a new bridge. Bridge costs are estimated at $50 per square foot. Two additional lanes to 158 could increase ideal capacity to 162,500--an estimated population for 1985 for the Outer Banks. Two additional bridges could meet 1990 needs. The Department of Transportation has not studied the possibility of expanding the bridge systems on 64 or the bridge over the Currituck Sound on 158.

B. THE THOROUGHFARE SYSTEM

In addition to hurricane evacuation, the transportation system is called on to safely move persons through and within the Dare beach area. The current system is not capable of moving traffic; furthermore, its poor traffic flow presents a danger to the life of its users. According to Ron Poole, Department of Transportation, the bypass is currently at or beyond capacity. He stated that the average traffic counts for lag spots in Nags Head-Kill Devil Hills vicinity were as follows (1978 data expressed in average daily traffic rates). (To allow for seasonal peaks the Planning Staff suggested using a range of 2.6 to 2.9 times average daily. An ATR exists at two points for the summer months).

TABLE 1

	Daily Average	Average Summer(2.7)
Washington Baum Bridge	7,000	18,900
NC 12 Intersection	3,600	9,720
North of Oregon Inlet	2,926	7,904
*NH: 158 Bypass south of Town Hall	5,000	17,500
(158 Business	3,600)	9,720
KDH: 158 at Wright Memorial	8,000	21,600
(158 Business	4,000)	10,800
SS: 158	5,000	17,500

*NH - Nags Head KDH - Kill Devil Hills
SS - Southern Shores

This traffic count squares with personal observations of the residents. Traffic flows are worse on the bypass and in Kill Devil Hills near Ocean Acres. Recently, people have resorted to using the

beach road as their bypass. Traffic flows during the summer months are fortunate if they maintain a 35 mph average.

To place this information in perspective, we should note the growth in traffic since 1970.

TABLE 2

	1970 Daily Average
Washington Baum Bridge	3,200
NC 12	1,600
North of Oregon Inlet	1,700
NH: 158 Bypass south	2,650
(Business)	2,850
NH: 158 Bypass at Wright Memorial	2,950
SS: 158	2,200

Traditionally, the Department of Transportation expresses their information in terms of capacity. The capacity of the beach road and bypass varies with speed and road width. A typical rate is as follows:

TABLE 3

	Standards on Capacity (Road Width)				
(Speed)	24'	22'	20'	18'	16'
35 mph	11,000	9,450	8,460	7,700	7,150
45 mph	7,500	6,450	5,770	5,250	4,500
55 mph	3,000	2,580	2,310	2,110	1,800

The capacity of our roads are 7,500 (beach road) and 11,000 respectively.

The under capacity of this system is not only an inconvenience, it is a safety hazard. Since 1976, the Dare beaches north of the

Washington Baum Bridge have experienced 136 injury accidents with 232 total injuries. Nearly all of these injuries occur during the tourist season. One was fatal, 32 incapacitating. The data shows a consistent increase in the rate of accidents:

TABLE 4

ACCIDENT RATES

	No. of Injury Accidents	No. Fatal	No. Incapacitating	Visible Injury
1976	17	0	4	10
1977	27	0	7	11
1978	39	1	9	17
1979	49	0	11	19

A larger number than usual were rear-end accidents (44.4% versus statewide 32.7%).

The outlook for the planning period forecasts that traffic volumes will reach 35,000 to 40,000 vehicles per day on 158 Bypass by 2000.

In order to prepare for likely influx of people into the area, the Department of Transportation prepared a long range thoroughfare plan for Nags Head and Kill Devil Hills in 1973. According to that plan, DOT intended to handle the future growth (a growth much greater than they now anticipate for 2000) by building a six-lane highway with a median. In selecting this alternative, they appeared to consider several alternatives, including relocating the highway, the use of service roads and four and five lane alternatives. A new highway right-of-way was rejected because of the value of land on the beach. Service roads were rejected because of the high likelihood of accidents

from "helter-skelter" cross movement and the need for a greater road right-of-way from 150 feet. Four and five lane systems were felt to be aggravating and inadequate relief. 1979 costs for various road alternatives are estimated as follows:

TABLE 5

CONSTRUCTION COST ESTIMATES FOR TYPICAL THOROUGHFARE CROSS SECTIONS (1979 DOLLARS)

Cross Section	Cost Per Mile
A. Four lanes divided with median--Freeway	$1,850,000
B. Four lanes divided with median--Rural	1,025,000
C. Seven lanes--Urban	1,400,000
D. Five lanes--Urban	1,050,000
E. Six lanes divided with raised median--Urban	1,680,000
F. Four lanes divided with raised median--Urban	1,075,000
G. Four lanes divided with grass median--Urban	1,100,000
H. Four lanes--Urban	740,000
I. Three lanes--Urban	600,000
J. Two lanes with parking on both sides--Urban	600,000
K. Two lanes with parking on one side--Urban	560,000
L. Two lanes--Rural	715,000
Diamond Interchange	1,400,000
Interstate Grade Separation	600,000
Bridges	$50 per sq. ft.
Widening for Adequate Lanes and Shoulders - $ 20,000 per foot per mile + $350,000 per mile	
	12.79 CWL

In evaluating the capacity of a six-lane bypass, DOT estimated that such a road could handle 35,000 to 40,000 vehicles per day if it had a high standard of development. Without a high standard of development, the maximum would be 30,000 vehicles. Signalization

would decrease capacity. A "high standard of development" was described by Mr. Newman of DOT to mean control of crossovers, spacing of intersections and limits on commercial entrance and exits. Currently, many of the public streets are at intervals of 350 to 400 feet. Measures directed at controlling commercial access has met difficulties--the Attorney General's office has written an opinion to a property owner challenging the Town's restrictions of access to the bypass where access to other streets exist. According to the Attorney General, the Town cannot restrict access unless it buys the right of access from the landowner. Additional methods to increase efficiency of the bypass include: (1) requiring deep setbacks and designing parking areas with deep entrances that will allow cars easy exit from the bypass--long driveways to parking area; (2) keeping heavy traffic users from the bypass, particularly banks; (3) limiting curb cuts.

The major problems with the six lane system are the unlikelihood of its being built in the near future and its acceptance by the people as being in keeping with the family beach atmosphere. Although recently plans have been made to four and five lane 158 in Currituck County and to build a bridge over the intercoastal waterway (at a 1980 cost of $50 million), there is reportedly a scarcity of funding for new projects. The low priority given to the Outer Banks in the past has reflected the philosophy that the area is a destination or end point and is not likely to increase industrial development in the state. DOT planners expressed concern that frustration with immediate problems might result in the development of alternatives that are incompatible with long-range plans.

If the long-range objective is to get support for a six-lane bypass, have it prioritized, funded and designed by the state within the next ten years to serve 1990 traffic flows of 25,000 vehicles/day, then another problem arises, "what do we do with the traffic flow until the six-lane road is built." DOT estimates it would take at least three years to build a six-lane road from the Currituck Bridge to NC 12. The costs of this road may exceed $30 million.

The short or mid-range alternatives are limited, they include (1) signalization, (2) one-way pairs, (3) improvements to the Beach Road. By improving the Beach Road to a 24 foot carriageway, we could increase the capacity of this road from 7,000 to 11,000. According to DOT, the costs would include purchasing additional right-of-way. Signalization is not likely to result in better flow or capacity; however, it may reduce accidents. The costs of signals average about $10,000/signal. Converting the Beach Road and bypass into a one-way pair would increase by 50%, so that as many as 33,000 cars could be accommodated. (Current level is 27,000, current capacity 18,000). The costs of a one-way pair system is difficult to estimate, but DOT projects sign costs at $1,000 per intersection. Problems associated with the one-way system include potential for accidents involving pedestrians along the Beach Road and confusion to road users returning to the old town and not reading the signs. The Beach Road is currently a local collector. The road is heavily used by pedestrians going from their cottages to the ocean. A one way system would increase the speed on this road as well as the volume--conflicts between cars and walkers seem imminent. We should note that the Beach Road is experiencing increased traffic as a result of the inefficiency and poor flow on the

bypass.

Finally, immediate action needs to be taken to alleviate dangerous flow patterns near Ocean Acres subdivision in Kill Devil Hills. Strong commercial development has caused a bottleneck in this area.

A traffic flow and time frame should be identified with a short-range alternative. A time frame should be selected on the long-range alternative and decisions made for handling growth in the event the long-range project is not begun in a timely manner.

The Town has set a number of policies dealing with hurricane evacuation, the Bypass and other parts of the transportation system. Basically, the number one priority is to increase the current capacity of the Bypass to prevent loss of life from accidents there and on the Beach Road. The Town has requested that Department of Transportation prioritize the 6 lane road set out in the 1973 Thoroughfare Plan. The Town requests priority be given to increasing bridge capacity and the mainland. In the event neither policy results in actions within a reasonable time, the Town will consider growth control measures.

CHAPTER VI

ANALYSIS OF IMPLICATION OF DIFFERENT HOUSING MIXES

A. MODEL

INTRODUCTION

Citizens and local officials are faced with increasingly difficult decisions about how land should be used and how much and what type of development should be allowed. Often they are being presented proposals by individuals, developers, planners, and others for new types of development that they may not have dealt with before: clustered single family housing, townhouses, walk-up apartments, and high rise apartments.

In addition to assessing traditional aspects of development on the tax base, service levels, and the environment, officials must analyze the needs of a coastal community dealing with a fluctuating seasonal population, resident and non-resident demands for recreational amenities, public access to a limited, sensitive coastal environment, and non-traditional housing structure of primary and second homes and temporary shelter (such as motels, cottages, etc.). Coupled with--or more appropriately, in response to--public pressures and demand for shelter, recreation, and coastal access, is the necessity for setting forth the policies which will accomodate individuals' desires while balancing the interests of the public at

large in the local community, including development pattern, tax rates, and service levels.

General Considerations

Determination of resultant housing patterns involves a variety of considerations by citizen policy makers and the private individual. Generally, these include:

(1) the supply and quality of housing and housing types;

(2) taxation policies affecting housing types;

(3) land development guidelines, including the existing regulatory system and the basis for new ones;

(4) financing of housing purchases;

(5) competition among suppliers of housing and various housing types;

(6) the costs of municipal and governmental services (that is, the public) to the population occupying various housing types;

(7) aesthetic considerations involving environmental, density, style, and architectural concerns.

Policy influences exerted (either potentially or actually) on such considerations involve a variety of interests at local, state, and federal levels, in addition to private sector concerns primarily of a financial nature. Relative to the myriad of considerations, local citizens and officials exert influence on a limited number of factors. However, local concerns rightfully can and must address the community development pattern and housing mix, and its resultant effect on tax base structure and the degree to which services can be effectively provided.

Projection of Effective Demand and Consumer Considerations

Projection of effective demand for housing normally involves analysis of four major determinants of demand: (1) household formation, (2) acquisition of second homes, (3) vacancies, and (4) net removals. Household formation involves the desire of a given population, through age attainment, changes in marital status, and other factors, to secure residential structure. Acquisition of second homes quite obviously reflects the decisions made to secure through purchase or rental a residence in addition to the household's primary dwelling.

The vacancy rate is the ratio of unoccupied units to the total housing stock, and indicates the degree of pressure of demand for housing on the available supply. Areas with more or less stable population provide relatively stable data upon which local citizens and officials can base decisions about future amounts and types of housing. Coastal communities characterized by significant seasonal population shifts can expect that plans for effecting a certain housing mix may result in higher vacancies in off-seasons and shortages during peak periods, other factors being equal. Thus it is important to consider local sentiment weighed against the factors of tax base structure and service level efficiency in order to achieve an optimal housing mix best suited to the community.

Net removals involves simply the removal of housing from total stock due primarily to age or changes in land values.

In addition to the above, other factors also affect demand for housing. These include construction costs, financing terms, interest

rates, personal income, and homeowner costs. All of these factors affect consumer decisions to secure housing, although construction, financing, and interest costs are associated as well with the supply of housing. During times when construction costs are high and financing is difficult to obtain, building construction declines. Pressures to increase the available supply results. Factors of personal income and homeowner costs deal primarily with the consumer aspects of housing. A consumer evaluates to purchase a house by considering his earning power and what the home will cost in terms of mortgage payments, property taxes, and insurance.

Analytical Framework

The foregoing discussion identifies some of the important considerations which need to be assessed before local communities can decide on a course of action to achieve a desired community development pattern and specifically, its housing mix. Thus far, the discussion notes some of the different types of housing; that taxation policies affect housing types and community patterns; that land development guidelines and housing policies will affect future housing types and patterns; that population occupying various housing types will entail certain services and a cost for those services; that there are aesthetic factors involving appearance and environmental concerns; and that coastal communities are subject to additional pressures involving recreation, shore access, seasonal population shifts, and sensitive environmental factors.

Ultimately, local government must decide the extent of its influence over development patterns and housing mix in consideration

of providing sufficient community services to support current and future permanent and seasonal populations, and at what cost. Coupled with this is the concern for obtaining the revenues to pay those costs, and inevitably involves the tax base.

Model Approach

To address these issues, subsequent discussion describes the adaptation of a model to aid in assessing the relative costs of various community types comprised of different housing mixes. The model involves application of costs to each community type to enable comparisons. Data and cost factors have been developed by the Real Estate Research Corporation. Limitations of this discussion preclude the inclusion of the detailed analyses which resulted in the cost indices. Rather, the model presents a conceptual framework for discussion of the issues and aids in comparison of relative costs for different community types. Certain design factors have been incorporated into the model, and include: design for a community of 33,000 population; costs based upon 1973 constant dollars; and a net average of 3.3 persons per dwelling unit.

Assumptions

The model described herein involves the following assumptions:

(1) different housing mixes result in different community patterns or types;

(2) all development produces costs to government, both initial capital costs as well as operating costs for services;

(3) different community patterns will entail relative cost differences for provision of services, all things being equal as far as type and degree of service provision;

(4) costs can be assessed to each community type in such a way as to enable meaningful comparisons among the various community types for provision of such services.

Study Approach

The model is structured according to the following procedure:

(1) identify different housing types;

(2) consider planned versus unplanned ("sprawl") communities;

(3) group different housing types (to obtain sample mixes) and development plan types to produce community prototypes for analysis;

(4) consider various capital and operating costs to produce cost indices, and apply to each capital or service cost center for each prototype;

(5) total costs for each community prototype mix, and indicate government versus private expenditures;

(6) compare aggregate costs for each community prototype.

The section on community cost analysis which follows involves a description of the model and its components. As noted, costs applied to the model are indices and should not be construed in absolute terms. Rather, they have value in enabling comparisons of the possible, relative costs associated with different housing mixes and varying community prototypes.

Summaries are provided for much of the analysis undertaken prior to incorporation in the model. These are presented in the form of tables, and display the application of accepted cost indices developed by other researchers, primarily the Real Estate Research Corporation.

COMMUNITY COST ANALYSIS

Description of Prototypes

Below are identified various housing types and the community

types which are comprised of different groupings--or mix--of housing types. Incorporated into the community types are considerations for both planned and unplanned, or sprawl, development.

Housing Types

(1) Single-family home, traditional lot--includes standard primary residential homes, single cottages, mobile homes, etc. on separate lot; includes seasonal and year-round use;

(2) Single-family home, clustered--includes same types as 1 above, but grouped or clustered; in this sense, mobile home parks and cottage courts would also be included here;

(3) Townhouses, clustered--includes groupings of townhouses which may be individually owned or involve apartment-type complexes in townhouse style which are rented;

(4) Walk-up apartments--apartment buildings generally two or three floors; includes motor inns, motels, and so on;

(5) High-rise apartments--apartments generally six or more floors; includes hotels and motels of similar design, condominiums, and so on.

Such housing types developed homogeneously in an area can be expected to utilize a certain amount of land. Assuming 1,000 units for each type (generally described as a "neighborhood"), Table 1 indicates the amount of land required to sustain such a housing development and its supportive facilities.

Obviously, the same number of units of low density housing will consume a much greater amount of land than will a relatively higher density of housing. Also, the lower the density of the housing type, generally the greater the number of persons occupying each unit will be, although differences in absolute values are slight.

TABLE 1: NEIGHBORHOOD LAND BUDGET

For 1,000 Housing Units		Housing Pattern (Acres)					
		A	B	C	D	E	F [f]
Residential [a]	Units/Acre						
A - Single, Conventional	(3.0)	330	-	-	-	-	66
B - Single, Clustered	(5.0)	-	200	-	-	-	40
C - Townhouse, Clustered	(10.0)	-	-	100	-	-	20
D - Walk-Up Apartments	(15.0)	-	-	-	66	-	13
E - High-Rise Apartments	(30.0)	-	-	-	-	33	6
Sub-Total		330	200	100	66	33	145
Open Space/Recreation [b]		45	90	90	73	32	66
Schools [c]							
Elementary		19	19	17	17	12	17
Secondary		10	10	9	9	3	9
Sub-Total		29	29	26	26	15	26
Other Public Facilities [a]							
Churches		5	5	5	5	5	5
Transportation [d]							
Minor, Collector and Arterial Streets		75	60	45	30	15	45
Vacant (Temporary) [e]		16	16	34	-	-	13
Total		500	400	300	200	100	300

[a] Source: Real Estate Research Corporation.
[b] Derived from ASPO, Standards for Outdoor Recreational Areas (ref. no. 02-001).
[c] Derived from Council of Educational Facility Planners, Guide for Planning Educational Facilities (ref. no. 03-021).
[d] Derived from Urban Land Institute, Innovations Vs. Traditions in Community Development (ref. no. 01-138).
[e] Derived by subtraction from rounded totals. Little significance to these quantities.
[f] 20% each of A-E.

Community Types

When various combinations of housing mix are identified (including provision for planned versus unplanned development) different community types will result. For this model, six different combinations are considered, as described below. All communities are assumed to contain 10,000 dwelling units.

I. Planned Mix Community--Consists of a housing mix of 20 percent of each housing type; thus, there are 2,000 units of each type in this community; neighborhoods are contiguous and large areas of open space are preserved.

II. Combination Mix Community--Housing mix is the same as I, but that 50 percent of the community is constructed as planned unit developments, with contiguous and related land uses, while 50 percent is unplanned sprawl development.

III. Sprawl Mix Community--Housing mix is the same as I and II, but development pattern occurs somewhat randomly in a leapfrog manner, with many small parcels undeveloped with vacant land remaining.

IV. Low Density Planned Community--Housing mix is 25 percent traditional single-family and 75 percent clustered single-family; neighborhoods are contiguous, as in I, but densities are lower, resulting in less undeveloped vacant land; open spaces are preserved and land uses are comprehensively designed and interrelated.

V. Low Density Sprawl Community--Housing mix is 75 percent traditional single-family and 25 percent single-family clustered; small parcels of passed-over land separate neighborhoods, but no land is left vacant undeveloped.

VI. High Density Planned Community--Housing mix is 10 percent single-family clustered, 20 percent townhouse, 30 percent walk-up apartments, and 40 percent high-rise apartments, housing types are mixed in contiguous neighborhoods; much vacant land remains; considerable proportions of open space are planned, and land uses are related.

Based on the above, communities will show cost variations because of the following factors:

(a) differences in housing mix and residential density;

(b) differences in degree of planning, reflected in differences in land budgets;

(c) differences in timing of development; in planned communities, housing constructed each year consists of a mix of types, while in sprawl communities, lower density housing is constructed initially and higher density housing is built later in the development period to fill in passed-over sites; also, in planned communities, other facilities are constructed earlier and are stated in larger increments, being phased according to housing construction; in sprawl communities, other facilities are built later, in smaller increments, and are not necessarily in phase with housing construction.

Land Budgets

As discussed for each of the housing types in Table 1, land budgets for each of the community types are also indicated (Table 2). All six community types contain 6,000 acres. However, there is significant variation among communities in acreage consumed by residential uses and open space. Three categories of vacant land uses are also shown. The degree of community planning is reflected in the acreage amounts allocated to these three categories, with the passed-over land resulting in greater amounts of improved and semi-improved vacant land in the sprawl prototypes. The three vacant categories can be described as follows:

(a) vacant, improved--contains full complement of minor and major streets and roads and all utilities; it is considered fully developed and ready for construction;

(b) vacant, semi-improved--has arterial roads and utility mains and trunk lines running through it; there are no local streets or roads;

(c) vacant--contains only major arterial roads; contains no utility lines whatsoever.

Environment

All costs presented in the analysis are based on "typical" terrain and topographical conditions. The impact of more extreme site

TABLE 2: COMMUNITY LAND BUDGET

For 10,000 Housing Units	Units/Acre	Community Development Pattern (Acres) I Planned Mix	II Combination Mix 50% PUD 50% Sprawl	III Sprawl Mix	IV Low Density Planned	V Low Density Sprawl	VI High Density Planned
DEVELOPED AREA							
1. Residential [a]							
A. Single, Conventional	3.0	660	660	660	833	2,500	-
B. Single, Clustered	5.0	400	400	400	1,500	500	200
C. Townhouse, Clustered	10.0	200	200	200	-	-	200
D. Walk-Up Apartment	15.0	130	130	130	-	-	200
E. High-Rise Apartment	30.0	60	60	60	-	-	133
Subtotal		1,450	1,450	1,450	2,333	3,000	733
2. Open Space/Recreation [b]		660	530	400	660	400	660
3. Schools [c]							
Elementary		170	170	170	170	170	170
Secondary		90	90	90	90	90	90
Subtotal		260	260	260	260	260	260
4. Other Public Facilities [d]		140	140	140	140	140	140
5. Transportation [e]							
Neighborhood R.O.W.		450	450	450	640	710	300
Expressway		80	80	80	80	80	80
TOTAL DEVELOPED AREA		3,040	2,910	2,780	4,113	4,590	2,173
VACANT AREA							
1. Improved, Land [f/g]		130	180	235	175	390	90
Improved, R.O.W.		22	33	43	31	69	19
Subtotal		152	213	278	206	459	109
2. Semi-Improved, Land [f/g]		435	878	1,320	585	903	310
Semi-Improved, R.O.W.		21	44	70	32	48	16
Subtotal		456	922	1,390	617	951	326
3. Unimproved, Land [f/g]		2,235	1,857	1,474	1,010	0	3,220
Unimproved, R.O.W.		117	98	78	54	0	172
Subtotal		2,352	1,955	1,552	1,064	0	3,392
TOTAL VACANT LAND		2,960	3,090	3,220	1,887	1,410	3,827
TOTAL COMMUNITY ACREAGE		6,000	6,000	6,000	6,000	6,000	6,000

Notes:

a/ Source: Real Estate Research Corporation. Extrapolated from neighborhood land budget.

b/ Derived from ASPO, Standards for Outdoor Recreational Areas (ref. no. 02-001).

c/ Derived from Council of Educational Facility Planners, Guide for Planning Educational Facilities.

d/ Assumes 10 acres + 1 acre/100 pupils for elementary and 30 acres + 1 acre/100 pupils for second. Source: Real Estate Research Corporation.

e/ Neighborhood right-of-way acreage extrapolated from neighborhood land budget. Expressway right-of-way width is 220' for a three mile length.

f/ Vacant Areas - Total Acreage	I	II	III	IV	V	VI
Vacant Improved % of developed acreage	5%	7.5%	10%	5%	10%	5%
Vacant Semi-Improved % of developed acreage	15%	32.5%	50%	15%	Balance of 6,000 acres	15%
Vacant Unimproved % of developed acreage	Balance of 6,000 acres	Balance of 6,000 acres	Balance of 6,000 acres	Balance of 6,000 acres	None	Balance of 6,000 acres

g/ Vacant Areas - Right-of-Way						
Percent of Vacant Improved Acreage	15%	15%	15%	15%	15%	15%
Percent of Vacant Semi-Improved Acreage	5%	5%	5%	5%	5%	5%
Percent of Vacant Unimproved Acreage	5%	5%	5%	5%	None	5%

TABLE 3: SUMMARY OF PROTOTYPES

	Neighborhood	Community
Population	Varies according to housing type; three populations ranging from 2,825 to 3,520 used	Population of 33,000; same for all communities
Dwelling Units	1,000 for each neighborhood	10,000 for each community
Acreage	Varies from 100 to 500 acres, depending on assumed densities and housing types	6,000 acres for each community
Development Pattern	Conventional and clustered	Planned, sprawl, and combination
Housing Types	(A) Single-family, conventional (B) Single-family, clustered (C) Townhouses, clustered (D) Walk-up apartments (E) High-rise apartments (F) 20% mix of each type (A)-(E)	(I) 20% mix; planned (II) 20% mix; combination (III) 20% mix; sprawl (IV) 75% single-family conventional; planned (V) 75% single-family conventional, 25% single-family clustered; sprawl (VI) 10% single-family clustered, 20% townhouses, 30% walk-ups, 40% high-rise apartments; planned
Environments	"Undistinguished" site with typical environmental features; not site specific	Same as neighborhood
Commercial	Convenience center, 7,500 square feet of building area, 21,780 square feet of land area.	(a) Strip commercial development, 200,000 square feet of building area, 1,056,000 square feet of land area (b) Center commercial development, 240,000 square feet of building area, 740,000 square feet of land area.

conditions and environmental sensitivity--as might be expected in the coastal environment--can be expected to yield greater costs.

Prior to the discussion of direct cost analysis, Table 3 presents a summary of the community prototypes used in the model.

Direct Cost Analysis--Neighborhood Level

Direct cost analysis at the neighborhood level--that is, housing mix involving 1,000 units--involves analysis of direct capital and operating costs for the following facilities and services: residential dwelling units, open space and recreation, schools, streets and roads, and utilities (water and sewer, storm drainage, gas and electric, and telephone lines). Information on the relative costs of these items is summarized in Tables 6 and 7 at the end of this report. Below is a summary of the total costs for each housing type, the relative percentages of these costs to government and private sectors, and a breakdown of the costs to households in terms of capital costs, services charges, and taxes. Capital costs are presented first, following by operating and maintenance costs.

Housing Type	Total Capital Costs	Cost to Government/Private	Household Cap/Serv/Taxes
Single-family, conventional	$ 48,911	15%/85%	83%/3%/14%
Single-family clustered	$ 46,258	15%/85%	38%/43%/19%
Townhouse, clustered	$ 27,259	20%/80%	38%/43%/19%
Walk-up apartment	$ 21,282	25%/75%	13%/62%/25%
High-rise apartment	$ 20,696	13%/87%	16%/71%/13%
Housing mix, 20% each	$ 33,088	18%/82%	46%/37%/17%

Housing Type	Total Operating Costs	Cost to Government/Private	Households Service/Taxes
Single-family, conventional	$ 1,721	67%/33%	35%/65%
Single-family clustered	$ 1,720	67%/33%	36%/64%
Townhouse, clustered	$ 1,388	72%/28%	33%/67%
Walk-up apartment	$ 1,319	74%/26%	30%/70%
High-rise apartment	$ 548	57%/43%	52%/48%
Housing mix, 20% each	$ 1,410	71%/29%	34%/66%

Clearly, at the neighborhood level, the lower the density of housing type, the greater the capital costs and operating and maintenance costs. Relative proportions of costs to government and private sectors also indicate that, generally, there is a lower proportion of costs to government the higher the density of housing type.

Direct Cost Analysis--Community Level

The community cost analysis includes both capital and operating costs for all facilities and services examined at the neighborhood level. At the co munity level, additional items analyzed include: police and fire services, government regulation, solid waste collectionand disposal, postal service, health care. libraries, and churches.

No economies or diseconomies of scale are assumed in the capital or operating costs estimated. However, facilities which would be inappropriate at the scale of 33,000 population (for example, an electric power plant) are not included in cost estimates. Standards and unit costs reflect national norms or averages taken from a number

of studies. All costs are expressed in 1973 dollars, and financing costs for capital expenditures are not included. Present technologies, construction practices, and service standards are assumed.

Tables 4 and 5 summarize information on the relative costs of the items addressed (as noted above) for each of six community development prototypes. Below is a summary of the total costs for each community type, the relative costs to government and private sectors, and a breakdown of the costs to households in terms of capital costs, service charges, and taxes. Costs are indicated only for the tenth year, assuming a ten year period is required to facilitate the development of 10,000 units with services capable of supporting an ultimate population of 33,000. Capital costs are presented first, followed by operating and maintenance costs.

Community Prototype	Total Capital Costs	Cost to Government/Private	Households Cap/Serv/Taxes
Planned mix	$ 357,533	16%/84%	47%/38%/15%
Combination mix com.	$ 368,162	21%/79%	43%/37%/20%
Sprawl mix community	$ 372,833	24%/76%	41%/37%/22%
Low density planned	$ 489,806	12%/88%	81%/7%/12%
Low density sprawl	$ 514,559	19%/81%	75%/6%/19%
High density planned	$ 287,062	18%/82%	26%/56%/18%

TABLE 4

COMMUNITY COST ANALYSIS
CAPITAL COSTS

	Community Development Pattern					
	Planned Mix	Combination 50% PUD 50% Sprawl	Sprawl Mix	Low Density Planned	Low Density Sprawl	High Density Planned
COST CATEGORY	Cost	Cost	Cost	Cost	Cost	Cost
Open Space	$ 2,968	$ 2,826	$ 2,684	$ 2,968	$ 2,684	$ 2,968
Schools	$ 45,302	$ 45,382	$ 45,307	$ 45,382	$ 45,382	$ 45,382
Public Facilities	$ 16,216	$ 16,441	$ 16,453	$ 16,259	$ 16,615	$ 16,304
Transportation	$ 27,077	$ 29,768	$ 32,353	$ 33,770	$ 37,965	$ 22,862
Utilities	$ 33,227	$ 36,042	$ 38,684	$ 47,444	$ 61,974	$ 22,432
Subtotal	$124,870	$130,459	$135,556	$145,823	$164,620	$109,948
Residential	$214,172	$214,172	$214,172	$318,291	$320,400	$160,300
(Exclusive of Land)	$339,042	$344,631	$349,728	$464,114	$485,020	$270,248
Land	$ 18,491	$ 23,531	$ 23,105	$ 25,692	$ 29,539	$ 16,814
Total Capital Cost	$357,533	$368,162	$372,833	$489,806	$514,559	$287,062

Source: Real Estate Research Corporation

TABLE 5

COMMUNITY COST ANALYSIS
OPERATING AND MAINTENANCE COSTS

	Community Development Pattern					
	Planned Mix	Combination 50% PUD 50% Sprawl	Sprawl Mix	Low Density Planned	Low Density Sprawl	High Density Planned
COST CATEGORY	Cost	Cost	Cost	Cost	Cost	Cost
Open Space	$ 380	$ 320	$ 260	$ 380	$ 260	$ 380
Schools	$ 9,643	$ 9,652	$ 9,737	$ 9,643	$ 9,737	$ 9,643
Public Services	$ 5,103	$ 5,296	$ 5,405	$ 5,165	$ 5,575	$ 5,164
Transportation	$ 260	$ 260	$ 261	$ 354	$ 396	$ 209
Utilities	$ 3,987	$ 3,988	$ 3,989	$ 5,130	$ 5,141	$ 3,335
Total Ten Year Operating Costs	$ 19,373	$ 19,516	$ 19,652	$ 20,672	$ 21,109	$ 18,731
Cumulative Costs	$ 125,265	$ 117,299	$109,489	$133,186	$116,827	$120,919

Source: Real Estate Research Corporation

TABLE 6

NEIGHBORHOOD COST ANALYSIS
CAPITAL COSTS

	Housing Pattern					
	Single-Family Conventional	Single-Family Clustered	Townhouse Clustered	Walk-up Apartment	High-Rise Apartment	Housing Mix
COST CATEGORY	Cost	Cost	Cost	Cost	Cost	Cost
Open Space	$ 220	$ 274	$ 274	$ 252	$ 203	$ 245
Schools	$ 5,354	$ 5,354	$ 4,538	$ 4,538	$ 1,646	$ 4,538
Transportation	$ 3,080	2,661	$ 2,111	$ 1,464	$ 801	$ 2,064
Utilities	$ 5,483	$ 3,649	$ 2,369	$ 1,579	$ 958	$ 2,782
Subtotal	$14,137	$11,938	$ 9,292	$ 7,833	$ 3,628	$ 9,629
Residential	$32,146	$31,724	$16,263	$11,766	$15,188	$21,417
(Exclusive of Land)	$46,283	$43,662	$25,555	$19,599	$18,796	$31,046
Land	$ 2,628	$ 2,596	$ 1,704	$ 1,683	$ 1,900	$ 2,042
Total Capital Cost	$48,911	$46,258	$27,259	$21,282	$20,696	$33,088

Source: Real Estate Research Corporation

TABLE 7

NEIGHBORHOOD COST ANALYSIS
OPERATING AND MAINTENANCE COSTS

	Housing Pattern					
	Single-Family Conventional	Single-Family Clustered	Townhouse Clustered	Walk-Up Apartment	High-Rise Apartment	Housing Mix
COST CATEGORY	Cost	Cost	Cost	Cost	Cost	Cost
Open Space	$ 30	$ 41	$ 41	$ 41	$ 30	$ 37
Schools	$1,168	$1,168	$ 989	$ 989	$ 270	$ 989
Transportation	$ 37	$ 28	$ 18	$ 11	$ 6	$ 19
Utilities	$ 484	$ 483	$ 340	$ 278	$ 243	$ 365
Total Operating Cost	$1,721	$1,720	$1,388	$1,319	$ 548	$1,410

Source: Real Estate Research Corporation

Environmental Concerns

With the exception of land consumption, the model does not consider (as presented here) any environmental consequences of development beyond "normal" site situations. Such factors need to be explicitly identified and analyzed in terms of site specific information. However, all things being equal (and they usually are not when concerned with the environment), the more land utilized in development, the greater the possibility of environmental disruption with associated greater costs.

APPLICATION OF HOUSING MIX TO KILL DEVIL HILLS

Although the model we have selected and modified above was chosen because of its adaptability to the Dare County beaches, there were obvious differences in revenue/costs which make this section dealing with application necessary. This section attempts to draw some preliminary conclusions about revenue and costs under (3) different scenarios, one the trend of the 1970s, the others housing mixes under moderate and high densities. All costs are in 1980 dollars. Information concerning estimated tax values for different housing types was based on values supplied by the Dare County tax office, with adjustments made after spot checking a number of individual properties in the Town.

CURRENT KILL DEVIL HILLS POPULATION
(Peak Seasonal/Monthly)

Housing Type	Pop. 1980	Units	Pop. 1990	Units
Mobile Homes	189	71	467	180
Single Family	8913	2117	13231	3342
Townhouse	0	0	778	199
Cottage Court	784	222	311	97
Motels	3547	1010	778	243

TABLE 8

REVENUE FROM UNITS ADDED 1980-1990
UNDER SENCARIO OF CONTINUATION OF RECEN TRENDS IN HOUSING MIX

Housing Type	% Population in Stock	# of Units	Valuation Per Unit	Total Valuation	Acres Used
Mobile Homes	3%	180	$10,000	$ 1,800,000	45
Single Family	85%	3342	18,000	60,156,000	836
Townhouse	5%	199	19,000	3,781,000	19
Cottage Court	2%	97	8,000	776,000	10
Motel	5%	243	8,500	2,065,500	5
Total				$68,578,000	915

TABLE 9

REVENUE FROM UNITS ADDED 1980-1990
SCENARIO WITH A MORE MODERATE DENSITY IN HOUSING MIX

Housing Type	% of Total Stock	# of Units	Valuation Per Unit	Total Valuation	Acres Used
Mobile Homes	3%	180	$10,000	$ 1,800,000	45
Single Family	50%	1729	18,000	31,122,000	432
Townhouse	25%	865	19,000	16,435,000	87
Cottage Court	5%	222	8,000	1,776,000	22
Motel	17%	756	8,500	6,426,000	15
Total				$57,559,000	601

TABLE 10

REVENUE FROM UNITS ADDED 1980-1990
UNDER SCENARIO WITH A HIGH DENSITY HOUSING MIX

Housing Type	% Population in Stock	# of Units	Valuation Per Unit	Total Valuation	Acres Used
Mobile Homes	0%	0	$10,000	$ 0	0
Single Family	35%	1210	18,000	21,780,000	303
Townhouse	35%	1210	19,000	22,990,000	121
Motel	30%	1334	8,500	11,339,000	27
Total				$56,109,000	451

TABLE 11

COMPARISON OF REVENUE PRODUCTION
UNDER DIFFERING HOUSING MIXES

	1970s Trend	Moderate	High Density
Total Valuation	$68,578,000	$57,559,000	$56,109,000
Less: Vacant Lots	21,960,000	14,244,000	8,424,000
Net Valuation	46,618,000	43,315,000	47,685,000
Revenue Produced	247,075	229,569	252,730
Acres Developed	915	601	451
Revenue/Acre	$270.02	$381.97	$560.37

We notice from the above that the revenue produced during the planning period from low density development should be higher than under either moderate or high density development. However, since the higher densities require less land for development, land that is undeveloped (vacant land) can still be developed in the future. Since additional revenue can still be generated from this land, the more proper test is one of revenue produced per acre. Higher densities of development will result in greater profits per acre. One of the benefits

of higher densities is the potential for retaining open space. In the event that the town were to pursue a policy of taking some of its profits from higher density development and acquiring open space, the results would show less revenue per acre but the preservation of open space. Where the land were utilized for recreational purposes, the Town might expect indirect tax benefits from commercial investment and sales taxes returned by the State.

Unlike the revenue side of the coin, the cost side is not as easy to portray. In fact, a more detailed analysis addressing future costs of development is justified. However, we would expect the following:

TABLE 12

COST IMPLICATIONS FROM HIGHER DENSITIES

Facility	Effect on Costs	Reason
Sewer	Substantial decrease	Fewer miles of mains to serve future population
Water	Substantial decrease	Fewer miles of pipe
Roads	Substantial decrease	Fewer miles of road to construct and maintain
Solid Waste	Decrease	Fewer stops and pickups
Schools	(county expense)	
Health	(county expense)	
Recreation	Decrease	Recreation planned in high density development

In addition to quantifiable costs, we should also note that the costs to the environment are considerbly less under planned high and moderate density scenarios. Higher density styles of development offer the Town more potential to assist in site selection and probably should result in building on suitable soils, away from hazard and sensitive areas. It should result in less disturbance of vegetated cover.

CHAPTER VI

RECREATION: DEMANDS, OPPORTUNITIES, NEEDS

The population of Kill Devil Hills rises and swells every summer with the tourist season. Tourism, which is predominantly beach use oriented, is the major industry of the Kill Devil Hills as well as the corporate and non-corporate areas of its neighbors. Therefore, it is important that the land use plan contain some analysis of recreational opportunities.

Existing Demand

From the attitudinal survey we discovered that the majority of the persons connected to the Town (residents and non-resident property owners) felt that the Town needed additional beach access points and parking for beach access, and perhaps, some walking, jogging and bike paths. Public marinas and boat launching facilities and picnic facilities also received some attention. This desire list should be tempered by noting that only beach access received enough attention to merit consideration for high priority funding and even this did not receive the support of the majority of the respondents.

Future Demand

The future demand for recreation is felt to be largely a function of the population. Because of the dramatic increase expected in population the demands for access points should be several times more

acute. This geometric increase in demand could result because most of the new population will locate in sections that are removed from the beach. The plans being made to try a demonstration public transit system on the beach could dramatically reduce the demand for parking areas incidental to beach access, but not the amount of beach use or access.

In terms of total demands, the Town's growth should be affected by tight money which might reduce the amount of housing starts and construction of commercial (motel) units. None of the Dare County beaches appear to have been significantly affected by either the costs of fuel or its availability in the past (see data on population in 1973 and early summer 1979). From a regional perspective the North Carolina Statewide Comprehensive Recreation Plan forecasts strong increases in demand for nearly all types of recreational opportunities, but especially for water related ones. Regional recreational opportunities which are highly mobile (Cape Hatteras) might be affected by availability of fuel.

Existing Facilities

Beach Access: Beach access is provided by the private and public sectors. Perhaps the most significant opportunities are provided by the significant number of motels located on the ocean or with ocean access. Motels offer the entire public an opportunity for an encounter at the ocean. In addition to motels, the public's right to enjoy the beach is insured through public access points. Most of the existing and possible access points are road rights of way that are platted to the ocean but which have never been built. Since these areas have been

dedicated to the Town for public use they are suitable for public access. There is one difficulty with rights-of-way dedication, namely the Town must accept the dedication by maintaining the right-of-way (typically by paving the road). Beach access plans relate that the Town has 40 access points, of which 6 have been accepted and are maintained. Several of these access points provide for public parking, in all 60 cars can be accommodated. In terms of standards for future needs, Ron Johnson, author of Ocean and Estuarine Recreation Access, noted that on the barrier islands in Carteret County that 20% of the poeple use the ocean beaches at one time. Assuming that in 1990 the population will be 30,000 in Kill Devil Hills, that 50% will live within walking distance to the ocean and that no public transit exists. Then, 15,000 people would need to frequent the ocean beaches by way of the auto. The Town will need parking to accommodate 3000 people at one time, or between 750 and 1500 cars. Pat McDowell, a local engineer, estimates that 15 cars can be parked on a typical 50 by 150 foot lot on the ocean. Large lots (over 100 feet) in width can utilize economies of scale from better design, typically one car requires 200 square feet. To accommodate the 1990 population approximately 2 to 4 acres for parking will be needed. (This allows for full use of 50 foot lots on ocean.) If a one-way loop system for transportation is not built, it may be feasible for the Town to purchase land west of the beach road for parking. This land sells for a fourth of the price of ocean front lots. Additional possibilities might be be persuade property owners who have been denied permits to build on the oceanfront to dedicate the land to the town (this would enable them to have a pretty hefty write-off for taxes.) Parking lots are a

permissable use in ocean hazard areas under CAMA. Oceanfront park standards call for 2 acres/100 people.

Estuarine Access: Estuarine access is provided by both the private and public sectors. This access is substantially less than exists on the ocean beach because no motels exist on the sound in Kill Devil Hills. The Wildlife Commission maintains one public access for boat access and mooring. In addition, private moorings are available in subdivisions connecting to Colington Harbor and at the Soundside Restaurant. Ron Johnson estimates that 1 acre of soundside park should be provided for every 1000 people. Since the future population will probably locate closer to the sound, there will be a great demand for soundside access in the Town.

Walking and Jogging: Walking and jogging occur regularly on the streets and the ocean beaches. There is an opportunity to provide paths along the highways at minimal expense. If the paths are to be used for bicycles, cost estimates run at $25,000 per mile. The Town has lost the opportunity to secure walking paths in most of the Nags Head Woods but there are still some unplatted areas that could accommodate this use.

Unique and Unusual: The Town of Kill Devil Hills boasts Wright Memorial Park. This park attracts visitors each year. In light of the large land holdings of the U.S. Park Service, it would seem appropriate that some of this land could be made available for picnicking and outdoor recreation. The Town should consider approaching the Park Service with a joint undertaking.

Fishing: The Town has one privately owned fishing pier. Surf fishing is also very popular. The Sound adjacent to Kill Devil Hills

is legally closed to shellfishing. The recent subdivisions in the Woods will remove this area from use for duckhunting.

Conventional Facilities: Kill Devil Hills has private tennis and handball facilities. There does not appear to be any real demand for other recreational uses.

In conclusion, the Town currently has undertaken policies leading to expanded access to the ocean beaches. Future demands will make additional demands that do not appear to have been considered. Sound access is needed to accommodate present need.

Bibliography

North Carolina Statewide Comprehensive Outdoor Recreation Plan, 1978. Department of Natural Resources and Community Development, Division of Parks and Recreation.

Ocean and Estuarine Recreation Access. Prepared for Cartaret County by Recreation and Park Consultants, Inc., 1979.

Comment

The Town had decided to take an experimental step to see if it can avoid purchasing oceanfront or beach road property for access or purchase, namely the Town is cooperating in a mass transit system. This system will hopefully provide access for existing subdivisions. If the the system succeeds and can be expanded, existing access points will be sufficient, if maintained. A policy on maintaining these points has been adopted.

Requests to share facilities are being made to Park Service representatives.

CHAPTER VIII

CULTURAL RESOURCES

Kill Devil Hills is renowned for being the Town from which the Wright Brothers made their first flight. It is therefore fitting that a memorial site is situated on the grounds where the flight and the preparation for it occurred. The Park Service operates and manages the Wright Brothers Memorial. The Memorial is on the National Register. Future building on the site will require review by federal and state agencies.

Also, the State has included on its study list for future nomination to the National Register the Kill Devil Hills Life Saving Station. Kill Devil Hills has a significant number of old beach cottages which might desire future study for possible nomination to the National Register.

The implication of a structure being placed on the National Register is that it will qualify for special tax breaks under the Tax Reform Act. These features include accelerated depreciation for improvements for property and for commercial purposes.

Historic and architecturally significant buildings can be adversely affected, both directly and indirectly, by a large number of activities. All construction projects have the potential to require the demolition of important, though simple, structures on a site as well as to alter the use of nearby land thereby causing secondary impacts to a building of historic or architectural importance. In addition, new construction is frequently unnecessary as existing buildings can be renovated for adaptive reuses; often these are uses quite different from the use intended at the time of a building's construction. Rehabilitation is more energy conservative and job intensive than new construction, and recycles elements of the coastal historic character into everyday use.

Archaeological resources are fragile and nonrenewable. Such resources include both historic and prehistoric sites on land. These sites are found in urban and rural areas, as well as along the shores. Archaeological sites contain vast amounts of information about our past; information that, at times, can be found nowhere else.

Due to the fragile nature of these resources, many different types of activities damage or destroy archaeological sites. Most activities that involve ground disturbance, such as construction, grading, excavation, and even agricultural and timbering activities damage or destroy these resources. Other types of activities that do not necessarily involve ground disturbance can also affect archaeological sites. These activities include recreational use, flooding, erosion and soil compaction.

Underwater cultural resources often hold a wealth of information due to excellent artifact preservation and their normally undisturbed

condition. Exploration and study of historic waterfronts, abandoned or wrecked vessels, etc., can shed light on many aspects of maritime history associated whith this planning area which might otherwise be unknown. Therefore, the understanding and proper management of these irreplaceable cultural resources is extremely important to prevent their loss during future development.

Disturbance of submerged bottom lands, particularly during new dredging, jetty construction, and beach replenishment, should consider possible effects to underwater cultural resources during the earliest stages of planning. Areas where known shipwrecks exist, many of which are plotted on USGS maps or Geodetic Survey charts, and areas known historically to have seen extensive maritime activities (such as inlets, shipping lanes, and hazard areas) should be avoided if possible. If not, documentary investigation and, where warranted, underwater archaeological survey should be initiated to determine the existence of cultural resources and to assess their significance.

A list of federal and state laws and regulations protecting cultural resources is attached.

FEDERAL, STATE AND LOCAL CONTROLS

FEDERAL

____ National Historic Preservation Act of 1966

____ The Archeological and Historic Preservation Act of 1974, Public Law 93-291

____ Executive Order 11593, Protection and Enhancement of the Cultural Environment, 16 U.S.C. 470 (Suppl. 1, 1971)

____ National Environmental Policy Act, Public Law 91-190, 42 U.S.C. 4321 Et. Seq. (1970)

____ Community Development Act of 1974, Public Law 93-383: Environmental Review Procedures for the Community Development Block Grant Program (40 CFR Part 58)

____ Procedures for the Protection of Historic and Cultural Properties (36 CFR Part 800)

____ Comprehensive Planning Assistance Program (701) as Amended by Public Law 93-393

____ The Department of Transportation Act of 1966, Public Law 89-670

____ Identification and Administration of Cultural Resources: Procedures of Individual Federal Agencies

STATE

____ G.S. 121-12(a) Protection of Properties in the National Register

____ State Environmental Policy Act, Article 1 of Chapter 113A of the General Statutes

____ Executive Order XVI

____ Indian Antiquities, G.S. 71.1-4

____ Salvage of Abandoned Shipwrecks and Other Underwater Archeological Sites: G.S. 121-22, 23; 143B-62(1) g, (3)

____ Archeological Salvage in Highway Construction, G.S. 136-42.1

____ Provisions for Cultural Resources in Dredging and Filling Operations, G.S. 113-229

CHAPTER VIII

CARRYING CAPACITY

In order to develop a set of policies to guide future growth, a municipality must seek to balance the demand for development with the land capable of being developed. The land capable of being developed is the carrying capacity. The carrying capacity of the land reflects many private and governmental policies, decisions and attitudes. Thus, if a municipality has a policy of evacuating persons from its limits during a major storm, the number of persons who can be accommodated during a reasonable period prior to the storm on its highways and bridges would represent its carrying capacity. Similarly the carrying capacity of the water system reflects its service ability without incurring a diminution in water pressure or water quality. To a certain degree this standard (as are many others) is personal, to some degree it represents non-local standards as in State standards for quality of municipal water supply, and to some degree it represents local municipal standards. Where public sewers exist the capacity of the system is the capacity of the waste treatment facility (if it is exceeded the State will probably prohibit further connections), where public sewers do not exist the capacity of the land to handle on-lot sewage disposal system will represent this constraint. The ability of the land to handle on-lot sewage disposal reflects government policies toward pollution of the sound and risks of health hazards.

The carrying capacity of a municipality is the limit of its most constraining system (be that hurricane evacuation, transportation, water or sewer facilities, on-lot sewage disposal, health care, etc.). As we suggested above, the carrying capacity must be matched with the land demanded for development and the people desirous of being served at a particular date. Where the amount of land suitable for development is less than that demanded, the minicipality is considered constrained. A municipality must seek to become unconstrained. This can be accomplished by altering the demand side or the capacity side of the equation. To alter the demand side, one can alter the attractiveness of the land consumed in development. This would involve slowing the growth rate or creating a higher density housing mix. To alter the capacity side, the minicipality can create additional facilities or alter a policy which restricts development.

Calculating Demand

To calculate demand we need to know the number of persons in the Town in 1980, the growth likely to occur to 1990, the land consumed by the 1980 population and the land likely to be consumed by the 1990 population. In addition to these residential uses (motel, cottage court, townhouse, single family houses), we need to know the amount of land used in 1980 for commercial, institutional and recreational uses. Where a deficiency exists in any of these uses at the present time, we must consider adjustments to this use which will make it more in accord with our experience from dealing with similarly situated municipalities.

To project the amount of land that would be needed to meet the 1990 population, we multiplied the additional population anticipated to move into the area by 1990 times the standard for land needed in that classification. Several non-residential classifications were presumed to adjust to more typical ranges within the next ten years. The equation for determining land use requirements is as follows:

$$L_{90} = L_{80} + P_{80-90} [K_h + K_r + K_c + K_i + K_t]$$

(Note: We modified this expression to handle the expression of land requirement for transportation.)

Where:

L_{90} = Land required for urban uses in 1990

L_{80} = Land required for urban uses in 1980; therefore, L_{80-90} is land required for urban uses from additions to the population during these years

P_{80-90} = Population added to municipality between 1980 and 1990

K_h = Standard land requirement for residnetial use

K_r = Standard land requirement for recreational use

K_c = Standard land requirement for commercial use

K_i = Standard land requirement for insitutional use

K_t = Standard land requirement for transportational use

Calculating the Constraints

In order to express the constraints in a way that would relate to the use of the land, we either calculated the capacity directly or mapped the land constrained and then added up the acreage to compute the capacity. The following are some of the constraints we considered:

Sewer: We made no provision for a sewer system being built within the ten-year period. If one were built, we calculate that the load would be far in excess of capacity at the time it is completed. See

capacity from paper on Environmental Considerations.

Hurricane: We feel that the Town is currently at or beyond its share of the population that would need to use the bridges to leave the barrier island during a 48-hour period preceding a major storm or hurricane. (See Transportation Paper.)

Water System: We have presumed that additions will be made to the water system to allow it to serve any level of population anticipated within the planning period.

Wetlands: We constrained only those wetlands that were regulated as areas of environmental concern by the State. Other wetland areas will be measured in land unsuitable for septic systems. Wetlands serve many functions: they act as recharge groundwater reservoirs, as a waste treatment plant by settling out sediment and nutrients, as plant and wildlife habitats. Wetlands are suitable for non-intensive recreational and educational purposes (e.g., hiking and nature trials, fishing, hunting).

Flood Hazard Areas: Although in many inland communities flood hazard areas are considered a contraint to development, they are not considered one in Kill Devil Hills. The reason for the lifting of the contraint is that if one builds above the flood level by the use of piling sunk into bedrock and utilizes construction methods designed to prevent flood and related damages, then the constraint should not apply. The Town of Kill Devil Hills complies with the State Building Code designed to prevent damage from wind and flooding.

State and Federally Owned Land: Areas owned by governmental agencies for recreational and other purposes are not considered within the scope of developable lands. We removed Wright Memorial Lands from

the total land available from development.

Soils Unsuitable for Development: Areas which do not permit proper functioning of septic system filter beds because of wetness, flooding, steepness, overly slow or rapid permeability are not suitable for development without municipal sewage treatment. By not being suitable we mean that a municipality will probably have to accept certain consequences for using such land for residential use, namely pollution of the water in the Sound and possibly the groundwater. The County Health Department can be expected to prevent operation of septic systems that malfunction and cause a danger to human health.

Dunes: Development on steep slopes is a natural constraint. Dunes present a special problem for the developer and the municipality. Left unvegetated the dunes offer poor support for roads and structures. To allow the dunes to be leveled may result in substantial protest from townspeople who consider the dunes part of their heritage. The soundside dunes are a unique geological formation and judged by the people to be of substantial environmental importance (see questionnaire results). The ocean dunes (primary where one exists and and all dunes within 60 feet where one does not exist) are regarded as a complete constraint which cannot be lifted by the Town since they are an area of environmental concern. However, almost all property owners who own oceanfront lots should be able to build on their land in historically acceptable manner despite the regulations. Thus, only soundside dunes may be considered a constraint. Primary dunes are a constraint but we do not anticipate any land being lost to development because of the application.

Woodlands: Forests improve the macro-climate and pose a major balancing effect upon the water regimen--diminishing erosion, sedimentation, flood and drought. The scenic role of woodlands is apparent, as is there usefulness as a habitat for plant and animal life. Woodlands offer substantial potential for recreational use--picnicking, bicycle and walking paths, etc.

Zoning: Zoning is not a constraint to development in Kill Devil Hills in that the historical lot size used for development is larger than that mandated in the most restrictive zone in the zoning ordinance.

Note: In using the maps to measure the land constrained under several constraints, it is important to avoid double accounting. Once a land area is removed from development from the application of one constraint, it cannot be counted as removed from the application of a second constraint. This is a particularly difficult concept to grasp when working with concepts such as zoning.

TABLE 1

STANDARDS FOR LAND USE PROJECTIONS

Land Use		Land Consumed (acres/person)
Residential	Single family	.058
	Townhouse	.038
	Cottage court	.020
	Motel	.019
Commercial		.0022
Institutional		.0026
Recreational		.0032

In developing the above standards, residential uses were descriptive of the actual situation. In handling other uses, we consulted

national standards and uses our experience from similarly situated communities. In handling recreational use, we used standards developed for ocean beach communities by Ron Johnson, namely .00016 for beach access, .002 for parks on ocean and .001 for park on sound.

TABLE 2

EXISTING LAND USE (1980)

Land Use			Land Consumed (acres)	
Residential	Single family	530		
	Townhouse	0	613	
	Cottage court	16		
	Motel	67		
Commercial			72	
Institutional			2	
Recreational			1	
Transportational			70	
Total Acreage				758

TABLE 3

LAND REQUIRED IN 1990 (Low Density)

Land Use			Land Consumed*	
Residential	Single family	1278.3		
	Townhouse	27.6	1428.4	
	Cottage court	26.1		
	Motel	96.4		
Commercial			63.8	
Institutional			75.4	
Recreational			92.8	
Transportational			166.0	
Total Acreage				1826.4
Additional Acreage Needed 1980-1990				1068.4

*Land that should be consumed.

TABLE 5

CARRYING CAPACITY WITH PRESENT CONSTRAINTS

Land Use Constraint		Area Constrained (acres)*
Developed land		
Roads		
Park Service		
Wetlands		
Total constrained		2040
Acres available for development		2110
Scenario #1: Constrain soils unsuitable for on-lot sewage disposal and within 1000 feet of sound.		
Unsuitable soils	150	
Total constrained		2190
Acres available for development		1960
Scenario #2: Constrain all unsuitable soils, also all soundside dunes.		
Total constrained		3700
Acres available for development		450
Scenario #3: Constraint of on-lot sewage lifted and public sewer built.		
Total persons that can be served		[17,500 persons]

*Total Area of Town: 4150 acres.

Comment

Kill Devil Hills can accommodate its 1990 growth under an extension of its present constraint system. Those constraints include currently developed land, state roads, Park lands and wetlands. Accordingly in 1990, the Town will be 90% developed. Furthermore, the Town adoption of an interim policy on not developing on soils unsuitable for septic systems without fill may slow the growth rate somewhat. When public sewers are available, this constraint could be removed leaving over 2000 acres available for development. The Town can anticipate strong pressures for redevelopment during the early 1990s, or if the soils policy is abandoned in the late 1980s.

Several technical aspects limit the capacity of the Town at this time: one is the water system which is at capacity (see Environmental Considerations); another is the bridge and transportation system which is at or near capacity (see Transportation System); another will or may be the sewer system, when and if it is built.

SECTION THREE

Chapter I Current Plans and Implementation

Chapter II Previous Policies

Chapter III Land Use Compatibility

Chapter IV Land Classification

CHAPTER I

CURRENT PLANS, POLICIES AND REGULATIONS

Kill Devil Hills has adopted the following plans:

Dare County Land Use Plan (1976)

Comprehensive land use plan propared by Dare County for all municipalities within the county except Nags Head. See pp. 147-148. The plan addresses problems from countywide perspective in a traditional manner. Several chapters should be consulted in connection with information on current plans, namely population characteristics (especially of permanent population) and economic characteristics. One 1976 plan was prepared by NCDNRCD.

Kill Devil Hills Public Improvements Program (1979)

Set forth a public improvements program for the ten-year period beginning in 1979. Improvements cover police, fire, administration, sanitation, streets and water departments. Scheduling is provided year by year. No costs are estimated. Prepared by Albermarle Regional Commission.

Kill Devil Hills Beach Access Plan (1979)

Inventory and analysis of beach access points including purchases and improvements deemed necessary to oceanfront and sound to provide better access for public. Prepared by Albermarle Regional Commission.

Nags Head--Kill Devil Hills Thoroughfare Plan (1972)

The thoroughfare plan outlines future plans to accommodate growth on the road system, particularly plans for a six-lane highway and design of major intersections. Prepared by NCDOT.

Kill Devil Hills has adopted the following implementation devices:

Zoning Ordinance (1975)

Traditional zoning ordinance addressing densities, heights, uses, etc. Also includes flood hazard district and provisions for building along oceanfront in eroding areas.

Subdivision Ordinance (1975)

Established standards for subdividing land. Requires developers to install streets and dedicate easements for utilities.

N.C. Building Code

Requires buildings meet State building standards, including flood proofing.

CHAPTER II

EXISTING POLICIES FROM 1976 PLAN

In the 1976 county plan the Town of Kill Devil Hills through its Planning Board submitted a list of policies concerning planning. These policies (called "objectives") were as follows:

1. To promote tourism as the major industry of the community.

2. To encourage the extension of the tourist season into the Spring and Fall months.

3. To encourage permanent residential development which will attract more year-round visitors.

4. To promote wise development which will protect the unique fragile environment of the Town.

5. To insure planned, orderly development for the most efficient utilization of suitable land within the Town.

6. To provide for separation of incompatible uses such as commercial and residential areas by the use of natural barriers and open spaces.

7. To identify and consolidate centralized and compact business areas.

8. To encourage future residential development which will provide more useable open space and more cost-effective utilization of municipal services through clustered growth.

9. To encourage the location of a suitable site for non-polluting service industries to support the tourist and development sector.

10. To encourage the development of a community-wide recreation program which will provide community parks, bike trails, oceanfront areas and other appropriate facilities.

11. To encourage and reinforce the family beach atmosphere that makes Kill Devil Hills a pleasant place to live and to visit.

12. To work for closer cooperation with Dare County and adjacent municipalities.

13. To improve municipal services and government organization for better responsiveness to public needs.

CHAPTER III

LAND USE COMPATIBILITY

Significant Land Use Compatibility Problems

Compatibility in land use is often a highly subjective matter. Traditionally, planners have observed that where residential uses are segregated from commercial and commercial from industrial and vice versa that fewer complaints about uses are encountered. In general, commercial areas need to be located close to the residential and with good access to a major road. In the beach community a preference lies for segregating the permanent residents from the seasonal visitors, for aggregating high density uses, such as motels, and for segregating uses not in harmony with tourist uses to non-developed (at least, residentially) parts of the Town.

Kill Devil Hills has some compatibility problems; however, the residents and the Town do not feel they are significant. See responses to questionnaire showing near 90% satisfaction with commercial area uses and zoning. The major commercial area in the Town lies adjacent to the Bypass near the Town limits of Nags Head. (See existing land use map.) This area is currently less than 50% developed under the zoning ordinance. As the area fills in it is taking on more the character of a commercial district and less that of strip development. The area includes professional offices, real estate offices, banks, department stores, service stations, auto repair stations, restuarants,

quick shopping stores, fast food restuarants, ABC store, novelty shops, athletic facilities, and much more. It is the major commercial area on the beach. This section is complemented by a similarly developed section on the Beach Road consisting of real estate offices, quick food restuarants, motels with restaurants, indoor athletic facilities and the largest shopping plaza on the beach (Sea Holly Square). This area is in a flood hazard area and the uses in this section seem preferable to residential uses. Some already existing residential development between the roads will slow the complete commercialization of this area (although it seems desirable and inevitable).

The commercial section in the north end of Town has not developed as much and is in fact a residential section. Although the area was subdivided for extremely small lots, it has not developed as such.

Kill Devil Hills has fewer motel units than does Nags Head. Almost all motel units are located along the Beach Road. The motels are broken by sections of residential structures, at least one section in the north has historic homes representing quality development during the first part of the century. These homes are protected by zoning regulations from commercial encroachment.

Permanent residents of Kill Devil Hills have tended to live along the oceanfront and in subdivisions west of the Bypass. Thus, conflicts between these landowners and seasonal visitors have been minimized.

Major Problems From Unplanned Development

If Kill Devil Hills were an unplanned community, it would have significant compatibility problems. Such problems might include conflicts between the commercial and residential sectors and among

commercial uses themselves. Even with planning and zoning, the Town still has had some conflicts, although not serious. These include conflicts between noisy commercial uses and small shops also being used as residences. Traffic from commercial use often causes uneven traffic flows and bottlenecks, however this is seen as largely a technical problem which will be solved when the Department of Transportation builds the road network planned for in the 1972 thoroughfare plan.

Kill Devil Hills has concentrated its commercial development at the south end of the Town. This type of pattern has usually resulted in fewer trips, less traffic hazards and better marketing.

Mixed land uses are often traditionally cited as unacceptable. Residential users are annoyed by commercial operations--noise, lights, traffic. However, where the commercial uses afford opportunities and convenience to the residential sector, many less objectionable commercial uses are welcomed. This is especially true of grocery stores and offices. Most businesses desiring to be free of complaints have used vegetated buffers and large lots to lessen the tension for neighboring residential uses.

Industrial uses in Kill Devil Hills lie west of the Bypass and on the northeast side of the Fresh Water Pond. These uses consisting primarily of cement plants and operations are a non-conforming use. The zoning ordinance provides for a light industrial zone (LI)--see area west of Bypass and north of Fresh water Pond--yet this zone is currently in mobile home use, both on individual lots and in trailer parks. This use is a permitted use in this zone where it will probably be encouraged until the market justifies a higher use. This area is a dune hazard area and the transitory nature of the use is appropriate.

Areas Likely to Experience Changes in Predominant Land Use

During the next ten years the most significant changes in land use should occur west of the Bypass as vacant lands are developed for single family residential use. Most of the land is already subdivided and streets have been laid. In addition, single-family development shall probably fill in areas between the Beach Road and the Bypass. Commercial development will probably double, although Nags Head may receive a heavier share of future commercial development, filling in a large portion of areas permitted for this use. A rezoning of areas west of the Beach Road will allow this area to receive motel and commercial development otherwise likely to locate along the beach. We should note that new motel development has been non-existent to slow since 1973.

CHAPTER IV

LAND CLASSIFICATION

Established: The purpose of the developed class is to provide for intensive development and redevelopment of existing urbanized areas. Areas to be classifed as developed include lands currently developed for urban uses at or approaching a density of 500 dwellings per square mile that are provided with usual municipal services including at least public water, sewer, recreational facilities, police and fire protection. In the Town of Kill Devil Hills, the developed class has been subdivided into an established class to reflect a situation where the Town has services listed above, except for public sewer. The Town is currently involved in studying the feasibility of public sewer under the Regional 201 Facilities Plan, and supports the development of public sewer in the Town. The area in the Town classified as established is generally along the entire north-south length of the Town from the ocean front to the U.S. 158 By-Pass. Also included is a section west of the By-Pass between Kitty Hawk Drive and 5th Street (see classification map).

Transition: The purpose of the transition class is to provide for future intensive urban development within the ensuing ten years on lands that are most suitable and that will be scheduled for provision of necessary public utilities and services. The transition lands

also provide for additional areas when lands in the developed class are not available or when they are severely limited for development. In the Town of Kill Devil Hills, all lands not classified as established, rural or conservation are transition. The rural area is the Wright Memorial, and the conservation areas are the AECs.

Rural: Rural areas are those that are identified as appropriate for resource management. Generally areas classified as rural are intended to be those areas with high potential for agriculture, forestry, or mineral extraction; or lands that would make development hazardous and costly; and lands containing irreplaceable, limited, or significant natural, recreational, or scenic resources not otherwise classified. In the Town of Kill Devil Hills, the area of the Wright Memorial is classified as rural due to its historical value, rather than any potential for hazard (except for the man-made hazard of the air strip located on the site) or for its natural resource potential. A classification designation was also needed which could allow for potential expansion of the facilities on the site.

Conservation: The purpose of the conservation class is to provide for effective long term management of significant limited or irreplacable areas. This management may be needed because of its natural, cultural, recreational, productive, or scenic values. These values should not be identified as transition in the future. In the Town, lands classified as conservation include all AEC areas. Such areas would be the ocean hazard are, estuarine shoreline, coastal marshes, and all surface waters.

RELATIONSHIP OF POLICIES AND LAND CLASSIFICATION

Established: In this class, present uses include a combination of urbanized uses (e.g. high, medium and low density residential; commercial, transportation, and institutional). It is the policy of the Town to maintain existing growth and provide development opportunity to allow for increased tourist economy. The zoning in the established class allows commercial and high density uses in most areas (see zoning classification maps). It is also the Town's policy to continue to maintain services at the present level, and to work toward implementing a sewer system. The Town is seeking to attempt to limit motel development to west of the beach road. In the next fiscal year, the Town will undertake a study of management tools to implement its policies.

Transition: In the transition class, the policies toward growth and services are similar to those in the established class. However densities are somewhat higher in these areas. Almost all of this classification is presently platted for residential development. These areas are expected to accommodate the urbanized population and economic growth through the planning period.

Rural: This area is owned by the federal government and benefits the Town as an area of open space and tourist attraction. (The Wright Memorial).

Conservation: The purpose of the conservation class is to provide for effective long term management of significant limited or irreplaceable areas. This management may be needed because of its natural, cultural, recreational, productive or scenic values. In the Town, this class applies to all AEC areas, which include the ocean hazard areas, estuarine shoreline, coastal wetlands, and all surface waters. The Town supports CAMA regulations in applying standards for these areas. The Town allows plowing to create dunes, but does not support beach nourishment procedures or the establishment of groins or jeeties. The Town allows bulkheading on the estuarine shoreline. The Town allows the construction of walkways and platforms over the frontal dunes as long as public access is not interfered with.

SECTION IV

A. Federal and State Licenses and Permits

B. KDH: Questionnaire

C. Public Participation Element

STATE LICENSES AND PERMITS

Agency	Licenses and Permits
Department of Natural Resources and Community Development Division of Environmental Management	- Permits to discharge to surface waters or operate waste water treatment plants or oil discharge permits; NPDES Permits, (G.S. 143-215). - Permits for septic tanks with a capacity over 3000 gallonsday (G.S. 143-215.3). - Permits for withdrawal of surface or ground waters in capacity use areas (G.S. 143-215-15). - Permits for air pollution abatement facilities and sources (G.S. 143-215.108). - Permits for construction of complex sources; e.g. parking lots, subdivisions, stadiums, etc. (G.S. 143-215.109). - Permits for construction of a well over 100,000 gallons/day (G.S. 87-88).
Department of Natural Resources and Community Development Office of Coastal Management	- Permits to dredge and/or fill in estuarine waters, tidelands, etc. (G.S. 113-229). - Permits to undertake development in Areas of Environmental Concern (G.S. 113A-229). NOTE: Minor development permits are issued by the local government.
Department of Natural Resources and Community Development Division of Earth Resources	- Permits to alter or construct a dam (G.S. 143-215.66). - Permits to mine (G.S. 74-51).

	- Permits to drill an exploratory oil or gas well (G.S. 113-381). - Permits to conduct geographical exploration (G.S. 113-391). - Sedimentation erosion control plans for any land disturbing activity of over one contiguous acre (G.S. 113A-54).
Department of Natural Resources and Community Development Secretary of NRCD	- Permits to construct an oil refinery.
Department of Administration	- Easements to fill where lands are proposed to be raised above the normal high water mark of navigable waters by filling (G.S. 146.6(c)).
Department of Human Resources	- Approval to operate a solid waste disposal site or facility (G.S. 130-166.16). - Approval for construction of any public water supply facility that furnishes water to 15 or more year round residences or 25 or more year round residents (G.S. 130-160.1).

FEDERAL LICENSES AND PERMITS

Agency	Licenses and Permits
Army Corps of Engineers (Department of Defense)	- Permits required under Sections 9 and 10 of the Rivers and Harbors of 1899; permits to construct in navigable waters. - Permits required under Section 103 of the Marine Protection, Research and Santuaries Act of 1972. - Permits required under Section 404 of the Federal Water Pollution Control Act of 1972; permits to undertake dredging and/or filling activities.
Coast Guard (Department of Transportation)	- Permits for bridges, causeways, pipelines over navigable waters; required under the General Bridge Act of 1946 and the Rivers and Harbors Act of 1899. - Deep water port permits.
Geological Survey Bureau of Land Management (Department of Interior)	- Permits required for off-shore drilling. - Approvals of OCS pipeline corridor rights-of-way.
Nuclear Regulatory Commission	- Licenses for siting, construction and operation of nuclear power plants; required under the Atomic Energy Act of 1954 and Title II of the Energy Reorganization Act of 1974.
Federal Energy Regulatory Commission	- Permits for construction, operation and maintenance of interstate pipelines facilities required under the Natural Gas Act of 1938.

- Orders of interconnection of electric transmission facilities under Section 202(b) of the Federal Power Act.

- Permission required for abandonment of natural gas pipeline and associated facilities under Section 7C(b) of the Natural Gas Act of 1938.

- Licenses for non-federal hydro-electric projects and associated transmission lines under Sections 4 and 15 of the Federal Power Act.

Lists provided by the NC DNRCD.

B. KILL DEVIL HILLS--QUESTIONNAIRE

Instructions: Please place your answers in the space at the left of the questions. Some questions have special instructions.

INTRODUCTORY QUESTIONS

_____ 1. Which of the following best describes your relationship to the town?
- a. permanent resident
- b. non-resident real property owner
- c. regular seasonal visitor
- d. occasional seasonal visitor
- e. other

_____ 2. If you are a non-resident real property owner, do you intend to build a house on your property or to sell your property during the next ten years? (Please leave the question blank if you are not a non-resident real property owner.)
- a. intend to build a house on my property
- b. intend to sell my property
- c. do not intend to sell my property or build on it

_____ 3. Which of the following describes your principal relationship to the town?
- a. developer, builder
- b. commercial business
- c. motel owner or manager
- d. sportsfisherman or boater
- e. beach user
- f. retiree
- g. housewife
- h. other

_____ 4. Which of the following best describes your relationship to the town?
- a. active voter in Kill Devil Hills
- b. ineligible to vote in town elections
- c. eligible to vote, but not active in town elections

_____ 5. With which area of Kill Devil Hills are you interested?
- a. beach
- b. sound
- c. bypass
- d. other

SEWER

The permanent and seasonal population of Kill Devil Hills is expected to exceed 40,000 residents during the peak week in the summer by the year 1990. Kill Devil Hills relies almost exclusively on septic systems for sewage disposal. We are approaching a density at which the State may restrict new construction using septic systems. A public sewer system often takes over six years to construct. Also, it is very expensive.

_____ 6. Should Kill Devil Hills build or participate in the building of a public sewer system to handle the growth anticipated during the next ten years?
- a. Yes
- b. No

GROWTH

In addition to demands placed on the town to provide new services, a doubling of the permanent and seasonal population may affect the image of the town as a family beach community. Although it may make the delivery of some services (such as fire and police) more efficient, it will probably reduce the amount of open space.

_____ 7. How do you feel about the town's growth during the next ten years?
   a. The town should attempt to increase its natural (projected) growth rate.
   b. The town should accept its natural growth rate.
   c. The town should grow only as much as possible without costly additional improvements.
   d. The town should attempt to slow down the natural growth rate.

HOUSING MIXTURE

The housing in Kill Devil Hills consists of a mixture of single-family, multi-family, townhouse, cottage court, low profile motel and high-rise motel. Our past emphasis has stressed single-family homes. Within the last ten years we have added several high-rise motels. A shift in the composition of housing can influence the persons who come here, the money they spend, the services the town provides, the costs of those services and the tax base with which to pay for them.

_____ 8. Which of the following statements best approximates how you feel about the ideal future housing mixture?
   a. We should increase the proportion of multi-family and townhouse development.
   b. We should increase the proportion of cottage court and low profile motels.
   c. We should increase the proportion of high-rise motels.
   d. We should increase the proportion of multi-family, townhouse, cottage court, low profile motel and high-rise motels.
   e. We should increase the amount of single-family houses.
   f. We should keep the same mixture as in the past.

_____ 9. What factor was most important in your above decision?
   a. Preserve the "family beach" atmosphere.
   b. Increase in the amount of money spent by tourists.
   c. More efficiency in the cost of services.
   d. Preserving open space and the environment.
   e. Strengthening the tax base.

_____ 10. Regulations in the town specify that no building can be higher than fifty feet. Would you favor allowing greater building heights?
   a. Yes
   b. No

OPEN SPACE

The moderate density we have reached in 1980 has left us with much open space. Open space is undeveloped, vacant land. There are two types of open space: 1) space around houses and buildings and 2) large tracts of several acres. Large tracts can be obtained through purchase or density transfer, such as happens with planned unit development where a developer dedicates open space in exchange for being allowed to develop a portion of his property with greater density. Large lot sizes result in small open spaces around houses.

_____ 11. Do you desire to see large tracts of open space in the town?
a. Yes (unqualified)
b. Only if it can be accomplished without the town purchasing them
c. No

_____ 12. Where would you prefer to see large tracts of open space?
a. beach
b. sound
c. interior or soundside dunes
d. wooded or vegetated areas

_____ 13. How do you feel about the lot sizes for single-family dwellings?
a. too small
b. adequate
c. too large

_____ 14. Should the town adopt an ordinance favoring developing with planned unit development (P.U.D.)?
a. Yes
b. No

ENVIRONMENTAL FEATURES

Environmental features in Kill Devel Hills include ocean dunes, wetlands and the Nags Head Woods. The Woods contain rare and endangered species, fresh water ponds (town water supply), dunes, forests and marshes. Ocean dunes and wetlands are protected by the State. The State also requires a setback for septic tanks and fields from the fresh water pond.

_____ 15. Should the town enact large lot zoning and/or require a percentage of the lot to be left in vegetation?
a. Yes
b. Only large lot zoning
c. Only a requirement that a percentage of the lot be left in vegetation
d. No

_____ 16. Should the town seek to protect the dunes in the Woods and on the soundside?
a. Yes
b. No

RECREATIONAL FACILITIES

_____ 17. From the following facilities, please select and rank those
_____ 18. for which you feel there is a strong enough need to justify
_____ 19. their being provided at public expense. (Please place the most important facility in the space at the top to the left, second choice below it, etc. Leave blanks if you do not wish to provide any more facilities.)
_____ 20.

a. marinas and boat access
b. parking for beach access
c. bathhouses
d. playgrounds
e. tennis courts
f. indoor ball courts
g. ballfields
h. picnic facilities
i. jogging and walking paths
j. bikeways
k. convention and meeting hall

ZONING

_____ 21. How do you feel about the amount of land zoned for commercial use?

a. too little'
b. adequate
c. too much

_____ 22. Do you feel that the location of commercially zoned lands is appropriate?

a. Yes
b. No

TRANSPORTATION

The bypass is at capacity during the summer months. The costs of remedying this problem vary with the land which needs to be purchased and the area which needs to be paved. Some alternatives get better results, some require major cooperation from State agencies, and some cause personal inconvenience.

_____ 23. Please rank the following alternatives in order of preference.

a. Keep present situation as it is.
_____ 24. b. Make the bypass four lanes.
c. Build feeder roads along both sides of the bypass.
_____ 25. d. Build a new two-lane road along the sound.
e. Restrict commercial access on the bypass; eliminate left
_____ 26. turns; prohibit new streets from entering bypass.

_____ 27.

_____ 28. Of the factors you considered in making your decision in the prior question, which was the most important factor?

a. the degree to which the problem would be solved.
b. the time it would take to solve the problem
c. the costs to the taxpayers of the State and Nation
d. the amount of personal inconvenience
e. the amount of cooperation needed from State agencies.

ALTERNATIVE TRANSPORTATION

_____ 29. How do you feel about a transit system to serve the area from Southern Shores to Manteo?
a. favor a public system only
b. favor a private system only
c. favor either a public or private system
d. do not favor any transit system

FUNDING PRIORITIES

_____ 30. From the following projects, please select and rank those projects which you favor funding with public monies. (Please
_____ 31. place the letter of the item you feel is most important at the top space to the left, etc. Leave spaces blank when you reach
_____ 32. your limit of spending.)
a. pave local roads
_____ 33. b. improve water system
c. build public sewer system
d. build recreational facility
e. build regional hospital
f. build public transit system
g. build parking area for beach access
h. purchase open space

RELATION WITH OTHER GOVERNMENTS

_____ 34. Would you favor the creation of one municipality from all the Dare County communities north of the Oregon Inlet?
a. Yes
b. No

COMMENTS:

C. ISSUES FROM FORUM

1. complete public participation
2. alternate routes for 158
3. public sewer system
4. growth policy
5. PUD as a method of developing
6. need for industrial uses
7. policies concerning high-rise development
8. need for public recreation facilities
9. need to address surface water drainage
10. holistic approach to planning
11. oceanfront development policies (mixed use)
12. need for transitional areas
13. need for tax base to pay for facilities
14. need for beach access/public parking
15. need for pedestrian/bicycle ways
16. need for convention center
17. need to look at zoning
18. need for Outer Bank sewer authority
19. need to implement beach access plan (access structures)
20. need to protect the dunes
21. need to control beach driving
22. practicality of county-wide sewer (high costs)
23. need to coordinate management of Woods with Nags Head
24. combine police/fire with Nags Head
25. establish priorities

26. need to look at other taxes (sales rather than property)
27. beach community consolidation
28. public transportation

C. PUBLIC PARTICIPATION PROGRAM

INTRODUCTION

Public participation is necessary for effective land use planning. Since land use planning affects a wide range of economic, social, environmental and institutional interests, it should be carried out and implemented in a manner which meets public satisfaction. When properly developed, public participation in the planning process facilitated the identification of local issues and public preferences and fosters the evaluation and development of management alternatives.

Public participation is required by the North Carolina Department of Natural Resources and Community Development for land use planning under the Coastal Area Management Act. The Land Use Planning Guidelines (15 N. C. A. C. 7B .0207) state: "Local governments are encouraged to employ a variety of participation technqiues to assure that all segments of the community have a full and adequate opportunity to effectively participate in planning decision-making.

The public participation program must be as carefully scheduled and timed as the technical program, with specific activities keyed into particular stages of the technical program. Thus, under such a public participation program, by the time preliminary plan alternatives are developed, more widespread response and more intelligent reaction can be anticipated.

OBJECTIVES AND APPROACH

A. Objectives:

The public participation program is designed as an integral part of the planning process. The following objectives are to be strived for during the planning process:

(1) to develop an understanding among citizens and the organized private interest in the community of the principal physical problem and needs of the area and the role of planning in dealing with them and bringing about a more liveable environment.

(2) to cultivate the practice among civic leaders and organization of sharing in the planning process, from the earliest stages to review of the final plan.

(3) to provide media for reporting on planning studies and recommendations so that civic action programs have the benefit of studied analysis of the community's problems and needs.

(4) to overcome the lack of, or problems of, established political mechanisms so as to reach segments of the population not adequately represented in the planning and decisionmaking process.

(5) to communicate the concerns of interested citizens.

(6) to continue to build public confidence in the planning process.

(7) to continue to find ways to inform the public of plans, policies, regulations and problems.

(8) to reflect changes in the public perception of their area, its needs and resources, and the best use of these resources.

(9) to improve compliance with the planning program.

(10) to continue to disseminate and make readily availalbe information that can lead to better land use decisions.

B. Approach:

The approach of the public participation program is to combine an educational process with issue raising sessions, questionnaires and public meetings. In order to assure participation of appropriate groups, a sector analysis will be prepared to determine what publics exist and their relative makeup of the community's population.

These groups need to be supplied with background information on the basis for planning in the area. They should be given sufficient lead time, before imput is needed, to review relevant information.

DETERMINATION OF PUBLICS

It is important to recognize, in reference to land use planning, that there are many sectors of the public which vary in the time they spend in the community, their degree of participation in the political process, their importance to the community, and the interest group with which they must identify.

Some of these groups are listed below:

Groups Arranged by Political Imput

A. Permanent residents who participate in the governmental process;

B. Temporary residents (summer inahbitants, monthly and weekly residents)

C. Day users (close and remote)

D. Interested non-residents (absentee landowners and others)

E. Permanent residents who do not participate in the governmental process.

Interest Groups

A. General Public
B. Builders and Contractors
C. Realtors and Developers
D. Commercial Businessmen
E. Commercial Fishermen
F. Sport Fishermen
G. Beach Users
H. Government Workers
I. Vicarious Users
J. Low Income Persons
K. Retirement Persons
L. Farmers
M. Tenant Farmers and Laborers
N. Industry
O. Military
P. Civic Groups

During a planning board work session, the board was asked to weight each of the groups by percentage of population and degree of influence. Through this process a list of publics was prepared.

A. Forum:

A public forum was held with specific invitations to various interest groups in the community. The first part of the forum was educational; the second part sought to elicit community issues and problems.

B. Meetings of Governmental Bodies:

The planning process has been developed through the thoughtful presentation of planning material and the discussion and reaction of members of the planning board and the public. All meetings are open to the public and advertised in the papers. In addition the progress of the planning board has been reported regularly to the elected officials at their regular, public meetings.

PUBLIC INPUT

A. Planning Board:

During the first planning board meeting, the various publics were identified and weights were given to each group. Names and addresses were determined through a selective random sampling procedure designed to reach at least some members from each group. These persons were directly invited to participate in the issue forum. In addition, public notice of the forum was placed in the newspapers and on community bulletins of local radio stations.

B. Issue Forum:

The first part of the issue forum was educational. The second part was designed to elicit planning issues from the community. These issues were used to design the informational questionnarie which helped feed the decisionmaking process. In order to determine community issues, the Nominal Group Method was selected to elicit responses.

C. Nominal Group Method:

The Nominal Group Method works as follows: The process begins when an elected official or member of the planning board welcomes the citizens of the community to the forum. The official will explain the meeting's purpose (to solicit citizen's ideas about community problems, goals and objectives). No attempt will be made at this time to arrive at solutions during the meeting.

Thereafter the participants are given a sheet of paper with the questions to be addressed. Such as, "In your opinion, what are the development problems needing attention over the next few years? What suggestions do you have to plan for the future of the area? What should

the municipality lool like in the next 10 years? At this point an identifiable example from a different situation indicating the type of responses desired (problems, not symptoms or solutions) will be shared with the audience.

The citizens will then be divided into subgroups of five to ten people each. The subgroup members will be instructed to work individually and silently on compiling a key word list of problems facing the community. Participants who finish early will be encouraged to review their list for other possibilities. After individuals are given about a half-hour to compile this list of problems a recorder will join each subgroup and ask each individual in a round-robin fashion for one of his statements of community problems. The recorder will write each participant's statement verbatim on a flip chart. No debate, rewording or combining of items will be allowed. The purpose of this phase is to get as many ideas as possible listed without the immediate burden of their defense.

This process will continue until each member in the subgroup has the opportunity to enumerate all of his concerns. After this tabulation is completed, participants will be allowed to mingle and discuss among themselves the issues that were raised in the various subgroups. The subgroups will then be reformed so that a clarification of the issues may be accomplished. Throughout this phase, the role of the recorder is to minimize personalities entering the discussion and to keep a focus on the issues.

After a few minutes of clarification, the participants will be asked to vote silently and privately on the five most important issues

before their subgroup. The voting will be done by setting weights on the problems selected (the most important item will be given a weight of five (5). The votes will be collected and a tally made for that subgroup. After each subgroup compiles its priorities, the information is reported to the main group. Following a brief discussion of the results, the citizens are notified of the use of their concerns in policy settling. No statement of proposed outcomes should be made at this point in the process to prevent false expectations of potential courses of action.

Use of the nominal group process in setting community goals and objectives may help reduce adverse reaction frequently associated with land use planning. It may help citizens to feel that it is their plan. They will know what it contains and they will be familiar with its purpose. Thus, they may be more willing to support future management tools based upon the guidelines set forth in the plan. It is important to recognize that land use planning involves the resolution of conflicts among people about what the best uses of the land are.

Having determined pertinent issues from the forum, these issues will be discussed with the planning board. A questionnaire will be developed to ascertain public attitude and opinion on the issues. The questionnaire will be completed by telephone interview with attendees of the issue forum and persons selected by andom sample from the voter registration lists. The results of the questionnaire will be tabulated and used by the planning board to develop tentative goals, objectives and policies. At each stage of the technical planning process, the forum attendees will be asked to continue to participate as an informal advisory group to the planning board.