

*The
Southwest Area
Plan*

adopted by the city council 5 march 1996

the city of burlington, north carolina

THE SOUTHWEST AREA PLAN

TABLE OF CONTENTS

I. INTRODUCTION.....	1
II. SOCIAL AND ECONOMIC FACTORS.....	5
III. ENVIRONMENTAL FACTORS.....	10
IV. AREAS OF ENVIRONMENTAL CONCERN.....	22
V. TRANSPORTATION.....	43
VI. UTILITIES	51
VII. PUBLIC FACILITIES AND COMMUNITY SERVICES.....	54
VIII. LAND USE.....	63
XI. GROWTH MANAGEMENT STRATEGY AND POLICIES.....	71
APPENDIX A: PUBLIC WORKSHOP ATTENDANCE.....	79
APPENDIX B: LIST OF HAZARDOUS CHEMICALS	
BIBLIOGRAPHY (ABBREVIATED)	

THE SOUTHWEST AREA PLAN

LIST OF FIGURES AND TABLES

Figures

- Figure 1: The Southwest Planning Area**
- Figure 2: TAZ Map of the Southwest Planning Area**
- Figure 3: Hydric Soils Within the Southwest Area**
- Figure 4: Drainage Basins Within the Southwest Area**
- Figure 5: Historic Sites Within the Southwest Area**
- Figure 6: Industries Within the Southwest Area with Hazardous Chemicals**
- Figure 7: Alamance County Urban Area (MPO) Planning Area**
- Figure 8: Proposed Transportation Improvements**
- Figure 9: Existing & Proposed Water & Sewer Improvements**
- Figure 10: Existing Fire Stations & Service Districts in SW Area**
- Figure 11: Existing Land Use**
- Figure 12: Proposed Annexation Area**
- Figure 13: Future Land Use**

Tables

- Table 1: Population, Housing & Employment by TAZ**
- Table 2: Housing Inventory by TAZ**
- Table 3: Soil Associations Within the SW Planning Area**
- Table 4: Tree Species, Location & Associated Forests in the SW Planning Area**
- Table 5: Song & Game Birds Found in the SW Planning Area**
- Table 6: Identified Historic Resources Within the SW Planning Area**
- Table 7: Surface Water Classifications of Streams & Lakes in the SW Area**
- Table 8: NPDES Discharge Permits Issued Within the Lake Mackintosh Watershed in 1994**
- Table 9: Land Use in the SW Planning Area by Approximate Acreage**

WESTERN LOOP PLANNING AREA LAND USE CONCEPTS

The following table lists Land Use Concepts that have been presented on the Western Loop Land Use Concept Plan. The land use types include a brief description of each use and some defining characteristics.

Land Use Type	Description	Characteristics	Uses	Potential Zoning
Planned Community Mixed-Use	A pedestrian-friendly, community focal point containing a mixture of uses with ample sidewalks, street trees, on-street parking, public amenities and open space. The goal is to allow for growth while maintaining and enhancing the quality of life.	<ul style="list-style-type: none"> • Located near the interchange of an Interstate • Designed with the pedestrian in mind • Large amounts of continuous blank facades are discouraged • Landscaping should be emphasized • Provide interconnectivity between developments • Limited access/curb cuts 	Multi-family, townhomes, condos, Office, and Commercial development	Planned Unit Development (PUD), Conditional Zoning
Limited Commercial Node	A planned commercial area that offers limited services to serve the surrounding community.	<ul style="list-style-type: none"> • Limited commercial development • Located at an intersection of predominant roads • Limited Access 	Limited commercial uses (i.e. hotel, conference facilities, restaurants (sit-down dining))	Planned Employment Center (PEC), Conditional Zoning
Neighborhood Business	The public/commercial focal point within one or more neighborhoods that provides a mix of commercial, office, institutional and residential uses at the neighborhood scale.	<ul style="list-style-type: none"> • Limited commercial development • Serves the surrounding neighborhood • Located at an intersection of predominant roads • Pedestrian and automobile access • Design Compliments surrounding neighborhoods 	Limited commercial uses (i.e. grocery store, offices, specialty stores, etc.), single-family residential, and dwellings above stores, "Big-Box" and strip developments should be prohibited.	Planned Unit Development (PUD), Conditional Zoning, Neighborhood Business (B-1)
Employment Center/ Corporate Park	An area designed for office parks, research campuses, and some limited light industry for the manufacturing and processing of goods.	<ul style="list-style-type: none"> • Interstate accessible • Campus like atmosphere • Emphasis on landscaping and building design • Larger sites • Enforce buffers between adjoining land uses 	Light industry, office, and institutional uses. Limited accessory commercial uses.	Planned Employment Center (PEC)

Land Use Type	Description	Characteristics	Uses	Potential Zoning
Office/Hospital Support Services	An area designated for office and medical services.	<ul style="list-style-type: none"> • Close proximity to hospital • Campus like atmosphere • Emphasis on landscaping and building design 	Office, medical research, medical support services	Office – Institution (O&I)
Planned Community Residential	A regional development that is planned to provide a mix of residential uses with a limited amount of commercial/office.	<ul style="list-style-type: none"> • Reminiscent of early town development • Provides places to live, work, and shop • Pedestrian oriented • Mix of densities and building types 	Single-family, multi-family, townhouses, condos, limited commercial uses (i.e. grocery store, offices, specialty stores, etc.), “Big-Box” and strip developments should be prohibited	Planned Unit Development (PUD), Conditional Zoning
High Density Residential	A district designed to provide for multi-family development. Districts are usually located in close proximity to major roads and commercial development	<ul style="list-style-type: none"> • Provide interconnectivity between developments • Includes pedestrian amenities/greenways • Limited access/curb cuts 	Multi-family, townhomes, condos	MF-A & MF-B, R-6
Medium-High Density Residential	A district that provides for a mix in residential developments.	<ul style="list-style-type: none"> • A variety of residential types • Small neighborhood parks • Includes pedestrian amenities/greenways 	Single Family Residential, townhomes, condos	R-9, R-12, R-15
Medium-Low Density Residential	A district that provides for the development of conventional subdivisions at medium to low densities.	<ul style="list-style-type: none"> • Located outside commercial areas • Provide interconnectivity between developments • Preserves open space/ create greenways • Protect environmentally sensitive areas 	Single Family Residential	R-12, R-15, R-30
Low Density Residential	A district that provides for the development of conventional or cluster subdivisions at overall low densities.	<ul style="list-style-type: none"> • Located outside commercial areas • Preserves open space/ create greenways • Protect environmentally sensitive areas 	Single Family Residential	R-30

Adopted Western Loop Planning Area Future Land Use



City of Burlington, GIS Division: June 4, 2003

Legend

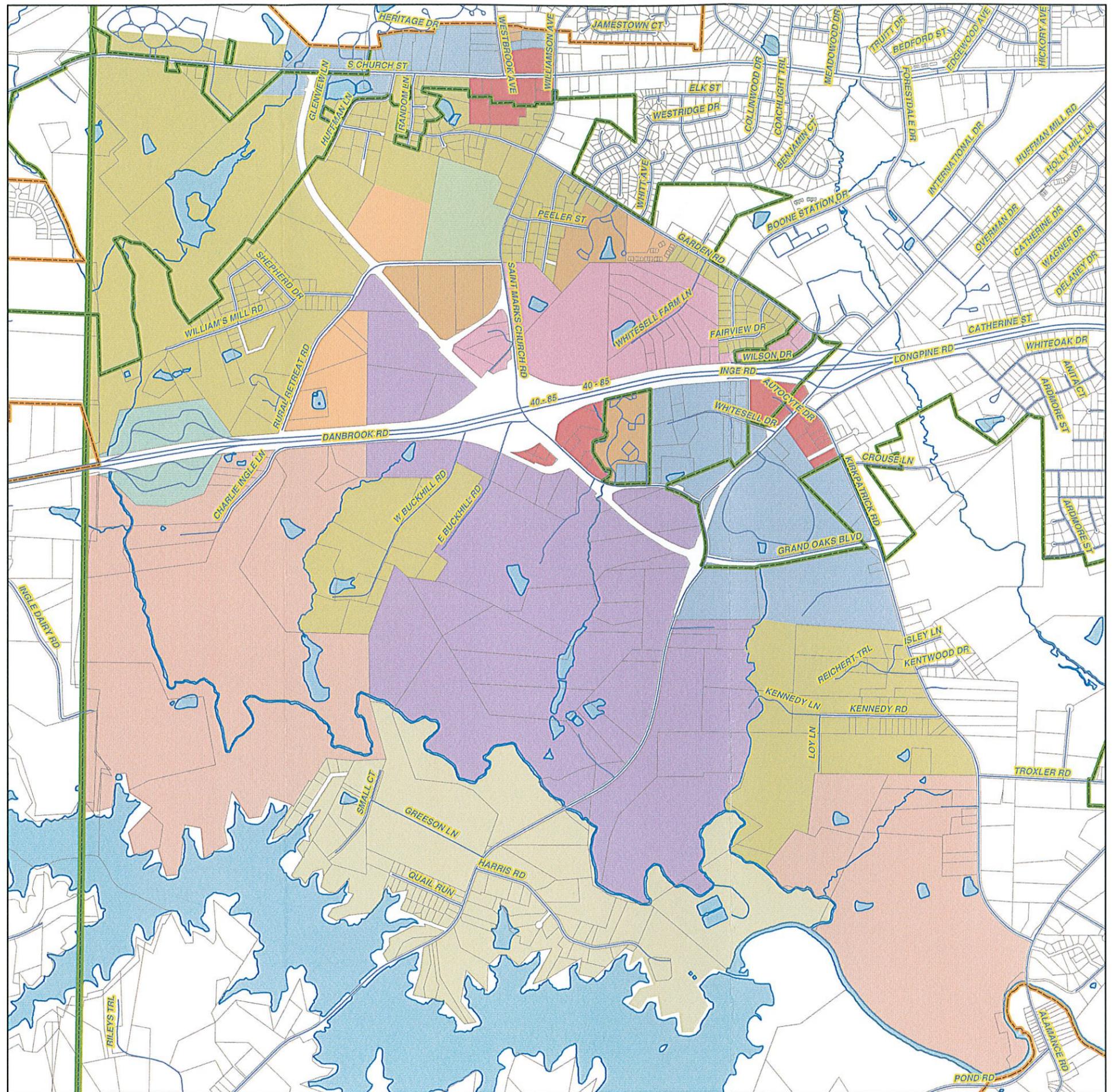
- Approximate County Line
- Other Municipal Boundaries
- Burlington Municipal Boundaries
- Tax Parcels
- Street Centerlines
- Surface Streams
- Lakes and Ponds

Future Land Use Categories

- High Density Residential
- Medium-High Density Residential
- Medium-Low Density Residential
- Low Density Residential
- Planned Community - Residential
- Planned Community - Mixed Use
- Limited Commercial
- Office/Hospital Support Services
- Employment Center/Corporate Park
- Other Public
- Park

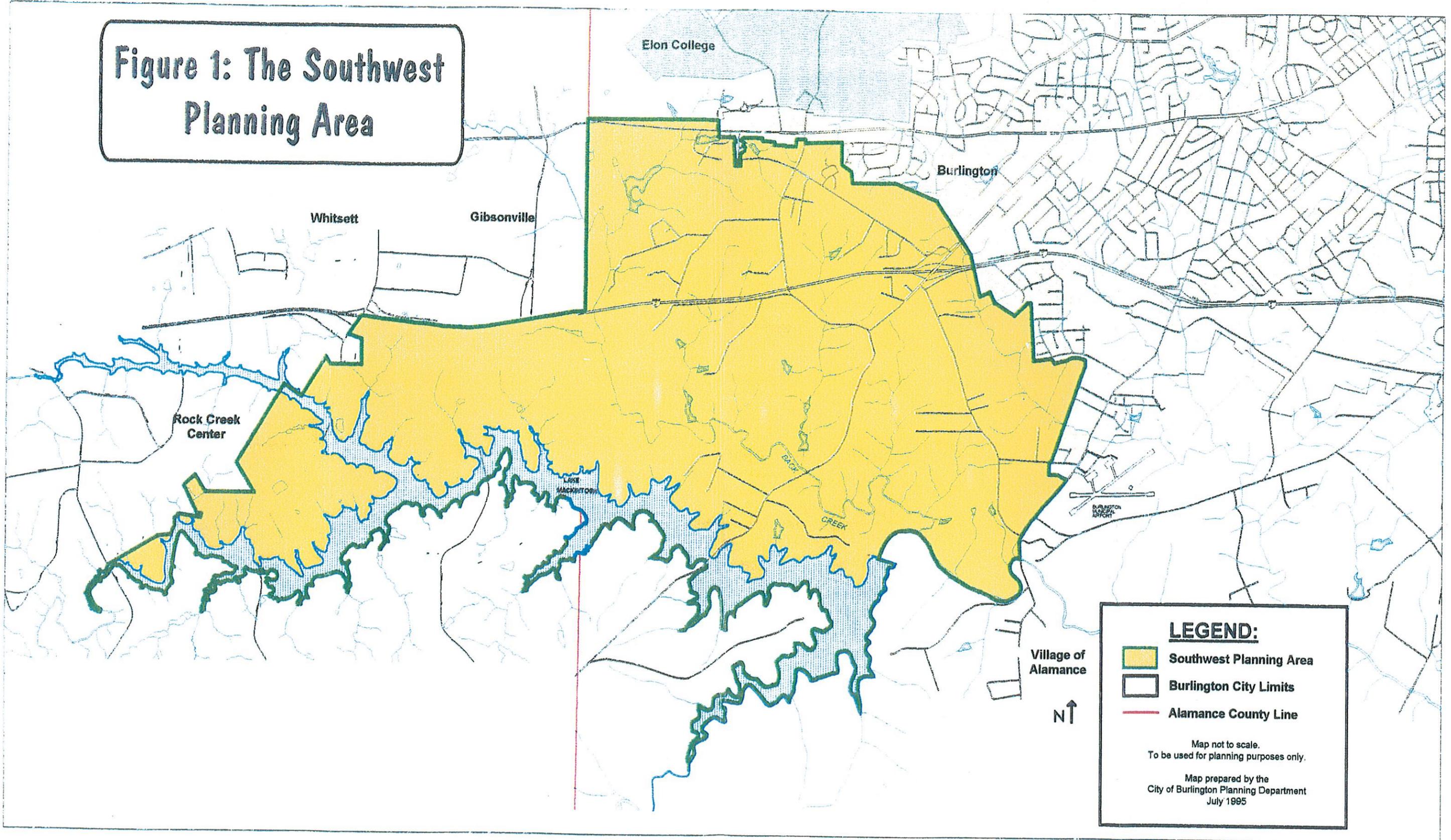


1 inch equals 1,702 feet



This map was compiled from the GIS resources of the Burlington Regional GIS Partnership for public planning and agency support purposes. These resources include public information sources of different scale, time, origin, definition and accuracy, leading to inconsistencies among features represented together on this map. Neither the City of Burlington nor the Partnership shall be held liable for any errors in this map or supporting data. Primary public information sources from which this map was compiled, in conjunction with field surveys where required, must be consulted for the verification of the information contained within this map.

Figure 1: The Southwest Planning Area



LEGEND:

-  Southwest Planning Area
-  Burlington City Limits
-  Alamance County Line

Map not to scale.
To be used for planning purposes only.

Map prepared by the
City of Burlington Planning Department
July 1995

THE SOUTHWEST AREA PLAN

I. INTRODUCTION

The Southwest Area Plan was prepared by staff of the Burlington Planning and Community Development Department at the request of the City Council. The intent of the Plan is to supplement the general recommendations made in the Burlington 2000 Comprehensive Land Use Plan and to develop a strategy for growth management within the region.

• History and Context of the Southwest Area Plan

In September of 1991, the Burlington City Council adopted the Burlington 2000 Comprehensive Land Use Plan. This document outlined comprehensive land use and development strategies for the City of Burlington and its extraterritorial areas for the next ten years.

Recommendations for the southwest area were contained within the *Southwest Burlington Small Area Plan* section of the comprehensive land use plan. Specific recommendations were made in the areas of land use and zoning, public improvements, transportation, historic preservation, and community appearance. Growth strategy maps and timetables were developed to assist in the implementation of the recommendations.

In 1994, the City Council identified the need for a new planning document addressing a much larger geographical area. This area is to include Burlington's existing and future urban fringe stretching from western Alamance County into eastern Guilford County along the I-85/40 corridor (Refer to Figure 1, The Southwest Planning Area).

As the southwest area becomes more attractive for development, a new strategic land management plan is needed (1) to guide the future growth of the area, and (2) to promote and maintain intergovernmental coordination among each of the seven governmental entities located within the region.

These jurisdictions include Alamance County, Guilford County, the towns of Whitsett, Gibsonville and Elon College, the village of Alamance, and the City of Burlington (See Figure 1). The City of Greensboro will also become an important government entity within the region, particularly if the City annexes the Rock Creek Corporate Center and the Stoney Creek residential community.

- **Objectives of the Plan**

The primary aim of this plan is to establish a **planning process** by which local governments within the southwest area can cooperatively and comprehensively begin to plan and guide the area's future growth and development. To accomplish this goal, the development of intergovernmental agreements on the following important growth related issues need to be addressed:

- (a) Planning and delineating the future urban growth areas, annexation boundaries, and extraterritorial jurisdictions of each existing municipality within the region;
- (b) Establishing a financial plan for constructing necessary water and sewer lines and other related improvements, and determining the existing and the future water and service areas of each municipality within the region;
- (c) Planning for the provision and the delivery of necessary public services, such as police, fire, waste collection, recreation and other services of each municipality within the region;
- (d) Determining needed transportation improvements and future roads and thoroughfares within the region;
- (e) Protecting the watershed and water quality of the Lake Mackintosh water supply reservoir for existing and future generations;
- (f) Planning future industrial and economic development opportunities, improvements and initiatives.

- **The Planning Process**

Since this plan has been initiated by the City of Burlington, the Burlington Planning staff has taken a lead role in preparing the initial draft. This draft will be presented to the Burlington City Council and the Burlington Planning and Zoning Commission at a joint work session to be held on August 14, 1995. After both the City Council and the Planning and Zoning Commission have had an opportunity to review the initial draft, public participation in developing the plan will be sought.

Three community workshops will be held to receive public comments on the plan. It is anticipated that these public meetings will be held in September or October at the Lake Mackintosh Park and Marina conference facility or another conveniently located facility within the southwest area.

- **Summary of Public Workshops**

This section provides a written summary of the public participation meetings held on October 9 and 25, and December 13, 1995. Comments received at the meetings are summarized below. These comments come directly from the minutes taken at each meeting. A list of all the citizens and staff attending the meetings, the complete minutes, copies of the public notices, and written comments submitted by citizens are included in Appendix A of the Southwest Area Plan.

Notices of all public meetings were published in the *Burlington Times-News* on consecutive Sundays prior to the October meetings and on two consecutive Sundays prior to the December meeting. Additionally, attendees of the October meetings were notified by first class mail of the December meeting and invited to come to the Planning Department and review the changes to the plan prior to that meeting.

Each of the three meetings followed a similar format with Planning Director Bob Harkrader briefly explaining the purpose of the plan and some of the major components, such as the Future Land Use Map and the Proposed Transportation Improvements Map. He then opened the floor for citizen questions and comments. At the December meeting, he explained the changes to the plan as a result of public comments at the first two meetings.

The first meeting to receive public input on the proposed Southwest Area Plan was held in the lower Council Chamber in the Municipal Building on October 9, 1995. The meeting was held from 5 p.m. - 6:30 p.m.; approximately 10 people attended. Many people spoke in favor of the plan, expressing concern at the lack of existing land use controls in the area and the need to expand the tax base. Several citizens also expressed the desire to see greenways and alternative transportation modes emphasized in the area. Burlington's location on Interstate 40/85 between the major cities of the Triad and the Triangle was seen as the major impetus for growth.

Other citizens voiced concern over the amount of land allocated to office and institutional land uses in the plan, stating that the city is oversupplied already. Citizens also expressed concern about the desirability for housing in the area around the proposed Western Alamance Loop. The fear being that the road will carry large amounts of traffic which will make the area undesirable for housing. Another concern was that taxes would be increased when areas which are presently residential are zoned for industrial use.

The second public meeting was held on October 25, 1995 from 7:00 p.m. - 9:30 p.m. at the Lake Mackintosh Clubhouse. Over 50 citizens attended this meeting. Again, citizens were concerned about property tax increases caused by industrial zoning. Planning Director Harkrader stated that based on his conversations with the Alamance County Tax Assessors Office, no tax increases would occur unless a change in the use of the land occurred. Citizens also wondered about the time table for construction of the St. Mark's Church Road Interchange and the Western Alamance Loop.

The third public meeting was held on December 13, 1996 from 6:00 p.m. - 8:00 p.m. at the Lake Mackintosh Clubhouse. Approximately 40 people attended the meeting. Planning Director Bob Harkrader introduced the plan and noted the changes which had been incorporated into the plan due to suggestions at the previous public meetings.

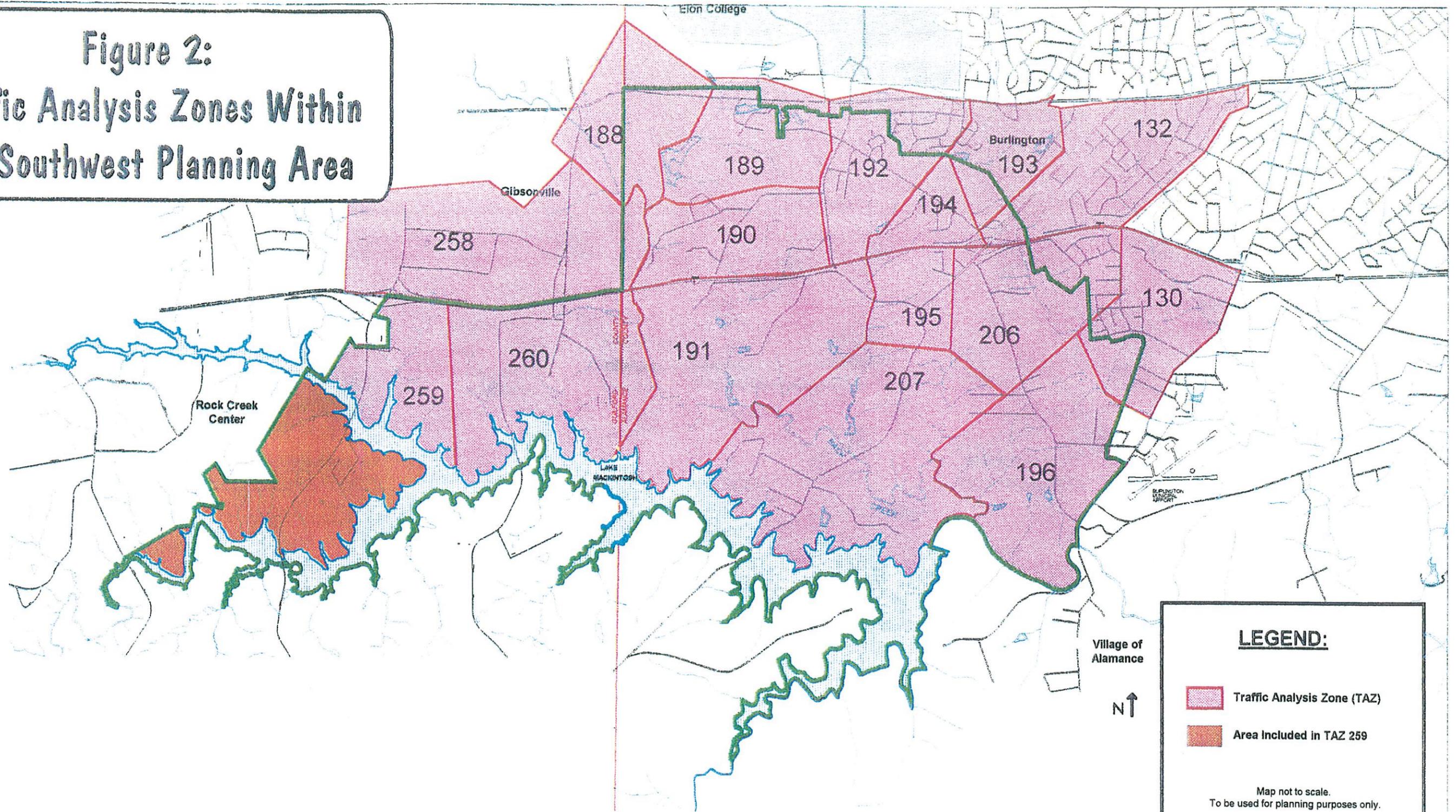
Citizens were generally happy with the plan, noting that the land use patterns proposed matched those that were existing, especially with regard to residential enclaves in the area. Some residents still expressed concern over the potential impact of industrial land uses on Lake Mackintosh and the groundwater. During the meeting Mr. Harkrader noted that the plan would be scheduled go to a public hearing before the Planning and Zoning Commission on the fourth Monday in January of 1996. He noted that the City Council would probably hold a public hearing on the adoption of the plan at its first meeting in March of 1996.

- **Adoption of the Plan**

The Southwest Area plan was presented to the City of Burlington Planning and Zoning Commission on January 22, 1996. After the presentation, the Commission voted unanimously, 9-0, to endorse it and to recommend that the City Council adopt the plan.

After proper public notification, the City Council of the City of Burlington held a public hearing on March 5, 1996 to consider adoption of this plan. After the public hearing, the City Council voted unanimously, 5-0, to adopt this plan and its recommended policies.

Figure 2:
Traffic Analysis Zones Within
the Southwest Planning Area



LEGEND:

- Traffic Analysis Zone (TAZ)
- Area Included in TAZ 259

Map not to scale.
 To be used for planning purposes only.

Map prepared by the
 City of Burlington Planning Department
 July 1995

II. SOCIAL AND ECONOMIC FACTORS

Data Collection

In the fall of 1993, the City of Burlington Planning Department and the Alamance County Administrative Services Department surveyed the greater Burlington area. The purpose of the survey was to count and evaluate each dwelling unit and to count the number of workers at each business. The results of the survey will be used for transportation modeling and decision-making. An added benefit was the accurate assessment of housing and employment in the greater Burlington area.

The greater Burlington area was divided into Traffic Analysis Zones. Traffic analysis zones are discrete geographic areas within the greater Burlington area which are used for analyzing transportation needs. Figure 2 shows the traffic analysis zones within the southwest planning area.

Findings

Southwest Burlington is the fastest growing part of the City. The portion of the southwest area north of Interstate 85/40 has prospered for a number of reasons, most prominent among these are: improved access at the Huffman Mill Road Interchange, the widening of Highway 70, and the increasing tendency of the area to be used as a bedroom community for Elon College and the major cities of the Triad and Triangle. The portion of southwest Burlington south of the Interstate is less intensively developed than the area to the north. Properties along Huffman Mill Road and to the east along Kirkpatrick Road benefit from the supply of water and sewer service. This area promises to be the next major growth area for Burlington; its attractiveness is demonstrated by the location of the new regional hospital and related health service businesses. The area to the west of Huffman Mill Road promises to develop more slowly than either of the former areas because it lacks water and sewer service and transportation access. But it too has experienced development pressures. The J.D. Mackintosh Lake and Park will continue to bring visitors through the area. The proposed Western Alamance Loop will provide more convenient access for citizens from western Alamance and eastern Guilford counties to the lake and hospital. The eventual provision of urban services to this portion of the southwest planning area will promote significant growth.

Table 1 gives a summary of the population and employment data collected in the fall of 1993. Table 2 contains the number and condition of dwelling units in the southwest area. The housing data was collected in a windshield survey; condition was evaluated according a pre-set scale. Businesses were called and asked their number of full- and part-time employees. Every employee was counted as full-time for the purposes

of the study. The population of the area was derived using the household projection method described below.¹

**TABLE 1:
POPULATION, HOUSING AND EMPLOYMENT
INVENTORIES
BY
TRAFFIC ANALYSIS ZONE
FOR THE SOUTHWEST PLANNING AREA**

Zone	Total Dwelling Units	Persons Per Household	Total Population	Total Employed
130*	2	2.47	5	0
188	50	2.23	112	14
189	35	2.54	89	5
190	68	2.61	177	6
191	31	2.54	79	1
192	177	2.43	430	231
194	44	3.17	139	694
195	17	2.17	37	8
196	7	2.43	17	387
206	10	2.00	20	148
207	39	2.36	92	30
259**	33	2.92	96	1
260	22	2.80	62	5
Total	535	2.53	1355	1530

Source: City of Burlington Planning and Community Development Department and the Alamance County Administrative Services Department, 1993.

* average persons per household in Alamance County used due to small sample size. **TAZ 259 incorporates data from portion of Southwest Planning Area outside of MPO boundary.

¹The Household Projection method derives the population of an area based on the number of dwelling units multiplied by the average persons per household. From the 1990 comprehensive plan, we determined that there is a great difference between the average number of people per household by subarea in the southwest area. We used data from the 1990 census at the block group level to determine the average persons per household for each traffic analysis zone, then that number was multiplied by the dwelling unit number from the 1993 survey to determine the projected population by TAZ. These numbers were then aggregated to determine the total population for the southwest area.

Population

The boundaries of the southwest area include a wide variety of settlement patterns from heavily suburbanized to commercial and agricultural uses. The area includes some of the most attractive and fastest growing suburbs in the City of Burlington. In general, population growth in the entire southwest planning area and especially south of the Interstate corridor has been hampered by the lack of infrastructure. Because of the topography, only a relatively small portion of the entire area can be served by existing sewer lines.

According to the *Burlington 2000 Comprehensive Land Use Plan*, the population of the area south of the Interstate corridor grew at an annual average rate of .88% in the decade between 1980 and 1990. By contrast, the population in the portion of the southwest planning area which is north of the Interstate corridor grew at an annual average rate of 2.5%. The total population of the southwest area including Guilford County was approximately 1,150 in 1990 according to the 1990 census.

There is evidence that the population continues to grow in the area. Between 1990 and 1994, more than one hundred fourteen residential building permits were issued for the portion of the southwest area in Alamance County (including Burlington). This amounted to almost twice as many as any other comparable area in the greater Burlington area except for the area surrounding the airport, which had ninety-one. (Residential Building Permit data is not kept by area in Guilford County so it is difficult to assess the location of residential building there.) The Alamance County portion of the area has also experienced a significant amount of non-residential building activity. Twenty non-residential building permits have been issued in the area. According to projections by the Burlington Planning Department, the population of the southwest area in 1993 was approximately 1,350.

The location of the hospital south of the Interstate corridor, the widening of Highway 70 between Greensboro and Burlington, and the amenities offered by Lake Mackintosh are factors which are likely to increase development pressures on this already attractive area. Given the timely supply of water and sewer service to the area, it is not unreasonable to assume that the future growth of population and commerce in Burlington rests in the southwest area.

Employment

Not surprisingly, employment in the southwest area mimics the pattern seen in population. Employment is concentrated around the Burlington city limits with declining density moving away from the urban area. TAZ 194 at the Huffman Mill Road/Interstate 85/40 interchange had the greatest employment level of any TAZ in the area. 387 people are employed in the TAZ 196 which holds the Willow Springs Industrial Park within its boundaries. In TAZ 192 along Garden Road 231 people are employed and 148 people

work in TAZ 206 which encompasses both sides of Kirkpatrick Road. The theme of the intense development close to the city limits and less developed interior in the southwest area is once again evident; the 4 areas mentioned adjacent to the City of Burlington boundaries comprise 95% of total workforce in the southwest planning area. Less than 50 people work in each of the remaining 10 zones. In fact, all ten zones combined employ less than TAZ 206.

It is germane to note some additional factors that will have an effect on the western edge of our planning area. TAZ 259 contains the Rock Creek Corporate Center which has many lots available for development. Presently Ametek and Konica, two manufacturing companies, are located here and employ over 400 people. Further development within Rock Creek Corporate Center could dramatically affect the existing infrastructure in the area. In addition, employment can be expected to increase dramatically in TAZ 195 as a result of the relocation of the county's hospital facilities to this area. At build out, the hospital, its ancillary services, and the Rock Creek Corporate Center will dramatically change the southwest area.

**TABLE 2:
HOUSING INVENTORY BY TRAFFIC ANALYSIS
ZONE FOR THE SOUTHWEST PLANNING AREA**

Traffic Analysis Zone	DWELLING UNITS BY HOUSING CLASSIFICATION			Total Dwelling Units
	Above Average	Average	Below Average	
130	1	1	0	2
188	0	14	36	50
189	13	18	4	35
190	7	55	6	68
191	1	20	10	31
192	121	51	5	177
194	12	29	3	44
195	1	13	3	17
196	0	4	3	7
206	0	10	0	10
207	5	31	3	39
259	0	29	4	33
260	0	10	12	22
TOTAL	161	285	89	535
% OF TOTAL	30	53	17	100

Source: City of Burlington Planning and Community Development Department and the Alamance County Administrative Services Department, 1993.

Housing

Housing units are more evenly distributed than employment throughout the southwest area, yet the pattern is the same. The TAZs with the greatest number of housing units border the Burlington City Limits. TAZ 192, which includes the Chase Apartments and Westhampton subdivision, has more than twice the number of dwelling units (177) as the TAZ with the second greatest number, TAZ 190. TAZ 190 has 68 dwelling units and TAZ 188 has 50. Each of the other TAZs contains less than 50 dwelling units.

A majority (53%) of dwelling units in the southwest planning area are considered average. 162 or 30% are considered to be above average, while 89 or 17% were considered to be below average because of size, age or maintenance. Most of the above average rated dwelling units were located north of the Interstate. Average housing units were evenly distributed, while below average housing was concentrated at the county line north of the Interstate due to a question of definition which considered trailers as below average housing.

III. ENVIRONMENTAL FACTORS

Urban growth and development affects environmental quality in many ways. Land is cleared and graded; existing trees and vegetation are removed; stormwater runoff increases; air and water quality diminishes; the number of automobiles increases; the volume of solid waste and sewage grows.

In past planning initiatives conducted by both the City of Burlington and Alamance County, the southwest area has been considered an area of special or planned environmental management. This designation has been applied to the area due to its present environmental quality and its sensitivity which limit the potential for urban development.

However, as urban growth begins to expand outward into the southwest area, Burlington has a unique opportunity to plan ahead and to guide this growth in a careful and environmentally sensitive manner. This section of the plan provides an overview of some of the important environmental factors which need to be considered in this process.

Topography and Slope

The southwest area is typical of the topography of Alamance County and much of the surrounding Piedmont region. The terrain of the area is gently rolling with moderate slopes; there is considerable buildable land. Along the creeks and streams, the terrain is moderately steep. The average elevation is about 590 feet above sea level, with elevations ranging from a minimum of 500 feet to a maximum of 684 feet. Differences in slope are greater in north-south directions than they are in east-west directions.

The basic drainage pattern of the area is semi-trellised, with Back Creek and Great Alamance Creek and their tributaries following linear courses with angular turns. The existence of these angular turns indicates that this drainage pattern is partly controlled by rock jointing directions and the geology of the area.

Geology

The southwest area lies entirely within the upland section of the Piedmont Plateau. The Piedmont Plateau is a plain that has been uplifted and tilted slightly to the southeast. Fairly resistant rock underlies the plain, which slope generally to the east and southeast. Over time, streams have dissected and cut-down into the plain forming narrow moderately steep-walled valleys.

Both igneous and metamorphic rocks exist in the southwest area. The metamorphic rocks are mainly gneiss, schist, slate, and quartzite. The igneous rocks are

mainly granite and diorite. The geologic map of Alamance County identifies three basic underlying rock formations: Gs - Greenstone Schist; Sg - Sheared Granite; and, Sl - Slate, chiefly gneiss, schistose, or slaty tuffaceous.

The greenstone schist formation is found in two primary locations. The largest outcrop covers most of the entire southwest area and is located between Great Alamance Creek to the south and Little Alamance Creek (Guilford County) to the north. The other outcrop can be found north of US 70 and to the south of Elon College and Gibsonville. This formation comprises an estimated 75 % of the entire planning area. Greenstone schist is typically a fine-grained light to medium olive green rock of igneous origin. The principal minerals are plagioclase, hornblende, and chlorite. These rocks have been greatly sheared and deeply weathered; but in some places, particularly south of Elon College and Gibsonville, the unweathered schist is found almost at the surface. The formation of the greenstone schist strike to the northeast and dip steeply to the southeast.

The formation of sheared granite is confined to a small outcrop located directly to the north and south of US 70. This outcropping belongs to the Central Piedmont Belt (Carolina Igneous Belt) which is one of the three major belts of igneous and metamorphic rocks found along the western portions of the coastal plain and throughout the Piedmont Plateau. The granite is mostly a coarse-grained rock, light-pink in color, composed chiefly of orthoclase, plagioclase, quartz, and biotite. Elsewhere, it is light gray and medium grained with plagioclase as the dominant feldspar. The granite has been sheared, badly crushed and broken, probably as much as the existing greenstone schist and slates.

Tuffaceous slate underlies the surface throughout the rest of the southwest area in locations primarily to the south and southwest of US 70. These rocks are part of the Carolina Slate Belt, which can be found throughout the Piedmont region. Rocks of this belt have been called slates due to their complex character and well-drained cleavage, which gives them a slaty appearance. In reality, these rocks consist of volcanic-sedimentary formations composed of slates, breccias, tuffs, and flows.

Specific information regarding the depths to bedrock below existing surface soils and the nature of that underlying bedrock is beyond the scope of this document. It is recommended that site specific subsurface investigations be conducted in areas where future development is planned or likely to occur.

Soils

The soils in Alamance County have been uniformly mapped by the Soil Conservation Service (SCS), and classified according to broad soil associations and more specific soil series.

The basic characteristics of these soils have developed according to the parent material from which they were formed. Therefore, a rough correspondence exists

between the soil associations and the in-place weathering of the geologic formations discussed above.

The following six soil associations have been identified within the southwest area by the SCS:

- (1) Enon - Lloyd Association
- (2) Enon - Iredell - Mecklenburg Association
- (3) Wilkes - Enon Association
- (4) Enon - Lloyd - Cecil Association
- (5) Helena - Vance - Appling Association
- (6) Iredell Association

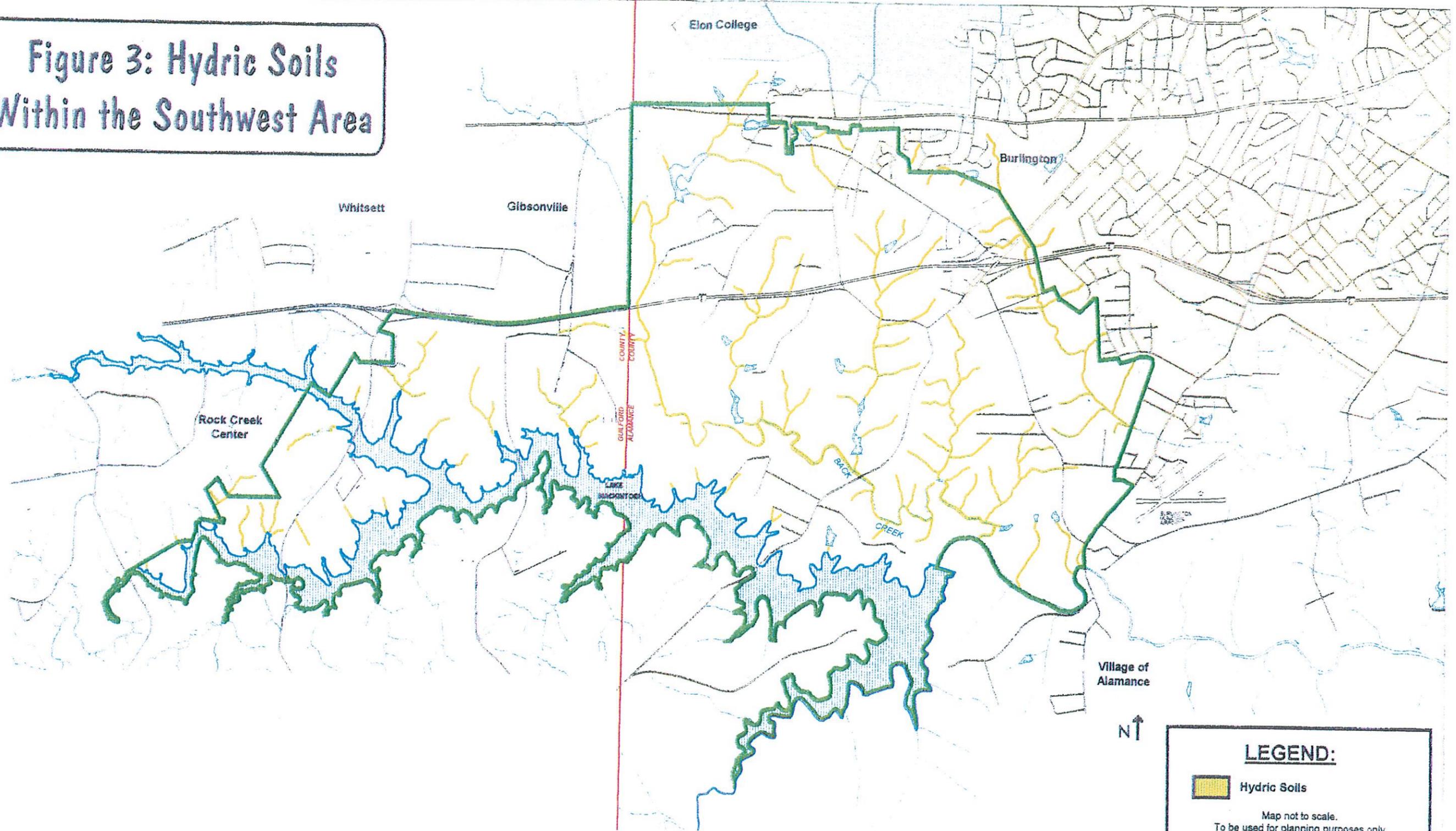
Most of the soils in the above soil associations are moderately deep to deep and are moderately well-drained to well-drained. Typically the soil profile consists of a sandy loam surface which grades downward into clay subsoils, to soft rock, and finally to hard unweathered rock. Another characteristic most of these soils share is their gently-sloping-to-steep sloping form. The gravitational pull down the slopes, along with the low load bearing strength of the soil make most of these soils very prone to erosion.

Drainage capacity and bearing capacity (ability of a soil type to support weight, such as buildings and roads), as well as the resource value of the soil (e.g. for building material, roadfill, agriculture) are determined by the soil type. Some soil types have properties which definitely limit their use. Expansive soils for instance, can cause damage to structures or building foundations in the form of cracking, heaving, shifting, or subsidence. Soils such as silts may become soft and settle when wet. Buildings and structures can often be modified to accommodate these soil limitations.

Land use decisions relative to soil suitability are dependent upon a number of considerations. These include: depth to bedrock, erodibility of soils, permeability, depth to water table, flood hazard, load bearing capacity, shrink-swell potential, and moisture retention. These soil characteristics and properties are shown in the attached table. This table is important for determining the limitations and potentials of each soil type and in making adjustments in land use, including urbanization. Soil-related failures can be avoided by adhering to the specific limitations to development associated with each soil type, and by incorporating stringent erosion control practices. Using the table and soil maps, a site where soil properties are favorable can be selected or practices that will overcome the soil limitations can be planned.

Alamance County has recently prepared a computer map of the hydric soils within the southwest area. The location of these soils are shown in Figure 3. The location of wetlands and hydric soils is helpful in evaluating the suitability of sites for growth and development and for developing the planning goals and policies of the southwest area.

**Figure 3: Hydric Soils
Within the Southwest Area**



LEGEND:

 Hydric Soils

Map not to scale.
To be used for planning purposes only.

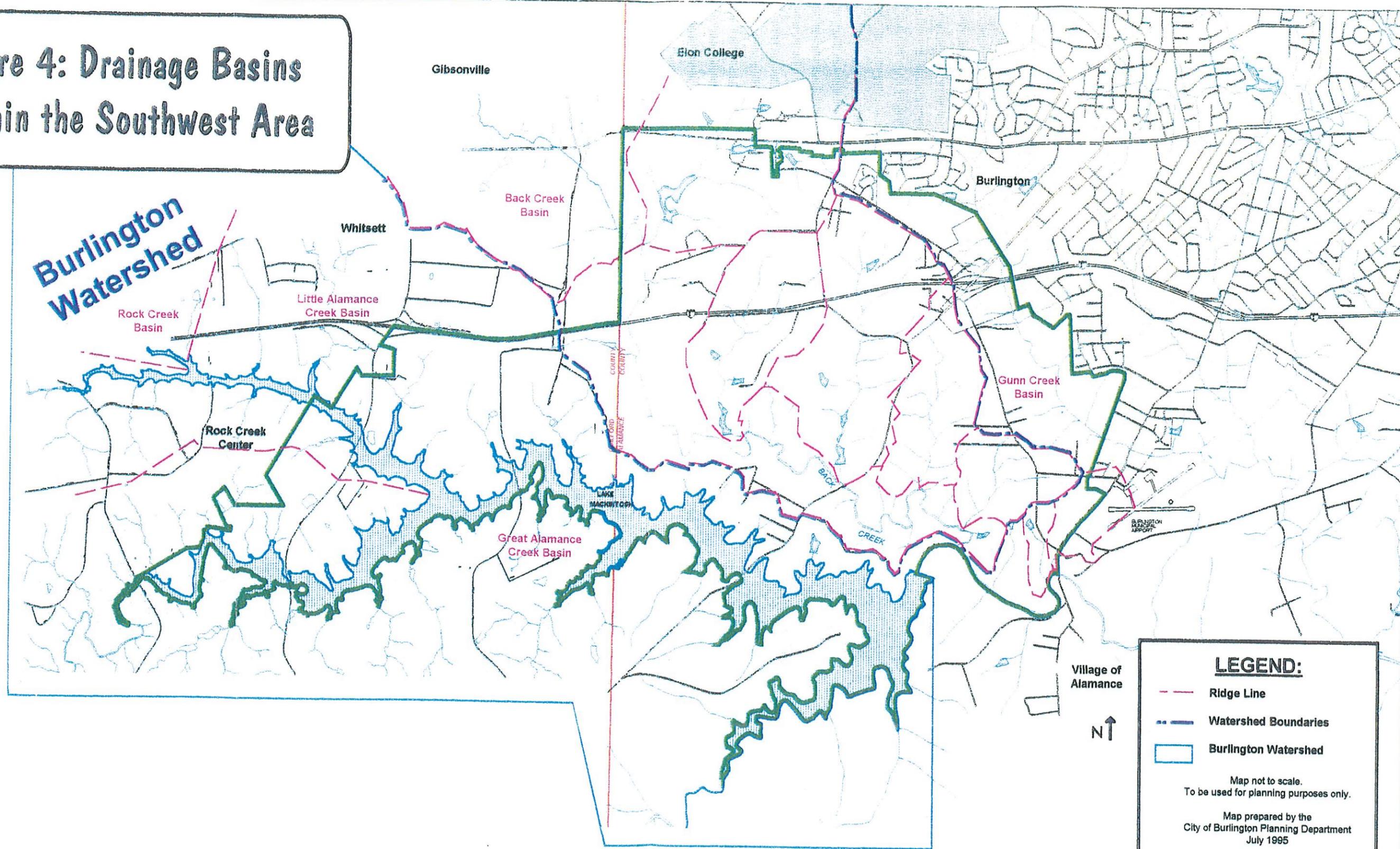
Map prepared by the
City of Burlington Planning Department
July 1995

**TABLE 3:
SOIL ASSOCIATIONS WITHIN THE SOUTHWEST PLANNING
AREA**

Soil Association	Enon - Lloyd	Enon - Iredell - Mecklenburg	Wilkes - Enon	Enon - Lloyd - Cecil	Helena - Vance - Appling	Iredell
Parent Material	Greenstone Schist	Greenstone Schist, Diorite	Sheared Granite, Greenstone Schist	Sheared Granite, Greenstone Schist	Sheared Granite, Gneiss, Schist	Diorite, Gneiss, Hornblende Schist
Description	Uplands - smooth to hilly terrain. Moderately well-drained - light olive-brown to dark reddish brown surface soils with brown to dark red subsoils.	Uplands - smooth to steep terrain. Well-drained - light olive-brown to very dark reddish brown surface soils with olive brown and yellowish subsoils.	Uplands - smooth to steep terrain. Well-drained - gray and light olive-brown surface soils with mottled light gray and olive-brown subsoils.	Uplands - smooth to steep terrain. Well-drained - light olive-brown to brown surface soils with brown to dark red subsoils.	Uplands - smooth to steep terrain. Well-drained - gray, grayish-brown and yellowish brown surface soils with strong brown, and yellow subsoils.	Uplands - smooth terrain. Moderately well-drained - very dark brown surface soil; brown subsoil.
Range in Slope	2% to 25%	2% to 15%	2% to 25%	2% to 25%	2% to 25%	0% to 10%
Depth to High Water Table	8 ft. +	1 to 8 ft. +	8 ft. +	8 ft. +	1.5 to 8 ft. +	1 to 2 ft.
Depth to Bedrock	3 to 8 ft. +	3 to 15 ft.	1 to 10 ft.	3 to 15 ft.	5 to 15 ft.	2 to 8 ft.
Depth From Surface	0 to 96 inches	0 to 60 inches	0 to 48 inches	0 to 96 inches	0 to 96 inches	0 to 60 inches
Natural Drainage	Good	Moderately Good to Good	Enon - Good Wilkes - Excessive	Good	Moderately Good to Good	Moderately Good to Good
Permeability of Subsoil	Slow to Moderate	Very Slow to Slow	Variable to Slow	Slow to Moderate	Slow	Very Slow
Shrink-Swell Potential	Enon - High Lloyd - Low	High to Very High	Moderate to High	Low Enon - High	Low to Moderate	Very High
Limitations to Development	Erosion	Erosion, Low Permeability, Instability of Clay Subsoils	Erosion, Low Permeability, Instability of Clay Subsoils	Erosion	Erosion	Erosion, Low Permeability, Instability of Clay Subsoils
Road fill	Poor to Fair	Poor	Poor	Poor to Fair	Poor to Fair	Poor
Topsoil	Fair	Poor to Fair	Poor to Fair	Enon - Poor to Fair Lloyd/Cecil - Fair to Good	Good Vance/Helena - Not Suitable	Poor
Borrow Material	Fair	Fair Iredell - Not Suitable	Fair	Fair	Fair	Not Suitable
Earth Dams	Fair to Good	Fair to Good	Poor to Good	Fair to Good	Good	Good
Farm Ponds	Frequent Rock Outcrops	Frequent Rock Outcrops	Frequent Rock Outcrops	Occasional Rock Outcrops	Occasional Rock Outcrops	Occasional Rock Outcrops
Septic Tank Fields	Enon - Severe Lloyd - Moderate	Severe	Severe	Moderate Enon - Severe	Moderate Helena/Vance - Severe	Severe

Source: Soil Survey of Alamance County, North Carolina, U.S. Department of Agriculture, Soil Conservation Service, April, 1960.

**Figure 4: Drainage Basins
Within the Southwest Area**



LEGEND:

-  Ridge Line
-  Watershed Boundaries
-  Burlington Watershed

Map not to scale.
To be used for planning purposes only.

Map prepared by the
City of Burlington Planning Department
July 1995

Hydrology

Surface Water

The natural surface hydrology of the southwest area is controlled mainly by the major streams and tributaries of the Alamance Creek Watershed. Great Alamance Creek, from its source to its confluence with Little Alamance Creek (in Alamance County) is the main stem of this drainage system. Main tributaries are Little Alamance Creek (in Guilford County), Back Creek (located in both Guilford and Alamance County), and Gunn Creek (in Alamance County). It should be noted that two separate streams with the same name exist (i.e. Little Alamance Creek), but each stream is located in two different counties and two different drainage basins.

In fact, the Great Alamance Creek drainage area can be divided into three separate basins: the Little Alamance Creek basin (Guilford County); the Back Creek basin; and, the Gunn Creek basin. Together these creeks form the major drainage pattern of the southwest area (Refer to Figure 4). Following the topography of the region, the natural drainage flow of the area is from the northeast to the southeast. Great Alamance Creek flows to the southeast and empties into the Haw River, south of the City of Graham.

Great Alamance Creek and the Lake Mackintosh reservoir account for almost 40 to 45% of the southwest planning area. Both Lake Mackintosh and Alamance Creek are topographically separated from the Back Creek and the Gunn Creek basins by a natural drainage divide or ridge line located midway between Back Creek and the northern shoreline of Lake Mackintosh (See Figure 4). All the tributaries, perennial streams and draws located to the south of this ridge line drain directly into Lake Mackintosh. Further to the northwest, the Town of Whitsett, the Rock Creek Corporate Center, as well as Stoney Creek and the Stoney Creek residential community ultimately drain into the Little Alamance Creek and Lake Mackintosh.

Lake Mackintosh is a primary water supply reservoir for the City of Burlington and other surrounding municipalities. The reservoir was completed by the City in early 1993. Between 1971 and 1984, the City of Burlington purchased approximately 1,878 acres of land along Great Alamance and Little Alamance creeks to develop the lake (949 acres in Guilford County and 929 acres in Alamance County). The land purchased includes both the area of the reservoir itself as well as a buffer zone (approximately 753 acres located around the shoreline of the lake). The buffer zone extends beyond the shoreline to an elevation of 560 feet. The reservoir includes a total of 1,125 acres of surface water and 60 miles of shoreline. It is the largest reservoir in Alamance County and eastern Guilford County. With a plentiful supply of water (a volume of 7.5 billion gallons) and opportunities for recreation, Lake Mackintosh is the most important lake in the region.

The drainage area of Lake Mackintosh (the Burlington Watershed) covers a land area of 135 square miles. Most of the watershed and the lake itself is located in eastern

Guilford County. Protecting the critical watershed area surrounding Lake Mackintosh is an important public responsibility. The current State water quality classification of Lake Mackintosh is WS-IV (See discussion on watershed protection for information regarding this classification).

The Back Creek Basin is the next important drainage feature within the southwest planning area. Located directly north of Lake Mackintosh (See Figure 4), the Back Creek basin includes a land area of approximately 4,100 acres, or roughly 50% of the southwest area. This basin also contains many smaller tributaries, streams and ponds, which can be further divided into six subbasins (See Figure 4). The streams in each of these subbasins drain mostly from north to south, emptying into Back Creek at almost right angles into the main watercourse.

The headwaters to Back Creek are located between the Towns of Gibsonville and Whitsett in eastern Guilford County. The creek flows under I-85/40 near the existing rest stop and ultimately drains directly into Great Alamance Creek, directly south of the dam for Lake Mackintosh.

The Gunn Creek basin, located primarily west of St. Mark's Church Road, Garden Road and Kirkpatrick Road, occupies only a small portion of the southwest area. Most of this drainage basin is developed at urban densities. As a result, it carries the stormwater runoff from much of west Burlington. Gunn Creek flows from the northeast to the southeast emptying into Great Alamance Creek, southeast of the Village of Alamance.

Subsurface Water

Ground water provides a relatively large percentage of the planning area water supply due to the lack of available public water service. Approximately 73% of the population is served by wells, while the remaining 27% are served from surface sources. Yields of wells in Alamance County range from 0-75 gallons per minute, which is typical for the upper Piedmont area of North Carolina. However, ground water production from wells is dependent upon several factors including the geologic unit which underlies the well, the depth to rock, and the topographic location of the well. As described previously, the southwest area is underlain by three basic rock formations.

The greenstone schist is the main rock type and is the best aquifer in the watershed. The movement of ground water through this rock is along planes of cleavage, fractures, and joints. At most places, these planes are well developed and provide important channels of ground water movement. Generally, the greenstone schist is deeply weathered and drilling is fairly easy. Yields from wells vary according to topographic location with best yields coming from low lands such as valleys, draws, and flat areas.

Slate, on the other hand, has a slightly lower yield, on average, than the greenstone schist. The ground water movement also occurs along planes, fractures,

joints, and along quartz veins. Most of these openings occur near the surface. Similar to the greenstone schist, yields from wells also vary according to topographic location. Wells drilled on slopes, in draws, and valleys have an average yield per foot of well nearly four times that of wells drilled on hills.

The sheared granite formation which covers several smaller portions of the southwest area yields an average amount of water. The average thickness of this water-bearing rock is less than 50 feet with water occurring primarily in fractures and joints. Like the greenstone schist and slates, topography plays an important role in the yield obtained from wells in this aquifer.

No clear-cut relationship exists between the geology in the area and ground water quality; this is due to the mixture of rock types within the area and the lateral movement of ground water the many rock types. Generally, groundwater in the area is of good quality and suitable for most domestic, municipal and industrial uses. It is unknown if any sources of groundwater pollution exist.

Vegetation

The natural vegetation in the southwest area is fairly typical of the central Piedmont and other parts of Alamance County, both in content and integrity. A majority of the area in nonresidential or nonagricultural use is in some stage of secondary succession. Existing vegetation has developed due to the natural succession process from the original primary forest which was predominantly oak-hickory. The succession process began when the land was developed for agricultural uses, then later abandoned. These fields soon became established stands of pines and later deciduous trees. Examples of old field succession can be seen in the stands of pines along Huffman Mill Road, Buckhill Road, and within many of the interior dry uplands sites of the planning area.

Generally, the tree species found in the southwest area can be divided into three common groups according to topographic location and drainage: the bottomland, the lower slopes, and the upper slopes. The best hardwood forests and exemplary plant communities are associated with the alluvial forest which grows primarily on along narrow and broad flats commonly found in floodplain areas. The alluvial or bottomland forest can be found in a significant number of locations within the area, particularly along Little Alamance Creek (Guilford County), Great Alamance Creek, and Back Creek and its tributaries. The tree canopy in these forests consist mainly of sweet gum, yellow poplar, swamp oak, water and willow oaks, hickory, sycamore, elm, and black gum, with a common understory growth of dogwoods, ironwood and alder (See Table 4, which lists tree species by forest type and location).

The most common communities of trees and plant life located in the area are associated with the Dry Mesic Oak-Hickory Forest and the Mesic Mixed Hardwood Forest. Mature stands of these forests are scattered throughout the southwest area and are

most frequently found on the upper to mid and mid to lower slopes and banks of the major creeks, streams and ponds within the region. Although none of these forests are virgin, large relatively mature canopies can be found along the shoreline of Lake Mackintosh and along the midslopes of Back Creek and its tributaries. White oak, black oak, red oak and hickories dominate the canopy in the Dry Mesic Oak-Hickory Forest, whereas beech, tulip tree and red maple dominate Mesic Mixed Hardwood Forests.

The upland areas and ridge crests are typically covered by the Dry Mesic Oak-Hickory Forest, which consists mostly of oaks, hickory and pines (See Table 4). This shortleaf pine-hardwood forest is found in many scattered locations throughout the southwest area. Most of the large stands of shortleaf pines are those that have revegetated from old fields. The remaining forested areas contain a mixture of both shortleaf pine, white oak, black oak, southern red and scarlet oaks, yellow-poplar, hickory, and other various hardwoods. It is not uncommon to find that these stands of pine and mixed hardwoods have a thin under-story of eastern red cedar. Virginia pine also intrudes into many stands of the shortleaf pine and hardwoods.

The existence of any sensitive or significant natural vegetation, unique plant growth, or any stands of specimen trees, trees of visual significance or champion trees, has gone largely undocumented in the southwest planning area. Except for several sites identified along Little Alamance Creek and Great Alamance Creek (now Lake Mackintosh) in eastern Guilford County (See *Natural Areas Inventory, Guilford County, 1991*), the remaining forested areas and ecological resources of Alamance County have gone largely unsurveyed. Alamance County to date has been reluctant to fund any form of participation in the North Carolina Natural Heritage Program. As urban growth creeps west and southward into the region, much of the remaining natural vegetation and forestland will likely be cut, graded and destroyed. Urbanization of the southwest area could be damaging to the important alluvial forests and the riparian environments of Back Creek and the tributaries to Back Creek. These areas offer prime habitat for wildlife in terms of feeding, nesting, and refuge areas.

Vegetation also plays an important role in maintaining the streamside ecosystem. Root systems help prevent channel erosion and soil loss from stream banks and adjoining floodplain areas, especially during periods of increased stream flow. Destruction of the streamside ecosystem may also contribute to higher rates of erosion and can negatively impact the water quality of adjacent streams. Other important functions of riparian vegetation are to provide wildlife habitats, to minimize flooding, to recycle nutrients, and to act as noise and visual buffers between roads and developed residential areas.

**TABLE 4:
TREE SPECIES, LOCATION AND ASSOCIATED FORESTS IN THE
SOUTHWEST PLANNING AREA**

Bottomland- Alluvial Forest		Lower to Upper Slopes -Mesic Mixed Hardwood & Dry Mesic Oak-Hickory Forest		Upper Slopes - Dry Oak-Hickory Forest	
<u>Trees</u>	<u>Understory</u>	<u>Trees</u>	<u>Understory</u>	<u>Trees</u>	<u>Understory</u>
River Birch	Dogwood	White Oak	Dogwood	White Oak	Dogwood
Yellow Poplar	Ironwood	Post Oak	Sourwood	Post Oak	Sourwood
Sweet Gum	Alder	Southern Red Oak	Red Cedar	Southern Red Oak	Red Cedar
Sycamore		Eastern Red Oak		Eastern Red Oak	
Willow Oak		Scarlet Oak		Scarlet Oak	
Black Walnut		Black Oak		Black Oak	

Source: Environmental Impact Statement for the Great Alamance Creek Water Supply Project, City of Burlington, 1976; and Natural Areas Inventory, Guilford County, 1991.

Wildlife

A wide variety of wildlife can be found within the southwest area including beaver, raccoon, fox, opossum, skunks, box turtles, snapping turtles, deer, rabbits, snakes, weasels, field mice, chipmunks and squirrels. Several bird species occur including non-game birds or song birds, game birds, and predator birds (See Table 5, Song & Game Birds Found in the Southwest Planning Area - this table is not an exclusive list, many species are migratory or seasonal and most appear in specific areas). It is unknown if any rare or endangered animal species exist in the region.

Wildlife is important to the community not only for aesthetic and educational purposes; it also provides recreation and food, especially in the rural areas. As discussed previously, alluvial forests and streamside ecosystems are important prime wildlife habitat areas. These densely vegetated areas provide the necessary requirements of food, cover, range, and nesting sites. The identification and protection of these prime wildlife habitats should be an important consideration when planning for the future land use and development of the region.

The protection and continuity of prime wildlife habitat areas can be achieved through the preservation of open space corridors along the large creeks and streams in the area. Most animal species can coexist with development if site design and revegetation incorporate plant materials favorable to the protection of these open space or greenway

corridors. Hunting, however, can continue to present problems when permitted to occur near residential areas. Stricter enforcement of hunting laws must be carried out if designated wildlife areas are established and public access to these areas increase with greater development of the region.

**TABLE 5:
SONG & GAME BIRDS FOUND IN THE SOUTHWEST PLANNING
AREA**

<u>Songbirds</u>	<u>Game Birds</u>
Grackle	Bobwhite quail
Starling	Wild Turkey
Red-wing Blackbird	Mallard
Meadowlark	Wood Duck
Yellow-bellied Sapsucker	Ring-necked duck
Red-headed Woodpecker	Mourning dove
Hairy Woodpecker	Sparrow Hawk
Downy Woodpecker	Marsh Hawk
Flicker	Screech Owl
Robin	Barn Owl
Warbler	Barred Owl
Cardinal	
Mockingbird	
Evening Grosbeak	

Source: Environmental Impact Statement for the Great Alamance Creek Water Supply Project, City of Burlington, North Carolina, 1976.

Archeological and Historic Sites

An Archeological Reconnaissance of the Great Alamance Creek Water Supply Project Region was completed for the Lake Mackintosh reservoir by Wake Forest University in 1975. This survey is the only known research conducted on the existing archeological resources of the southwest planning area. From this study, a total of 92 archeological sites were found and recorded. Roughly 85 of these sites are now inundated by Lake Mackintosh.

Most of the prehistoric sites surveyed were primarily hunting camps used by Indians of the Archaic and Woodland periods. Many of the older sites are generally located along the lower reaches of Great Alamance Creek in places where the floodplain widens. Although it should be noted that these sites are not necessarily in the floodplain, but often occur in the hills behind them. The other archeological sites identified include one historic period cemetery and two old mills, which are now located under Lake Mackintosh.

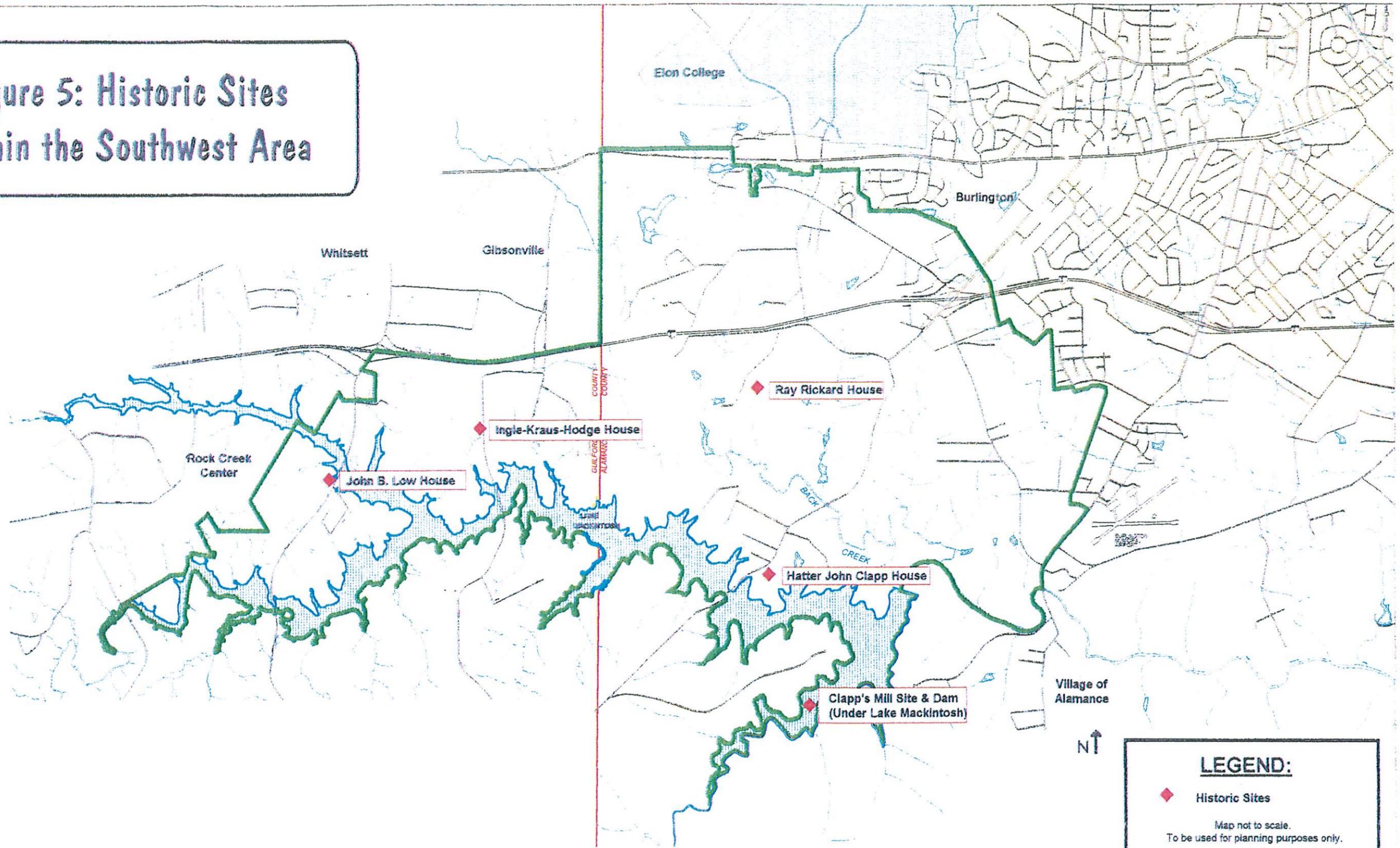
Further detailed information about the archeological sites of the region can be obtained from the North Carolina Department of Cultural Resources, Division of Archives and History in Raleigh.

Information about the significant historic sites located in the area can be obtained from the Alamance County and the Guilford County Historic Properties Commissions. A list of the identified sites is provided in Table 6. The general location of each site is shown in Figure 5.

Of relative historic significance is the "Battle of Clapp's Mill" which took place on March 2, 1781 within the area. This skirmish has received considerable attention recently for its importance as the inevitable conflict that could have ended the revolutionary war. As it was however, the British troops of General Lord Cornwallis (who were camped south of the present Lake Mackintosh along Great Alamance Creek) did not fall for the entrapment posed by General Nathaniel Greene and his troops (who lay in ambush readiness in locations along the present Huffman Mill Road, north of the bridge over Lake Mackintosh to Interstate 85). A memorial marker of the running skirmish which did occur has been dedicated at Burlington's Lake Mackintosh Park and Marina.

To help protect the character of this historic area, a "compatibility land use fringe" could be established along Huffman Mill Road, north of the existing watershed, to limit development to low density residential and non-residential uses that are compatible with the existing structures and land use of the area. Another possibility that could help both the historic and rural/recreational character of the area is to establish a 35 mph speed zone on Huffman Mill Road from the current City limits southward to Lake Mackintosh.

**Figure 5: Historic Sites
Within the Southwest Area**



LEGEND:

- ◆ Historic Sites

Map not to scale.
To be used for planning purposes only.

Map prepared by the
City of Burlington Planning Department
July 1995

**TABLE 6:
IDENTIFIED HISTORIC RESOURCES
WITHIN THE SOUTHWEST PLANNING AREA**

August, 1994

Alamance County Sites:

A-7-2	Hatter John Clapp House (probably National Register Eligible)
A-7-4	Ray Rickard House
A-8-8	Clapp's Mill Dam (under Lake Mackintosh)

Southeast Guilford County Sites:

26	Ingle-Kraus-Hodge House
33	John B. Low House

Note: Sites A-7-1, A-7-2 and A-8-1 and the Clapp Mill Battlefield Memorial at Lake Mackintosh could probably qualify for a "Clapp Family" National Register Multiple Listing.
Source: Architectural Resources: An Inventory of Historic Architecture, North Carolina Department of Cultural Resources, Division of Archives and History, 1979 and the Alamance County Planning Department.

IV. AREAS OF ENVIRONMENTAL CONCERN

Water Quality

The City of Burlington and residents of the southwest planning area are fortunate to have an abundant supply of relatively good quality water. However, uncontrolled urban growth can have a serious impact on water quality. Good water quality is critical to the health of both the human and the natural environment. Clean water is also one of the most valued factors in many national business surveys concerning relocation decisions.

The southwest planning area does not currently have any significant water quality problems. In fact, the water quality of Alamance Creek (Lake Mackintosh) is presently considered to be good. Raw water taken from the lake currently meets all federal and state standards for treated water, despite minor odor problems caused by algae growth. However, the City of Burlington will likely be faced with a number of water quality management issues in the near future. Continuing population growth within the region, changing land uses, and increasing industrial development can cause significant water quality degradation. In addition, there will always be the potential threat of spills of hazardous materials and illegal dumping which could degrade the drinking water quality of the lake. Many hazardous chemicals can not be identified as part of the City's ongoing water quality testing program. Continual improvements to these testing procedures will be necessary to insure high quality drinking water. Some of the other key water quality management issues could be:

- How much waste assimilative capacity is currently left within the area's existing receiving waters for new and expanding discharges, if any?
- What should be done if this capacity has been exhausted?
- How much capacity should be set aside for future expansions and/or new discharges?
- What impact will these decisions have on municipal growth and industrial development?
- What is the relative contribution of nonpoint source runoff on water quality problems and to what extent will it affect future point source allocations?
- How can the amounts and sources of nonpoint source pollution be accurately determined?
- Can Burlington successfully safeguard access to, the use, and the security of Lake Mackintosh?

Assessing water quality is a complex task involving many variables. The NC Division of Environmental Management (DEM) utilizes two principal methods. One is a chemical assessment called the Water Quality Index (WQI) which combines thousands of measurements of dissolved oxygen, bacteria, nutrients, and toxic substances into a single numerical value. The other is a biological assessment which evaluates the variety and the number of organisms living in the water.

From information provided by the most recent water quality study of Alamance County's water supply (NC Division of Community Assistance, 1986), of the seven chemical monitoring stations that collect data for the WQI in the county, only two stations have excellent ratings: Haw River at Ossippee; and Little Alamance Creek at Bellemont. The station at Haw River at Swepsonville has a good-fair rating, while all the other three stations on the Haw River have a poor rating. These WQI ratings are consistent with the data that has been recorded at these seven stations since 1980. No chemical monitoring stations exist for the streams and creeks within the southwest planning area, except for the City of Burlington's water treatment plant located on Lake Mackintosh.

From a biological analysis most of the streams feeding into the Haw River are rated good-fair. Within the southwest planning area, Little Alamance Creek (in Guilford County) is rated fair and Gunn Creek is rated poor. Great Alamance Creek or Lake Mackintosh is rated good-fair. No biological assessment has been performed for Back Creek or any of its tributaries within the southwest area.

As of May 14, 1992, the following surface water quality classifications have been established by the North Carolina Environmental Management Commission (EMC) for Lake Mackintosh and the major creeks and streams in the southwest area (See Table 7 below).

**TABLE 7:
SURFACE WATER QUALITY CLASSIFICATIONS OF
STREAMS & LAKES IN SOUTHWEST AREA**

<u>Water Body</u>	Classification
Lake Mackintosh (Great & Little Alamance Creek) (from source to Lake Mackintosh dam)	WS-IV
Back Creek (from source to Great Alamance Creek)	C NSW
Gunn Creek (from source to Great Alamance Creek)	C NSW

Source: North Carolina Environmental Management Commission, 1992.

Class WS-IV refers to waters protected as water supplies which are generally in moderately to highly developed (urbanized) watersheds. Discharges are restricted primarily to recycled (closed loop) systems that only discharge in response to 10-year storm events and other stormwater discharges. Domestic wastewater discharges and treated industrial wastewater discharges as well as new industrial connections and expansions to existing municipal discharges with a pretreatment program are permitted;

however, no new industrial wastewater discharges are allowed in the watershed critical area. Local ordinances and land management programs to control nonpoint source pollution are also required in all class WS-IV watershed areas.

Class C waters refer to waters which are suitable for uses which include aquatic life propagation and survival, fishing, wildlife, secondary recreation, and agriculture. The NSW supplemental classification indicates that the stream contains nutrient sensitive waters which require limitations on nutrient inputs.

Generally, water pollutants are grouped in five categories: oxygen reducing substances (organic waste), bacteria, sediment, nutrients, and toxic substances. These pollutants enter surface waters from two sources: point and nonpoint. Point source pollution comes from a fixed point, usually a pipe discharging to a stream. Point sources typically include industries, schools, and wastewater treatment plants.

Nonpoint sources of pollution do not come from a fixed point or source. They are closely associated to land disturbing activities such as construction, agriculture and mining. Once soils are disturbed they are vulnerable to runoff. Rainfall carries soil and chemicals in those soils to nearby streams. Nearly one third (1/3) of all pollutants in streams and nearly one half (1/2) of all pollutants in lakes come from nonpoint sources. Urban runoff from nonpoint sources contribute most of the lead, copper and zinc into receiving streams. Most of these chemicals come from roadways, parking lots, and paved storage lots and are flushed into waterways during rain storms. In comparison studies of point and nonpoint sources of toxic substances in Burlington, nearly all of the lead, 56 percent of the copper, and 73 percent of the zinc came from nonpoint sources (DCA, 1986).

Poor water quality can also be caused by organic substances, such as bacteria, algae or viruses, or by minerals dissolved from rock. Excess nutrients, particularly nitrogen and phosphorus, can also lead to the growth of algae bloom in lakes and reservoirs. This process, called eutrophication, can severely reduce the quality of a water supply. Nearly half of all of these two nutrients come from fertilizers that are washed into streams along with soils from croplands. Algae blooms can create taste and odor problems in drinking water supplies and make more expensive water treatment necessary. Large masses of algae also create nuisance conditions for water-based recreation and may clog water treatment plant filters. As masses of algae die and decompose, they may release foul odors, sometimes depleting the dissolved oxygen (BOD) in the water and causing fish kills.

Local government actions to help improve the area's water quality should include the following strategies:

- Support soil conservation plans to minimize erosion from agricultural land;
- Encourage the development and use of on-site industrial pretreatment programs;
- Require and maintain an updated hazardous materials inventory;
- Develop and implement emergency spill containment plans;
- Implement storm water control measures which require on-site detention;
- Implement and enforce a minimum 50 ft. vegetative buffer adjacent to all streams and creeks;
- Continue to support and strengthen the State's watershed regulations;
- Develop specific impervious surface area requirements for new development;
- Encourage industrial development to locate in areas which are not in water supply watersheds;
- Develop a local comprehensive stormwater management program and stormwater utility;
- Require strict enforcement of local sedimentation/erosion control ordinances.

The Water Quality Section of DEM is currently in the process of preparing a Basinwide Management Plan for the Cape Fear River Basin (the upper reaches of which will include the southwest planning area). This plan (to be completed by January 1996) will be of tremendous help to local government in identifying existing and future water quality problems; developing appropriate management strategies; maintaining and protecting water quality and aquatic habitat; assuring equitable distribution of waste assimilative capacity for discharges; and, improving public awareness and involvement in water quality management.

Watershed Protection

The quantity and quality of the southwest area's water resources are affected by what happens not only to the streams and creeks, but also to the entire watershed drained by these watercourses. Water quality expert, Dr. David Moreau warns, "It is clear that if you allow these watersheds to develop to urban densities, the likelihood is you're going to lose these as public water supplies." Since early in this century, efforts to provide safe drinking water at the local government level have focused on water treatment. Only recently has local government clearly recognized that land management must be coupled with water treatment, if public health and safety are to be protected.

One of the critical watershed protection issues for the City of Burlington is that the watershed area for Lake Mackintosh is located almost entirely outside of Burlington's existing City limits and its extraterritorial land use jurisdiction. In fact, the watershed area is located almost entirely within Guilford County (99.0%), with a small portion located in Alamance County (0.9%) and Randolph County (0.1%). As a result, the City of Burlington must rely predominantly upon other local governments and the State to provide the watershed protection for the City's primary drinking water source.

The State's new watershed protection rules, however have only been in effect at

the local level for less than one year. Prior to their final adoption, much concern was and is still expressed about the tradeoffs in watershed protection and economic development.

One of the most important decisions that had to be made by the State Environmental Management Commission (EMC) was the final classification of the Lake Mackintosh watershed. The water supply watershed rules outline four main regulatory classifications: WS-I, WS-II, WS-III and WS-IV, each of which have varying requirements for allowable wastewater discharges, land development densities, and other allowable activities. The rules also establish a "critical area" surrounding all water supply reservoirs. The critical area is measured from the normal pool elevation (shoreline) extending a minimum of 1/2 mile or to the nearest watershed ridge line, whichever is less, in all directions draining to the reservoir. For water supply intakes located in a stream or river without an impoundment, the critical area is 1 mile or the watershed ridge line.

Within the watershed classification system, WS-I watersheds are the most protected. In WS-II through WS-IV classifications, restrictions vary. For example, in the WS-II classification, only existing dischargers qualifying for an NPDES permit are allowed, while in WS-III watersheds, no new dischargers (nor any industrial development at all) are permitted within the critical area, and only domestic and non-process wastewater dischargers are permitted in the balance of the watershed. In WS-IV watersheds, these requirements are less severe in that industrial development is allowed to occur anywhere within the watershed, although no new industrial dischargers are allowed within the critical area. WS-IV watersheds, in general, are the least restrictive and thus provide the least protection under the State's water supply protection rules.

Since as early as 1989, when the first watershed rules were proposed by the State, Burlington City officials have been attempting to obtain a WS-II or WS-III classification for Great Alamance Creek or Lake Mackintosh. In the first round of reclassifications initiated by the EMC, Great Alamance Creek was originally assigned a WS-II classification. However, the General Assembly later acted to adopt new water supply watershed classifications rules which had the affect of changing this classification. This action was taken primarily due to mounting concerns about the protection of sources of public water supply in the face of escalating pressures on such watersheds for urban development.

In 1991, the City of Burlington again sought a more protective classification for Lake Mackintosh, a WS-III. However, Guilford County and the City of Greensboro, recommended not to approve the Burlington's WS-III recommendation because it would be too restrictive for the future growth and development of the watershed, particularly the Stoney Creek residential development and the existing Rock Creek Corporate Center, which are both located in Guilford County. In a memo to the Guilford County manager, the Planning Director for Guilford County stated that *"a WS-III classification should not be supported by Guilford County because it is about two orders of magnitude beyond our current regulatory position."* Additionally, the Mayor of the City of Greensboro

stated that Greensboro "is finalizing the extension of sewer service to the southeast area of the county to solve septic tank problems and that the cost effectiveness of making these improvements would not exist if development was limited as proposed in the WS-III classification".

After a final public hearing on the issue, the EMC in 1992 adopted a WS-IV classification for the Great Alamance Creek (Lake Mackintosh) Watershed much to Burlington's dismay. In an explanation of this decision to the City of Burlington, the Chief of the State Water Quality Section stated that "Great Alamance Creek was reclassified as a WS-IV watershed by the EMC due to the existing land use within the watershed; the I-85 corridor traverses the watershed, including the critical area of Lake Mackintosh, and most significantly, there is a large industrial park located in the critical area; and, the EMC considered the level of existing development to be compatible with the WS-IV watershed definition in the Water Supply Rules." No right of appeal is presently available to the City of Burlington regarding this classification.

In comparing the local watershed protection ordinances today between Guilford County and Alamance County, the Alamance County regulations provide substantially greater protection to the drinking water quality of Lake Mackintosh than do the Guilford County regulations. One of the major differences between the two ordinances is that Alamance County has elected to maintain a one mile critical area around all of its water supply reservoirs, instead of the 1/2 mile minimum required under the State's watershed regulations. In addition, Alamance County prohibits industrial and commercial development within the watershed critical area, while the Guilford County ordinance and the State's minimum regulations for WS-IV watersheds do not.

In lieu of establishing a one mile or a half-mile water quality critical area, Guilford County has instead created a tiered approach to watershed protection. The first two tiers, extending up to 750 feet from the water's edge, generally are targeted for public acquisition to prohibit any new construction. However, when the county's watershed ordinance was originally adopted by the Guilford Commissioners, it failed to clarify whether this provision applied to any future public reservoirs, such as Lake Mackintosh. The owners and developers of the Rock Creek Corporate Center subsequently filed a ten million dollar lawsuit against Guilford County contending that prospective industrial tenants were scared away from their development for fear of having their property condemned by the county if they built within 750 feet of the future shoreline of Lake Mackintosh.

In the wake of this lawsuit, the Guilford County Commissioners amended or corrected the ordinance to specifically exclude all future public reservoirs (i.e. Lake Mackintosh) from the 750 foot acquisition provision until more than twenty-five percent (25%) of the watershed critical area becomes urban in character, by meeting any of the tests defined in NCGS Section 160A-48(c). Additionally, Guilford County agreed to a monetary out of court settlement with the Rock Creek Corporate Center for the purchase

of 46.2 acres of all the Tier 1 and Tier 2 property within the Rock Creek industrial park located along the shoreline of Lake Mackintosh.

This situation has been made more complex by the fact that the voters of Guilford County adopted a bond referendum for the specific purpose of acquiring all tier 1 and 2 properties around all City of Greensboro reservoirs and all tributaries leading to these reservoirs. Additionally, this bond package established a \$2 million dollar fund for the specific purpose of acquiring only tier 1 property around Lake Mackintosh in Guilford County. As of August 26, 1994, approximately 227 acres of tier 1 property around Lake Mackintosh have been acquired by Guilford County.

The Back Creek and the Gunn Creek subbasins located within the southwest planning area are not part of any existing or future water supply watersheds. Since these subbasins drain into Alamance Creek south of the Lake Mackintosh impoundment, they are not subject to the State's public watershed water supply rules nor the local Alamance County watershed protection ordinance.

Floodplain Protection

Newly revised floodplain ordinances have been recently adopted by the City of Burlington, Guilford County and Alamance County which apply to all private and publicly-owned property within the designated floodplain areas of each jurisdiction. Each ordinance contains floodway and floodway fringe provisions which meet the eligibility requirements of the National Flood Insurance Program, as administered by the Federal Emergency Management Agency (FEMA).

For communities to qualify for flood insurance, encroachments, including fill, new construction, and substantial improvements to existing development within the floodway of a water channel must be prohibited by local ordinance. Exceptions may be granted if it can be demonstrated through hydrologic and hydraulic analyses that the proposed encroachment would not result in any increase in the base flood elevation. Additionally, no new development is permitted within the floodway fringe, unless the lowest floor of the structure after encroachment (including basements and manufactured homes) is elevated at or no lower than one or two (2) feet above the base flood elevation of the 100-year flood (this decision is made locally as a means to reduce flood insurance premiums within the community). Although FEMA does not prohibit construction in the floodway fringe, development is generally discouraged. Development and floodplain filling can result in a major loss of the storage capacity of flood waters, alter drainage patterns, and cause an increased velocity and volume of runoff. While development located on the filled floodway fringe is reasonably safe from flooding, areas downstream may experience increased flood heights and greater channel water velocity.

One of the major shortcomings of the FEMA program is that the regulations are based on existing conditions that do not take into account future upstream urbanization.

A new subdivision or building may be approved today in the lower reaches of a basin, yet upon future development of the upstream basin, the flood heights may rise significantly and flood the new development. This is all perfectly legal and within current regulations, and yet the tax payers will continue to pay for these post-regulatory flood damages. Common water law states that one cannot change the course of a stream or increase flood heights on his neighbor's property, but this requires a civil law suit and pits one landowner against another on a case-by-case basis.

At this time in the southwest planning area, few property owners have experienced flooding or stream bank erosion problems which can be attributed to upstream development. Low-lying areas along Great Alamance Creek, Little Alamance Creek, Back Creek, Gunn Creek and other streams included in this plan, flood periodically. Most of the flooding results from tropical storms and local thunderstorms. The largest flood of record within the planning area (a 20 year flood) occurred in October, 1954 on Gunn Creek.

However, as the region develops problems with downstream flooding and erosion may increase, particularly if filling of the floodway fringe occurs. Problems with flooding generally occur at two levels: drainage for specific lots or sites, and drainage for entire watersheds of creeks and streams. Drainage problems for individual lots are typically a function of slope, soil, and subsurface conditions and usually can be addressed through competent site planning and construction practices. With good land use planning and engineering design, watersheds and floodplain environments can be protected in a manner which can both accommodate development and protect private property.

The one hundred year floodplains of the major creeks and streams in the Alamance County portion of the southwest planning area were initially delineated by the U.S. Army Corps of Engineers (COE) in two studies published by FEMA (See Flood Insurance Studies: City of Burlington, 1980; and, Alamance County, 1987). Floodplain maps were also published by FEMA, at a scale of 1"= 1,000 feet. Although these studies are now out of date (due primarily to land use changes within each watershed and the creation of Lake Mackintosh), they are nevertheless still used today to establish the regulatory base flood elevations, floodways and floodway fringe areas (or special flood hazard zones) enforced in the local flood damage prevention ordinances.

Beyond the limits of the detailed floodplain studies mentioned above, additional studies have not been carried out by the COE. For any of the smaller tributaries and streams within each jurisdiction (such as the tributaries to Back Creek and Gunn Creek within the southwest planning area), FEMA has required that each local government adopt a minimum building setback requirement. This requirement varies from one local government to another. The City of Burlington requires that no building or fill material shall be located within a distance of the stream bank equal to five (5) times the width of the stream at the top of the bank or twenty (20) feet on each side from top of bank, whichever is greater. Alamance County, on the other hand, prohibits any encroachments, including fill, new construction or substantial improvements within a distance of the

stream bank equal to the setback established by the Coastal Area Management Act (CAMA) regulations. Where no setback is established by CAMA regulations, the area of no encroachment is twenty (20) feet on each side from top of bank, unless supporting technical data by a registered professional engineer is provided demonstrating that the encroachment does not result in any increase in flood levels during the occurrence of the base flood discharge.

Minimum building setback requirements are very important in other ways besides flood prevention and flood protection. The setbacks also serve to help maintain water quality by filtering out many sources of nonpoint pollution through existing natural streamside vegetation. Other benefits include the protection of existing alluvial forests and riparian vegetation; the protection of sensitive prime wildlife habitats; and, the provision of corridors of linear open space as a community grows. In evaluating the southwest area, it is important that all the area's perennial streams and tributaries are protected with a stream buffer of an adequate size and width which can meet the above objectives.

The current stream setback requirements as written in the floodplain ordinances for the City of Burlington, however are inadequate in that they do not satisfy all of the above objectives; particularly they do not prevent the removal of existing natural vegetation within the drainage setback area.

In Alamance County's land development ordinances, three different stream buffer requirements are enforced. In the subdivision ordinance, a stream buffer of a minimum of fifty (50) feet is required to be maintained at all times within new subdivisions (Section 64.442, pg. 15).

In the watershed protection ordinance, a minimum thirty (30) foot vegetative stream buffer is required along all the perennial waters and streams within designated watershed areas. Although the State Water Supply Rules (EMC, 1992) require that buffers be maintained around all perennial waters (solid blue lines on USGS 7.5 topo maps) with a minimum width of 100 feet; and the first 25 feet of the buffer is to remain as natural vegetation. In the county's floodplain ordinance, a twenty (20) foot no build area is established. When comparing all these requirements, it appears that a consistent and effective vegetative stream buffer requirement is needed in both the City and the county watershed, subdivision and floodplain ordinances.

Additionally, it should be noted that the floodplain and subdivision ordinances of Alamance County do not address the question of appropriate land use development within floodplain areas. In Alamance County, any type of residential and non-residential development of the floodplain is permitted provided it complies with the minimum standards of the floodplain ordinance. In the City of Burlington, the zoning classification of the property, as opposed to possible land use requirements in the floodplain ordinance, actually determine the allowable floodplain uses permitted. While Burlington's zoning is helpful, it is not entirely effective in preventing someone from requesting approval to

develop an undesirable commercial or industrial use, such as a gas station, landfill, a chemical storage facility, or a hazardous waste disposal site in a flood hazard area.

A more commonly used approach is to establish a special floodplain or resource conservation overlay district to all flood hazard zones. The overlay district and not the underlying zoning district outlines the specific uses of land and the development densities permitted within these flood prone areas. This approach can also be used as a means to control stormwater runoff by regulating the amount of allowed impervious surface area.

The FEMA is currently planning a major floodplain restudy of Alamance County to be conducted by the engineering firm of Hayes, Seay, Mattern & Mattern during the next twelve months. This restudy is greatly needed. The goal is to produce one series of new digital floodplain maps for the entire county as opposed to previous publications of separate maps for each government. This restudy would be timely for both the City of Burlington and Alamance County to adopt a floodplain overlay zone. Additionally, under FEMA's new Community Rating System (CRS), incentives are now available for communities to do more than just regulate development in the 100-year floodplain. The CRS allows lower flood insurance premiums for policy holders in communities that take additional measures to minimize flooding and flood damage. These measures include the implementation of approved local stormwater management programs (i.e. stormwater regulations). Credit can also be earned by carrying out an approved drainage system maintenance program.

Stormwater Management

Controlling the impact of stormwater runoff is a serious issue facing many local government officials. Citizens complain regularly about flooding caused by increased amounts of stormwater runoff. State and federal governments are mandating that local governments, industries, and citizens take measures to address the water quality impacts of stormwater runoff. Improved land use planning and best management practices are being promoted as measures to effectively manage stormwater runoff.

Urbanization, if not properly planned and managed, can dramatically alter the natural hydrology of an area. Buildings, roads, and parking lots--the manifestations of urbanization-- increase the amount of impervious surface in an area. Increased impervious cover decreases the amount of rainwater that can naturally infiltrate into the soil and increases the volume and rate of stormwater runoff. These changes lead to more frequent and severe flooding which can result in potential damage to property.

To decrease the impacts of stormwater runoff, developers can minimize the creation of impervious surface. By leaving as much natural or vegetated area as possible runoff is slowed enabling the natural processes infiltration and filtration to take place. Developers can also detain the runoff on-site to reduce peak flow rates, downstream flooding and erosion.

Draining runoff into a pipe as quickly as possible to prevent ponding is the traditional approach to stormwater management still commonly practiced by many municipalities in North Carolina, including the City of Burlington. Inlet structures, culverts, pipes and drainage channels are designed and sized to carry flows from a certain frequency rainfall event called the "design storm" - typically a 10-year, 24-hour frequency storm. This approach is not intended to minimize the quantity of stormwater runoff that is generated, reduce the peak rate of discharge, or prevent or control stormwater pollution. This approach is designed to move the stormwater from the urbanized area as quickly as possible. As a result, stream channels often require expensive modifications to convey the increased flows downstream and to control streambank erosion. As the frequency and severity of downstream flooding increases, the quality of receiving waters decreases.

The currently evolving approach to manage stormwater runoff is to use a comprehensive system. A comprehensive management system utilizes both preventive and control practices to achieve stormwater management goals. The main principle is to minimize the generation of runoff and pollutants. This is accomplished through a variety of on-site techniques which emphasize optimum site planning and the use of more natural drainage systems, rather than traditional piped systems. This "soft approach" includes both preventive measures (source reduction practices) and nonstructural practices (land management measures).

Source reduction practices consist of the following measures: local hazardous waste/chemical management ordinances; household hazardous waste and used oil collection centers/programs; exposure reduction techniques; preventive maintenance; spill control programs; public education and involvement; illicit connection elimination programs; erosion and sedimentation control programs; sanitary sewer system repair; street sweeping; catch basin cleaning; debris removal; landscaping and lawn maintenance controls; road salt application control; pet/animal waste collection; and, curb reduction/elimination.

One of the most effective means of controlling stormwater runoff is through effective land use planning. Managing the type, intensity and construction of development within a watershed can have positive effects on the quantity and quality of storm-water runoff. Sensitive areas such as floodplains, wetlands, water supply watersheds, and other natural areas which need attention can receive special planning protection. Land use plans can also designate the establishment of greenways along waterways. Green-ways serve multiple purposes including reducing flood flows and damage, providing recreation, filtering runoff, shading waterways and maintaining water temperatures, and providing habitat for wildlife.

Compact urban development is generally promoted as a means to avoid the costs of low density development, urban sprawl, more miles of roads, more air and water pollution from automobiles, loss of agricultural lands, and other problems. Therefore, communities should plan and require development to locate and cluster in areas more

suitable for development and away from sensitive areas.

However, highly compact development may require more use of engineered stormwater controls (i.e. wet retention ponds and other practices) if vegetated/natural areas are not available to filter runoff. Infrastructure planning also can have a major influence on the quantity and quality of stormwater runoff. The extension of new roads, water and sewer lines, and other infrastructure into a rural area will usually increase the density of development resulting in increased stormwater flows and pollution. As a result, extensions of infrastructure into sensitive watershed areas require careful planning.

Zoning ordinances, subdivision, floodplain and stormwater regulations, watershed protection ordinances and other land use controls are common tools used to implement plans, control runoff, and protect sensitive areas. Land use controls that are particularly helpful in managing runoff include: impervious surface limitations, minimum lot sizes, natural area/open space requirements, buffer zones/setbacks, landscape regulations, and tree protection requirements.

Stormwater control measures and other structural approaches to stormwater utilize the processes of detention/retention, settling, percolation, evaporation, evapotranspiration, filtration, adsorption, and biological uptake to reduce flows and remove pollutants. These practices can be very effective if properly sited, designed, constructed and maintained. Poor maintenance has been the key reason for the failure of these facilities in the past, particularly in the use of dry detention basins and wet retention ponds. Some of the more common stormwater control measures involve the use of (1) vegetative buffers, such as filter strips and grassed swales; (2) infiltrative devices, such as trenches and basins, recessed parking islands, and porous pavement; and, (3) detention/retention practices, such as dry detention basins, wet retention ponds, and artificial wetlands. Other control devices include sand filters, and oil and grease traps which are used to trap and remove pollution from the first flush of runoff from large buildings, access roads, and parking lots.

The State DEM requires the use of wet retention ponds to treat stormwater runoff in high density developments within water supply watersheds. Under the watershed protection rules, local governments must require wet retention ponds if they choose to permit high-density development within WS-II, WS-III, and WS-IV watersheds. These ponds must be designed to store runoff from the entire wet retention pond drainage area, not the development (built-upon) area only. Local governments are responsible for approving the final design of the pond and approving the operation and maintenance plan that is submitted by the developer. The developer is required to post financial assurance to assure necessary maintenance, repairs or reconstruction. Local governments must also inspect these facilities at least once a year to determine whether the controls are performing as they were designed. They can also require the facility owner to pay a fee for inspection. If the developer fails to adequately operate and maintain the facility, the local government can assume ownership and maintenance responsibility. However, it is unlikely the financial assurance funds will last for the life of the stormwater control

facility. Therefore, local governments have an option of establishing a stormwater utility as the most effective means to operate a stormwater management program. With a stormwater utility, all property owners pay a monthly user fee to cover the capital, operation, and maintenance costs of the entire program.

In 1990, the US EPA promulgated its final rules and regulations for the municipal stormwater National Pollutant Discharge Elimination System (NPDES) program under the Water Quality Act (WCA) of 1987. The purpose of this stormwater permitting program is to reduce and eliminate pollutants in stormwater runoff from municipal storm sewer systems and certain industrial activities. Unlike FEMA's floodplain management programs, which are strictly voluntary, EPA's water quality program is mandatory. Also, unlike the earlier point-source pollution abatement programs (sections 201 and 208 of the Water Quality Act, dealing with sewage effluent limitations) which had sizable Federal grants attached, the new stormwater NPDES program must be funded entirely by the local government.

Not only will local government have to address stormwater management, many for the first time, but they must now address stormwater solutions and controls. As an added burden, cities must also develop adequate funding sources to finance these new programs. The NPDES regulations mandate two phases for the municipal stormwater program. Phase I requires all separate municipal storm sewer systems in municipal areas with a population of over 100,000 or greater to obtain a permit from the State DEM to discharge stormwater into receiving waters. Currently, six municipalities in North Carolina are subject to this NPDES program. In addition, the NCDOT is attempting to obtain a statewide NPDES stormwater permit to cover all road and highway construction activities.

Under the Phase I permitting program, municipalities have followed a two part application process. The first part of the application requires municipalities to provide descriptive information about their storm sewer system (including the mapping of this system and its major drainage areas), as well as the provision of land use data, and the location of potential sources of pollution. The second part of the application focuses on monitoring the sources of pollution to the storm sewer system and developing a comprehensive stormwater quality management program addressing the community's specific needs.

Under Phase II of the program, the WCA expressly reserves the right to place the same requirements on smaller municipalities and counties under 100,000 in population. The EPA is currently working on reports to Congress outlining the additional areas and activities to be covered under Phase II of the program. In addition, reauthorization of the CWA is anticipated to include provisions which will affect these provisions. Indeed, it appears that the scope of the program may expand eventually and there will be additional storm water regulations affecting more urbanized areas.

The City of Burlington does not have a legal requirement to meet EPA regulations

at the present time. However, the Director of Public Works/Utilities recently recommended that the Planning and the Engineering departments develop and implement stormwater control strategies as well as requirements for all new development within the City. Given the development potential of the southwest planning area and the area's soils, geology and hydrology, this recommendation is timely and should be acted upon in a responsible manner.

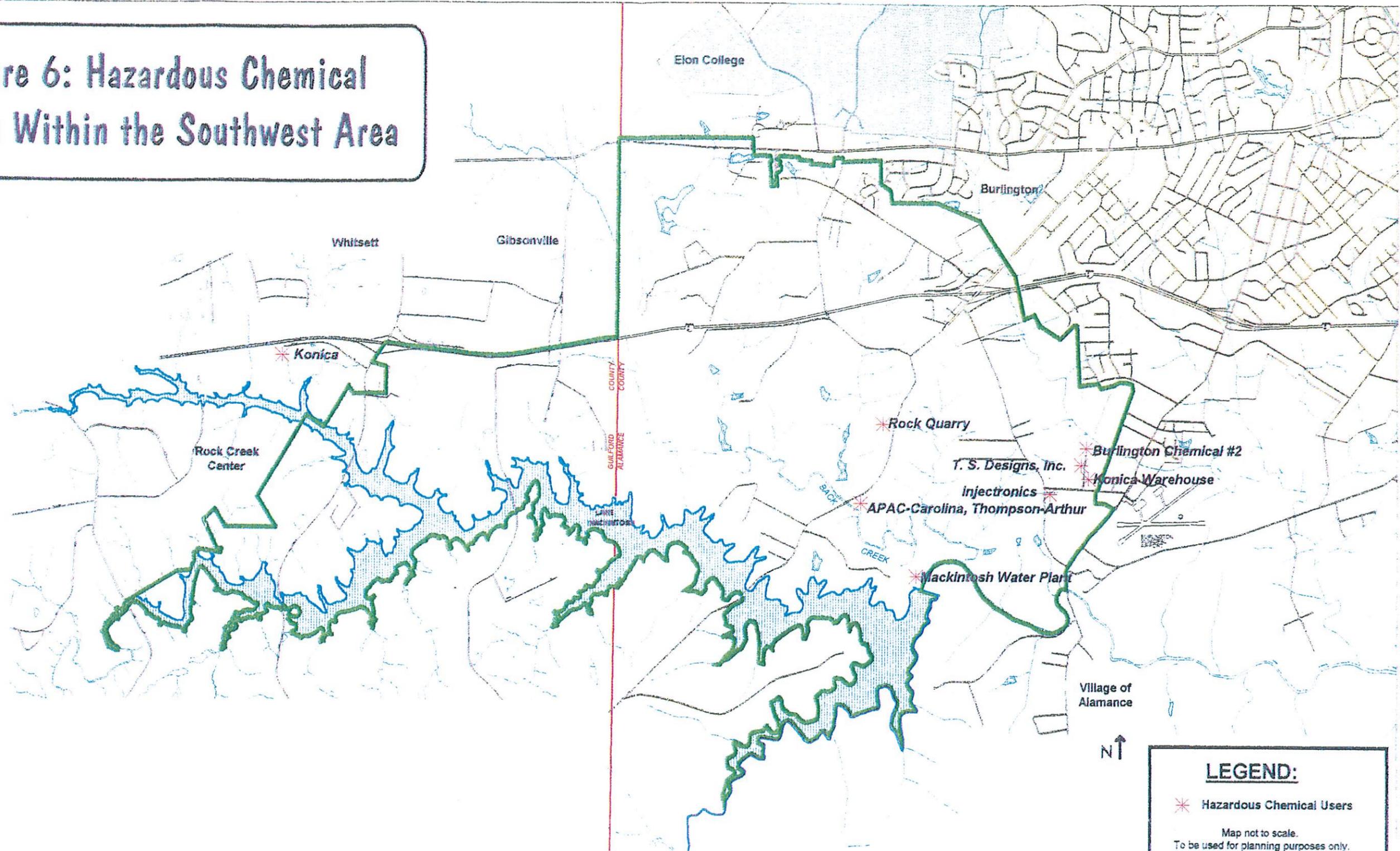
Guilford County, on the other hand, has had extensive experience with stormwater management since 1984. Recently, the City of Greensboro established a new stormwater utility and stormwater management program to address existing stormwater problems within the City.

Most of Guilford County's experience with stormwater management is directly related to implementation of its watershed protection ordinance. In the development of this ordinance (which is currently under review by the State DEM), Guilford County has elected to allow high-density development to occur within designated water supply watershed areas (this option is permitted under the State's minimum water supply watershed protection rules). When a local government elects to allow high density development within for example a WS-IV watershed "critical area", engineered stormwater controls must be used to control the first inch of runoff, and the development can not exceed a 50% built-upon area. Although the requirement for stormwater controls in watershed areas is new, Guilford County has already required 18 to 24 wet retention ponds to be built within the Burlington (Lake Mackintosh) Watershed (Lee Stimpson, Guilford County, 1994).

As the Rock Creek Corporate Center expands and industrial development along the I-85/40 corridor within the Gibsonville area increases, Guilford County's requirements for engineered stormwater controls (and the responsibilities the county has assumed in assuring that these facilities operate properly) will become critically important in protecting Burlington's primary drinking water supply.

Alamance County on the other hand, has elected not to permit high-density development within its regulated water supply watersheds. By way of this decision the County has determined that its water supply watersheds are best protected by maintaining the existing low density development patterns that are already in place in these areas. In fact, new subdivision development within a WS-IV watershed "critical area" in Alamance County can not exceed one dwelling unit per two acres and all other non-residential development within the critical area can not exceed a built-upon area of six (6%) percent of the site. As a result, Alamance County presently does not need to adopt specific regulations for engineered stormwater controls.

Figure 6: Hazardous Chemical Users Within the Southwest Area



LEGEND:

- * Hazardous Chemical Users

Map not to scale.
To be used for planning purposes only.

Map prepared by the
City of Burlington Planning Department
July 1995

Minimizing Pollutant Discharge

In evaluating the southwest planning area, there are five main sources of existing and future pollution which need to be addressed as the area grows: hazardous materials used, stored, or transported through the region; industrial and municipal wastewater discharges; agricultural/construction discharges; septic tanks; and, vehicular and industrial emissions. Each of these sources may adversely affect the natural and human environment.

Hazardous Materials, Storage & Transport:

The Guilford County and the Alamance County Fire Marshall's Offices are required by State and Federal law to maintain current lists of hazardous chemicals and other hazardous materials used or stored by private industry within their jurisdiction. From the information provided by these offices, a list of the hazardous chemicals used and stored at each business within the southwest planning area has been identified (See Figure 6 and refer to Appendix B). It is important to carefully plan future uses of land in the southwest area so that industrial development and the potential for hazardous emergency spills, leaks or other offensive emissions will not pose a threat to existing and future residential areas or to the natural watershed.

Lake Mackintosh is particularly vulnerable to hazardous material contamination due to its proximity to I-85/40 and the Rock Creek Corporate Center industrial park in Guilford County. Travel time studies conducted in the Piedmont indicate a chemical spill in a stream feeding a drinking water supply could be expected to travel one mile in UNDER three to six hours. Given the soils and the geologic conditions within the Alamance Creek Watershed, actual travel times could be quite less. Information regarding the types of hazardous materials transported along I-85/40 should be studied and documented. Additionally, the NCDOT, Guilford County and Alamance County should jointly prepare a coordinated emergency spill containment plan for the I-85/40 corridor. This plan would need to be applicable in all existing water supply watershed areas along the corridor. Funding for this effort is currently being pursued by the Guilford County Fire Marshall's Office through a Hazardous Materials Transportation grant.

The Federal Emergency Management Act (FEMA) requires all counties to prepare a comprehensive hazards analysis. This analysis includes locating hazardous materials stored and preparing a contingency plan for responding to hazardous material spilled during storage or transport. Alamance County maintains a hazardous materials inventory, but the county has not completed a contingency plan. Alamance County also does not have a countywide HAZ-MAT Team to specialize in responding to hazardous material spills. Instead personnel with each volunteer fire department within the county have been trained to respond.

In addition, State statutes require fire departments annually to prepare prefire plans for industrial and commercial sites within their jurisdiction. These plans include the types and locations of hazardous materials used on site. The 1985 North Carolina Right-To-Know law requires establishments storing more than 500 pounds or 55 gallons of hazardous materials to report to the local Fire Marshall.

The federal Resource Conservation and Recovery Act (RCRA) authorizes the State to regulate establishments that generate more than 220 pounds of hazardous waste (a by-product of hazardous material) per month. This includes reporting, storage, transport, and disposal requirements.

Because of these State and federal regulations, we know the locations, types, and quantities of hazardous materials stored and used in the Burlington area and the southwest planning area. This information should enable local government to adequately plan and to effectively respond to spills.

Industrial Discharges:

The federal Clean Water Act sets forth water quality related effluent limitations for industrial and municipal discharges into streams. These limitations vary according to the classification or intended use of the stream or stream segment. North Carolina administers the federal NPDES program at the state level. This effluent permitting program requires those permitted to monitor their effluent and to monitor both upstream and downstream of their discharge.

Dischargers of point source pollution are also regulated by the State through the NPDES permit system. These permits specify water quality standards for water entering receiving streams. The discharge standards are usually a compromise between sound scientific analysis and economic costs. The State may recommend a specific limit or level of discharge for a particular pollutant, but the final limits may be raised because the industry or community does not have the resources to upgrade facilities to meet those standards.

An example of this problem is the South Burlington wastewater treatment plant. This facility is currently operating under a schedule of compliance which allows the plant to discharge under predetermined effluent toxicity permit limits. These interim limits are tested monthly and if the plant is not in compliance, the City could possibly lose its permanent operating permit and be subject to stiff fines.

Local governments generally take an active role in this regulatory process when they find that they are not in compliance with their wastewater discharge limitations and are thus subject to fines. Also situations sometimes arise when one unit of government has inadvertently allowed untreated effluent or improperly treated effluent to enter and disrupt another unit of government's wastewater treatment plant operations.

Another problem with the NPDES permit program at the State level is that many pollutants are not adequately monitored at all. In Alamance County, thirteen (13) known or probable dischargers with toxicants in their effluents have been identified (DEM, 1985). Three of the thirteen discharge directly into receiving water for downstream water supply users.

The dischargers with significant non-compliance with DEM standards for toxic substances are Glen Raven Mills and the South Burlington wastewater treatment plant. Most of the problems at the South Burlington wastewater treatment plant are caused by the foaming of bleaches, soaps and phosphate byproducts resulting from various textile manufacturing processes. Some of these byproducts are biodegradable and some are not.

A list of the chief dischargers regulated by NPDES permits within the Lake Mackintosh watershed area are identified in Table 8 below:

**TABLE 8:
NPDES DISCHARGE PERMITS ISSUED
WITHIN THE LAKE MACKINTOSH WATERSHED IN 1994**

<p><u>Big Alamance Creek:</u> Rock Creek Mobile Home Park Southeast Junior/Senior High School E.M. Holt Elementary School Kayser-Roth, Alamance Village Dally Hosiery Mill D.A. Thacker residence</p>	<p><u>Beaver Creek</u> Forest Oaks Country Club Gregory residence</p>
<p><u>Little Alamance Creek:</u> Country Club Mobile Home Park Hedricke Cedar Valley Mobile Home Park Eastern Guilford Senior High School Lakewood Mobile Home Park Sedalia School AT & T Technological Systems</p>	<p><u>Stinking Quarter Creek:</u> Nathaniel Greene School</p>
	<p><u>Back Creek:</u> Martin Marietta Aggregate</p>

Source: Division of Environmental Management, North Carolina, 1994.

Agricultural/Construction Discharges:

Erosion, sedimentation, and agricultural-related nonpoint sources of pollution are a major concern in rural watersheds. This is true, particularly for the Lake Mackintosh watershed in areas south of I-85/40. To address these concerns, the North Carolina Division of Soil and Water Conservation coordinates a "best management practice" or soil conservation program in both Alamance and Guilford counties.

One of the more successful programs is the *Agricultural Cost Share Program for Nonpoint Source Pollution*. This is a voluntary program. It provides education, training, and monetary incentives to encourage farmers to employ best management practices (BMPs). The program is designed to encourage crop rotation, the development and use of animal-waste systems, the development of buffer strips, and the use of proper tilling methods to prevent runoff. The program can also be designed to encourage farmers to limit the amount of pesticides, animal manure, and other agricultural sources of nonpoint pollution.

If you participate in the North Carolina Agriculture Cost-Share Program, for example, you will be reimbursed 75% of the average cost for each BMP installed. The remaining 25% of costs are the responsibility of the landowner. In Alamance County alone, 526 *costshare contracts* have been written since 1985, and over \$1.2 million dollars have been obligated to Alamance County landowners to implement specific BMPs (SCS, Alamance County, 1994).

Another effort to increase the use of best management practices by the U.S. Food Security Act of 1985 and the Food, Agriculture, Conservation and the Trade Act of 1990 (Public Law 101-624) requires every farm receiving federal subsidies to develop a conservation plan for its highly erodible fields. The best management practices identified in each conservation plan must be in use by 1995. Additionally, all agricultural activities conducted after January 1, 1993 (within the critical area of WS-IV watersheds) must maintain a minimum 10-foot wide vegetated buffer, or equivalent control (as determined by the Soil and Water Conservation Commission) along all perennial waters indicated on the most recent versions of U.S.G.S. 1:24,000 (7.5 minute) scale topographic maps, or as determined by local government studies. Further, all animal operations greater than 100 animal units must employ BMPs. Local training on the use of BMPs is offered through the Soil Conservation Service (SCS) and the Alamance County Agricultural Extension Service office.

The North Carolina Sedimentation Pollution Control Act also requires an **erosion control plan** for all land disturbing projects over one acre in size, excluding farms and forests. However, the erosion control plan primarily addresses the construction phase of a project, not the long-term impact of the developed site or change in land use. The erosion control plan typically outlines measures to minimize soil erosion and off-site sedimentation of adjoining water bodies. Sediment is a major pollutant in stormwater runoff, and this law helps to minimize sediment concentrations in runoff from permitted sites.

The state erosion control rules specifically require the velocity of stormwater to be controlled within the site to prevent on-site erosion. Energy dissipaters such as riprap, temporary sediment basins with controlled releases, berms and other devices are used to control the velocity and the direction of the stormwater discharge. However, many of these devices are not effective in reducing the amount of runoff from the disturbed site to pre-development conditions in order to control downstream flooding. A combination of

effective stormwater management requirements and erosion control standards are needed once a site is graded and developed to prevent stormwater pollution and downstream flooding.

Alamance County, Guilford County and the City of Burlington have adopted erosion control ordinances which duplicate the minimum state erosion control rules. These ordinances require: (1) approval of an erosion control plan before construction begins; (2) containment of sediment in the area during construction; and, (3) final, permanent erosion protection with ground cover (within 30 days of construction completion). This erosion protection applies to downstream channels as well as to the construction site. However, these ordinances do not do enough.

One weakness is that there is almost always an inadequate number of trained and experienced personnel to inspect sites and enforce compliance with permits. Another problem is that some downstream erosion is natural, some is caused by unregulated development, and some is caused by poorly regulated development, thus it is difficult to identify one source of downstream erosion and prove that a violation of the ordinance has occurred.

Additionally, there are no local standards or rules controlling the amount of grading (or clear-cutting) allowed, nor are there any requirements for the protection of existing woodlands or large historic trees from being cut or destroyed. Extensive grading to a site can cause irreparable harm and site degradation. The City of Burlington and Alamance County's local erosion control programs could be greatly improved if specific standards were established regarding clear-cutting and the denuding of mature stands of trees and woodland vegetation. Additionally, specific stormwater management regulations need to be established at the local level to prevent stormwater pollution and to upgrade existing drainage facilities.

Septic Tanks:

Under current state law, a permit must be obtained from the county health department or the State Department of the Environment, Health and Natural Resources to operate a septic tank system. Before a permit is received, the appropriate agency examines soils, topography, and location to determine if it is safe to operate a standard septic tank system. In some cases, an alternative may be prescribed if conditions are not satisfactory for a standard system. Once a permit is granted for either system, it is the owner's responsibility to inspect and maintain it.

Periodically, septic tank systems can break down or overflow. If the health department receives a complaint of a septic tank failure, it will investigate and a new permit will be issued when the owner corrects the situation. Currently there are no federal, state, or local septic system maintenance programs to improve the effectiveness and reliability of septic systems. Under existing programs administered by the Alamance

and the Guilford County Health Departments, detecting and correcting system failure is difficult and is handled on an individual complaint basis or when health hazards arise.

Since a majority of the soils in the southwest planning area have been rated by the Soil Conservation Service (SCS) as having severe limitations for septic tank fields, on-site soil evaluations must be conducted to determine suitable locations for septic tank field development and use. This is particularly true in locations where the Iredell, Enon, Helenva, Vance, Lloyd, and Mecklenburg soil associations exist. Septic tank failure is quite frequent wherever these soils are found. These factors reinforce the need and justification for the provision of public water and sewer systems within the southwest area.

Vehicular and Industrial Emissions:

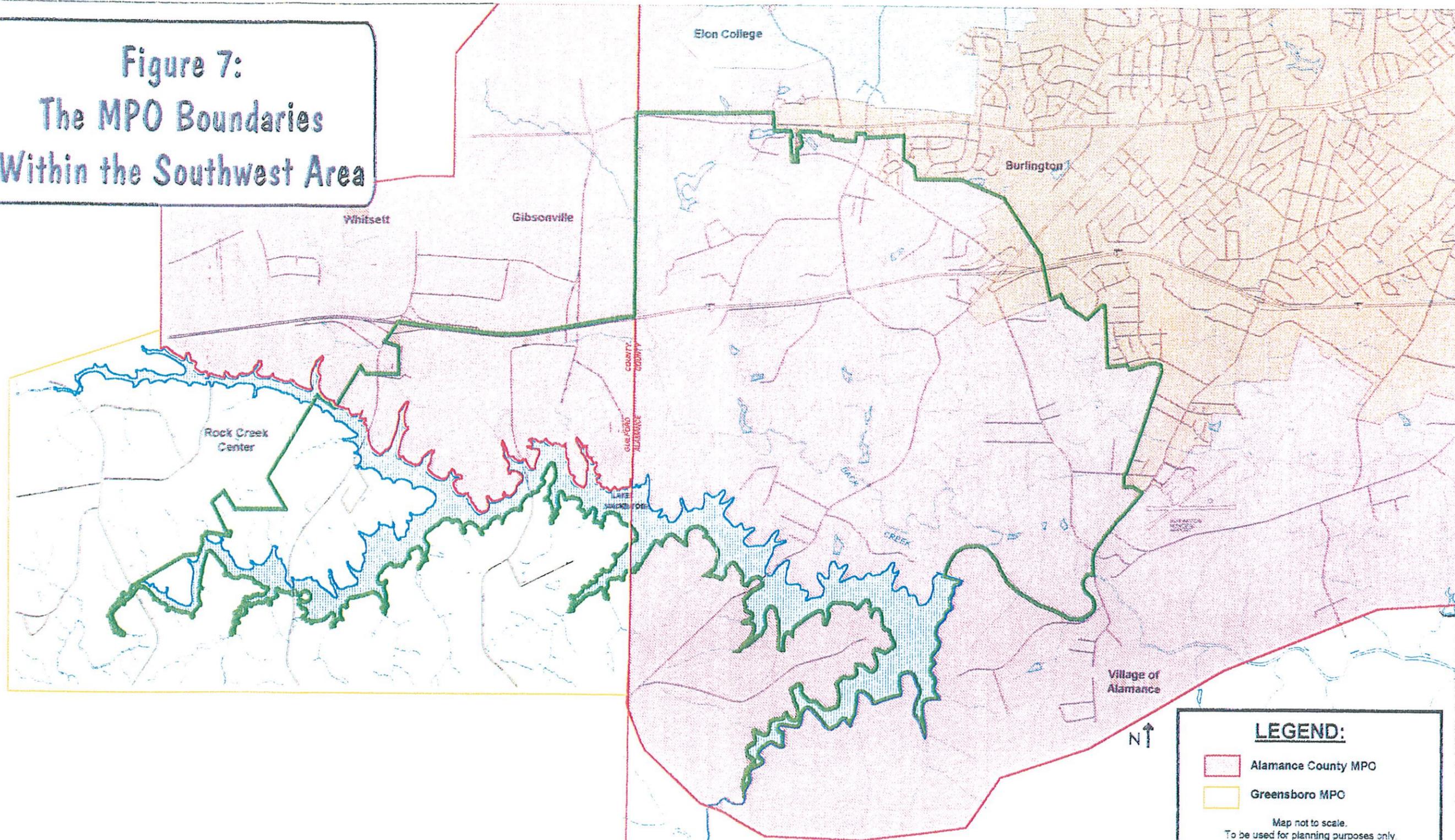
Automobile emissions currently are not a health hazard within the southwest planning area. The Alamance County/Burlington transportation planning area is rated as an "attainment area" for most of the current air-quality-related emission limitations set forth by the EPA under the Clean Air Act. This rating however is borderline due to the growing population of the urban area, expanding growth and development, and increasing automobile congestion.

Additionally, the area's good air quality attainment classification rating could be threatened since the Burlington urban area is now officially a part of the Greensboro/High Point Triad Standard Statistical Metropolitan Area (SMSA). Standards for regional compliance with CO (carbon monoxide) and ozone pollution could force Burlington and Alamance County to jointly participate with Greensboro and High Point in the development of a State Implementation Plan (SIP) to bring the entire SMSA into compliance. Measures necessary to attain these goals are: inspection and maintenance programs for auto emissions, air quality monitoring of major intersections and interchanges, and pre-construction review of major sources of air pollutants. The penalty for not complying is the withdrawal of all federal highway maintenance and construction funds for the area. Presently, however the need for regional air quality compliance within the Triad SMSA is not required by EPA.

Nevertheless, as Burlington continues to grow, it is important that the community realize that it has the opportunity to develop effective measures for maintaining current air quality standards now. Promoting energy-efficient forms of transportation including public transportation, car and van pooling will help maintain our clean air. Local government can assist by incorporating alternative forms of transportation into local land use plans as well as local zoning and subdivision design standards. To reduce emissions, existing transportation systems can be studied and evaluated to determine where traffic control signals can be made more efficient, storage lanes and turning lanes can be added, and traffic circulation improved.

Industrial emissions in the form of air particulates, and noise can also be addressed in urban land use planning, particularly when determining future development locations and designing future transportation improvements. Currently, within the southwest planning area, undesirable dust emissions and noise are created by the increased truck traffic along Huffman Mill Road. Truck traffic from the Martin Marietta rock quarry and the existing asphalt/concrete mixing plant have created an undesirable environment for residential development. While the truck traffic caused by the construction of the new hospital may be a temporary inconvenience, future building activity and construction surrounding the hospital and along St. Marks Church Road and Huffman Mill Road will be an ongoing concern. Additionally, the widening of I-85/40 from four to eight lanes has caused an increase in undesirable noise levels adjacent to the Interstate. The existence of these problems must be addressed in planning the locations for future residential and office/institutional development within the southwest area.

Figure 7:
The MPO Boundaries
Within the Southwest Area



LEGEND:

- Alamance County MPO
- Greensboro MPO

Map not to scale.
To be used for planning purposes only

Map prepared by the
City of Burlington Planning Department
July 1995

V. TRANSPORTATION

This section will discuss the existing transportation planning process and identify proposed new transportation routes. It will also discuss the scheduled improvements in the State Transportation Improvement Program (STIP). Other transportation routes which would improve transportation flow throughout the southwest planning area will also be identified.

The Transportation Planning Process

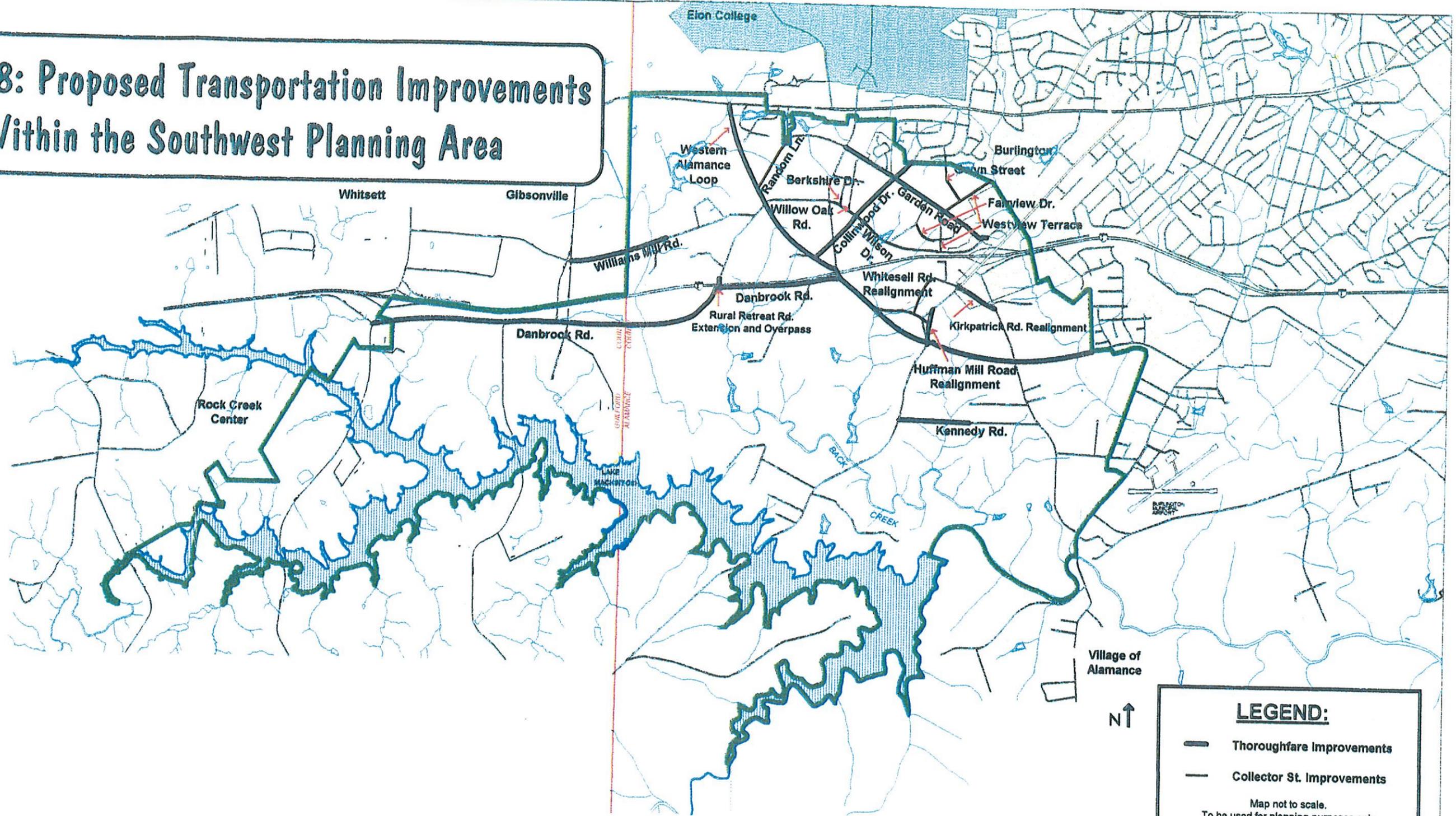
The Alamance County Urban Area MPO boundary is the designated legal planning area for conducting and implementing the transportation planning requirements of the Federal Highway Act of 1962 and the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA). This planning area includes the Burlington Metropolitan Statistical Area (as defined by the Bureau of the Census). The boundary also includes the "urban fringe," the area expected to become urban within a twenty year planning period. A majority of the southwest planning area falls within the boundary of the Alamance County Urban Area Metropolitan Planning Organization (MPO) transportation planning area (See Figure 7). A small area of land located in Guilford County between Great Alamance Creek and Little Alamance Creek lies outside of the MPO boundary but within the southwest planning area. Except for the area in the Alamance County Urban Area MPO and the City of High Point MPO all of the Guilford County is in the City of Greensboro MPO.

The following parties have agreed to a Memorandum of Understanding to participate in the continuing transportation planning process for the Alamance County MPO: the cities of Burlington, Graham and Mebane, the Towns of Elon College, Gibsonville, Haw River, Green Level and Whitsett; the Village of Alamance; Alamance County; and, the North Carolina Department of Transportation and the U.S. Department of Transportation (USDOT).

The Urban Area MPO is responsible for carrying out the transportation planning process at the local level. The MPO is an organization consisting of the boards of each local government; the NCDOT, a Transportation Advisory Committee (TAC); a Technical Coordinating Committee (TCC); along with various agencies and units of local and State government.

The TAC is composed of representatives from each governing board. It provides policy direction for the planning process, and acts to improve communications and coordination between each member jurisdiction. The TCC is responsible for the supervision, guidance and coordination of the continuing planning process, and for

**Figure 8: Proposed Transportation Improvements
Within the Southwest Planning Area**



LEGEND:

-  Thoroughfare Improvements
-  Collector St. Improvements

Map not to scale.
To be used for planning purposes only.

Map prepared by the
City of Burlington Planning Department
July 1995

making recommendations to local and State governmental agencies and the TAC regarding any necessary action. The membership of the TCC consists of key staff from the NCDOT, the Piedmont Triad Council of Governments, USDOT, Alamance County, and all the towns and municipalities within the county.

Transportation related policy decisions for local units of government are made by the respective governing boards (the City Council or the Town Board). Policy decisions for the NCDOT are made by the Board of Transportation. The municipal and Town governing board and the NCDOT have implementation authority for construction, improvement and maintenance of the transportation infrastructure within their jurisdiction.

Alamance County is designated as the Lead Planning Agency (LPA) and is primarily responsible for annual preparation transportation planning documents. Alamance County is also the primary local recipient of planning funds received from the USDOT for the Alamance County Urban Area MPO.

Current MPO Activities

The current primary transportation planning goal of the Urban Area MPO is the development of a comprehensive and long range multi-modal transportation plan. The transportation plan will consist of several elements including an updated Thoroughfare Plan, a Public Transportation Plan, and a Bicycle/Pedestrian Plan. Also underway are several background studies which will be incorporated into the final plan. These studies include a Transportation Alternatives Study to the Single Occupant Vehicle, the Piedmont Triad Regional Land Use Plan project, an Origin and Destination study, and a Population and Employment Projections study.

Scheduled Transportation Projects

Western Alamance Loop:

The largest and most significant transportation project planned for the southwest area is the Western Alamance Loop (Project U-2905). This project is a new thoroughfare route designed to connect Kirkpatrick Road (SR 1146) to US 70, including a new interchange to be located at the St. Marks Church Road/I-85 grade separation, as well as the upgrading and realignment of Huffman Mill Road (SR 1158) in the vicinity of the new Alamance Hospital site. The location of the Western Loop is shown in Figure 8, Proposed Transportation Improvements.

The total length of the proposed thoroughfare is 2.6 miles and the total estimated cost of the project is approximately \$18 million dollars, including right of way purchase

and construction. Under the approved State TIP for FY 1995-2001, this project has been scheduled as an Interstate project with planning and design to commence in FY 1995 and 1996, and right of way acquisition to start in FY 1997 and FY 1998. Actual construction is proposed to begin in FY 1999.

Huffman Mill Road Realignment

Another project scheduled in the State TIP is the realignment of Huffman Mill Road from St. Marks Church Road to the Burlington City limits adjacent to the new Alamance Regional Medical Center (a distance of approximately 0.8 mile). This project is scheduled to be completed in conjunction with the Western Alamance Loop thoroughfare improvements. Huffman Mill Road adjacent to the hospital is presently only a narrow two lane road. At one time it was a small country road. But now that the surrounding area is developing, the road needs to be upgraded to accommodate more traffic and to eliminate the existing dangerous curve in the road. This project would strengthen Huffman Mill Road into a 5-lane curb-and-gutter section directly to the north of a new intersection with St. Marks Church Road (see Figure 8). Directly south of the new intersection, Huffman Mill Road will be widened a short distance and then tapered to match the existing roadway alignment. No further widening of Huffman Mill Road south to Lake Mackintosh is planned at this time.

A necessary addition to this project would be the realignment of Kirkpatrick Road and Long Pine Road at Huffman Mill Road. The present alignment often results in congestion and stacking of automobiles traveling south on Huffman Mill Road and as a result there are back ups on Kirkpatrick and Long Pine roads. The congestion on Huffman Mill Road could eventually result in traffic congestion on the Interstate.

St. Marks Church Road Interchange

The need for a new diamond interchange on I-85 at or just west of St. Marks Church Road has been documented through several Thoroughfare Plan updates. In the most recently adopted Alamance County Urban Area Thoroughfare Plan, this interchange has been sited directly at the St. Marks Church Road bridge. The interchange would be approximately 1 mile west of the existing I-85/Huffman Mill Road interchange and approximately 2.9 miles east of the existing I-85/NC 61 interchange in Guilford County. Access will be fully controlled in the interchange area. The total estimated cost for a new interchange at this location if the existing St. Marks Church Road bridge can be used is approximately \$1 million dollars. If a new bridge is constructed, the total estimated cost is \$2.2 million dollars.

Depending upon the final design of the interchange, a significant amount of additional right of way on both sides of I-85 will need to be acquired. An existing

commercial structure on the north side of the Interstate will need to be removed and several residential structures on the south side of the Interstate will need to be relocated. Additionally Danbrook Road on the south side of the Interstate will need to be relocated and/or realigned to accommodate an on and off ramp to St. Marks Church Road.

The location of a new interchange typically is hotly contested because economic development goals, the need for smooth traffic flow, and community image meet, compete, and often conflict. Easy highway access also makes interchanges ideal sites for employment centers (whether for office or industrial uses) or commercial facilities serving long-distance travelers or regional shopping centers. Many interchanges also serve as the "front door" that welcome visitors to Town centers bypassed by the Interstate. Effective land use planning around new interchanges is essential if a community wishes to balance the needs of regional traffic, local development interests, and the community's own image (refer to the Land Use section of this document for further discussion and recommendations about this issue).

Grand Oaks Boulevard

The final project scheduled in the State TIP is the extension of Grand Oaks Boulevard to Kirkpatrick Road (Project # U-3304). This project is scheduled for Feasibility Study only at this time. It is identified on the Alamance County Urban Area Thoroughfare Plan as an important linkage in the proposed Southern Loop thoroughfare planned to the south of Burlington and Graham. As proposed this facility would be a 5-lane curb-and-gutter section within an 80 foot wide right of way. It would provide needed access between Kirkpatrick Road and Alamance Road and it would shorten the distance of east/west trips to the new hospital.

The City of Burlington has already reimbursed the developer of the Grand Oaks subdivision the difference between dedicating 60 and 80 feet of right of way for the existing portion of Grand Oaks Blvd. This road is currently a two-lane residential collector street with access to Alamance Road. An attached concrete sidewalk has also been built on the north side of the road. The additional right of way necessary for extending this road to Kirkpatrick Road will need to be acquired by the City of Burlington as the adjoining properties are subdivided and developed.

Other Proposed Transportation Improvements

Thoroughfare Plan Additions:

Collinwood Drive Extension

Currently, there is no available access between US 70 (Church Street), Garden Road and St. Marks Church Road in a north/south direction through the southwest planning area. To address this need, Collinwood Drive could be extended south to St. Marks Church Road directly north of the proposed interchange at I-85. This new road would reduce future traffic on St. Marks Church Road and provide a means of direct access to Garden Road and the proposed Westview Terrace extension described above. Additionally, it would facilitate opening up several large tracts of vacant land for future development purposes. A traffic signal would be required at the intersections at Garden Road and at St. Marks Church Road. The Collinwood Drive extension corridor should be added to the Alamance County Urban Area Thoroughfare Plan as a minor thoroughfare. This designation would make this improvement eligible for future funding consideration in the State TIP.

Rural Retreat Road Extension & Overpass

Other than I-85 and US 70, there are no secondary roads which provide direct access between eastern Guilford County (the Gibsonville area) and western Alamance County within the southwest planning area. One possible option is to consider extending Rural Retreat Road south across I-85 with a new overpass and to extend the existing Charlie Ingle Lane west to intersect Springwood Church Road, NC 61 and Konica Drive in Guilford County. This improvement would provide for a new frontage road directly south of the Interstate and it would provide a means for east/west access between St. Marks Church Road and NC 61 which is currently not available. This frontage road and the new overpass should be added to the Alamance County Urban Area Thoroughfare Plan during the current plan update.

Williams Mill Road Extension

Due to the lack of east/west access between the Whitsett/Gibsonville area and the City of Burlington south of US 70 and north of I-85, serious consideration should be given to extending Williams Mill Road in Alamance County to Whitsett Park Road and Springwood Church Road in eastern Guilford County. This improvement would help to enhance traffic flow between the proposed Western Alamance Loop (St. Marks Church Road) and Springwood Church Road. Additionally it would open up this area for development and provide a travel alternative to the Interstate. The Williams Mill Road

extension corridor should be added to the Alamance County Urban Area Thoroughfare Plan during the current plan update.

Kennedy Road Extension

There is currently no east/west access between Kirkpatrick Road and Huffman Mill Road south of the new hospital and the proposed Western Alamance Loop. With the future availability of water and sewer to this area, it will only be a matter of time before an increase in residential growth occurs. To plan this growth properly and to reduce future traffic congestion on Huffman Mill Road and Kirkpatrick Road, a connection between these roads will become a necessity. One the best possible options is to extend Kennedy Road directly west to Huffman Mill Road. Kennedy Road is currently maintained by the NCDOT. The existing right of way is adequate to allow the road to be widened and improved. Additional right of way will need to be acquired during the subdivision approval process. The Kennedy Road extension corridor should be added to the Alamance County Urban Area Thoroughfare Plan as a local connector to be constructed as a part of the subdivision process.

Danbrook Road Extension

There is currently no east/west access south of the Interstate between Highway 61 in Guilford County and Huffman Mill Road in Alamance County. With the future availability of water and sewer to this area and the proposed industrial zoning access to this area should be provided. To plan this growth properly and to increase accessibility to the area, a connection between these roads will become a necessity. One the best possible options is to extend Danbrook Road west to NC 61. Danbrook Road is currently maintained by the NCDOT. The existing right of way is adequate to allow the road to be improved. Additional right of way will need to be acquired during the subdivision approval process. The Danbrook Road extension should be added to the Alamance County Urban Area Thoroughfare Plan during the current plan update.

Garden Road Expansion

Garden road is a two-lane 24 foot wide roadway with a 60 foot right-of-way. It links Huffman Mill Road with St. Marks Church Road. The roadway offers the most direct access between West Burlington, Elon College, Gibsonville and the I-85. According to the Alamance County Urban Area Thoroughfare Plan, the roadway capacity is 12000 ADTs. In 1986, the roadway had 4800 ADTs. In 1994, the roadway handled approximately 8,000 ADTs at its intersection with Fairview Drive. Development pressure is expected to continue in this area, with the roadway reaching capacity in its present design sometime before the end of the decade. To relieve congestion, the widening of this roadway should be placed on the thoroughfare plan during the update process.

Collector Street Improvements:

Collector streets or minor thoroughfares collect traffic from local streets and carry it to the major thoroughfare system. Collector streets are used to supplement the major thoroughfare system by facilitating minor through traffic movements and also serve abutting property. The following collector street improvements would improve the traffic flow within the southwest planning area.

Westview Terrace Connector

Forestdale Drive will be extended from its location south of Church Street to Huffman Mill Road as part of the development of a new Super K Mart at the former Smith Elementary School site. To provide secondary access to this development and the Walmart/Lowes shopping center on Garden Road, it is recommended in this plan that a connector road be extended south from Forestdale to connect to Westview Terrace on Garden Road. This new street is needed to help reduce traffic congestion and provide an alternative to the existing Garden Road/Huffman Mill Road intersection and the South Church Street/Huffman Mill Road intersection. A traffic signal would be required at the intersection of Garden Road.

Wilson Drive Extension

Wilson Drive currently dead ends north of I-85 and west of Garden Road. This frontage road provides access to several residential properties and a commercial area north and west of the Huffman Mill Road interchange. Wilson Drive should be extended west to Whitesell Farm Lane and intersecting with the proposed Collinwood Drive extension and on to Rural Retreat Road as part of the review and design of future subdivision proposals for the surrounding area. In this fashion, east/west access between St. Marks Church Road and Garden Road can be obtained.

Fairview Drive Extension

Fairview Drive is currently a dead end residential street located west of Garden Road. This street should be extended west to the extension of Whitesell Farm Lane when the surrounding area is subdivided into residential lots.

Willow Oak Road and Berkshire Road Extension

Willow Oak Road and Berkshire Road should be extended south to connect to the extension of Wilson Drive. This will provide secondary access to the area and connect Garden Road with Wilson Drive.

Gwyn Street Extension

Gwyn Street currently dead ends south of Coachlight Trail. This street should be extended south to join intersect with the Westview Terrace Connector. In the review of recent subdivision requests in the area, consideration has been given to the idea of creating a new neighborhood park directly to the south of this area. Gwyn Street would provide direct access to this future park. It would also provide access to the adjoining vacant tracts of land.

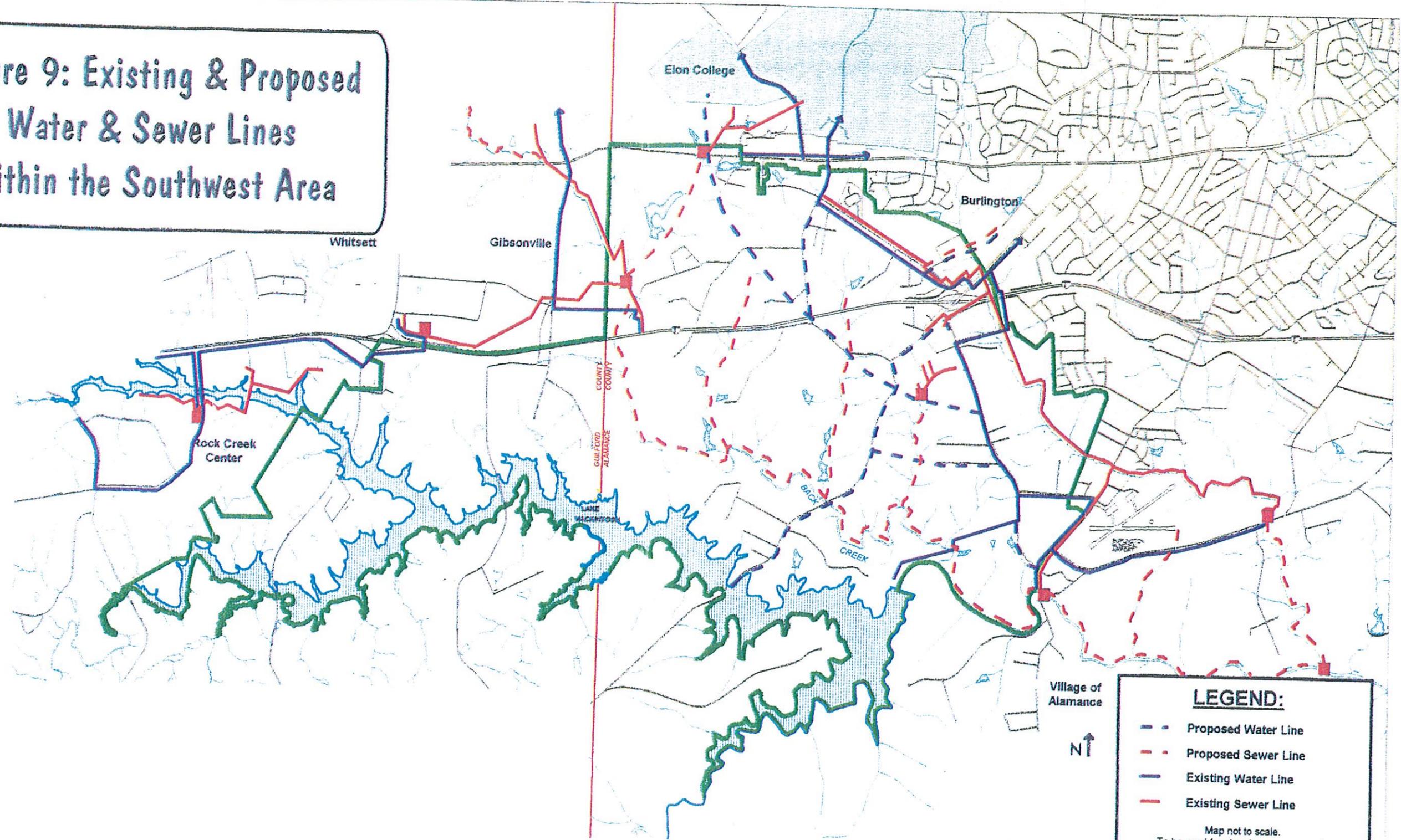
Whitsell Road and Inge Road Realignment

Whitsell Road and Inge Road are currently dead end residential streets located south of the Interstate and west of Huffman Mill Road. With the realignment and widening of Huffman Mill Road, there will be increasing traffic in this area and it will be difficult for residents along Whitsell and Inge Road to make left turns without some form of traffic signal. As the surrounding area develops, consideration should be given to connecting these streets or extending Whitsell Road to St. Marks Church Road to provide secondary access into the area.

Random Lane Extension

Random Lane currently dead ends at Garden Road. This street could be extended south to join with the Western Alamance Loop. It would provide secondary access for citizens in that neighborhood along with providing access to the Western Alamance loop.

**Figure 9: Existing & Proposed
Water & Sewer Lines
Within the Southwest Area**



LEGEND:

- - - Proposed Water Line
- - - Proposed Sewer Line
- Existing Water Line
- Existing Sewer Line

Map not to scale.
To be used for planning purposes only.

Map prepared by the
City of Burlington Planning Department
July 1995

VI. UTILITIES

Water and Sewer Service

Along with limited transportation access, high relief topography, and soil suitability, the major constraint to development in the southwest planning area is the lack of water and sewer service for its interior. Figure 9, Existing and Proposed Water and Sewer Lines shows the areas currently served by municipal water and sewer systems and proposed improvements within the southwest area.

The periphery of the southwest area is served by two major water and sewer systems, the Burlington and Greensboro systems. Water mains from the City of Burlington water plant at Lake Mackintosh follow along Kirkpatrick Road and cross Interstate 85\40 east of the Huffman Mill Road interchange. An 12" spur line serves the new hospital and the businesses along Pine Knoll Trail on the south side of the Interstate. This line is the sole existing municipal water supply south of the Interstate, west of Kirkpatrick Road to Highway 61 in Guilford County.

A 24" water main serves the Garden Road area, with 12" mains stubbing out west at the City limit line. The 24" main supplies water north to the Towns of Elon College and Gibsonville. Potable water is supplied to the Towns of Elon College and Gibsonville through two pumps each with a 720,000 gpd capacity located on Williamson Avenue and Westbrook Avenue, respectively. Additionally, Burlington supplies Elon College along the Front Street/Haggard Avenue main, pumping capacity on that main is 360,000 gpd. The amount of water available is significantly greater than the present demand; in 1993, on an average day, Gibsonville used 300,000 gallons of potable water and Elon College used 270,000 gallons.

The Town of Gibsonville supplies water service to the NCDOT rest area on Interstate 85\40 at the county line. This water line also supplies the Gibsonville satellite parcels along the Interstate corridor. The same water line continues west and connects to a 12" water main which runs under the Interstate east of the Hwy. 61 interchange. The water main proceeds west and connects with a City of Greensboro water meter opposite the AMETEK property. Water is supplied to this location by lines which were extended by the City of Greensboro in 1986 to serve the Rock Creek Corporate Center. The connection of the Gibsonville system to the Greensboro system increases the water pressure necessary to serve the industries at the satellite locations.

The layout of the existing sewer service in the southwest area is similar to that of the water system. The periphery of the southwest planning area is served by sewer while the interior of the area is not (the area from the Interstate south to the lake and west to Rock Creek Corporate Center). Numerous drainage basins, sparse population density and

the availability of other, less-expensive-to-develop land in the City have hindered development in the southwest planning area.

The City of Burlington supplies sewer service to the Towns of Elon College and Gibsonville and to the Village of Alamance which border the southwest planning area. The NCDOT rest area and the Gibsonville satellite jurisdictions are served by the Back Creek pump station. A 15" sewer outfall serves areas north of the Interstate along Garden Road then crosses the Interstate on the east side of the Huffman Mill Road interchange. The outfall runs down Gunn Creek where the 8" line which serves the new hospital connects. The line expands to 21" and then to 24" on its way to the South Burlington Wastewater Treatment Plant.

Treatment capacity at the South Burlington Wastewater Treatment Plant was recently increased to 12 mgd. On an average day, 7.2 million gallons of wastewater is treated at the plant, leaving an excess treatment capacity of 4.8 mgd. On rainy days however, the amount of wastewater flowing through the plant can increase dramatically. During recent storm events the daily flow has increased to over 20 million gallons, well beyond the capacity of the plant to treat the wastewater sufficiently for release into the Great Alamance Creek. This increase is primarily due to the problem of infiltration and inflow. A problem resulting from inadequate maintenance on existing sewer lines. In order to capitalize on the new industrial development in the area, the City should regularly maintain the sewer system for maximum efficiency.

Water and Sewer Service Area Expansions

The City of Burlington and surrounding jurisdictions must make a decision concerning the southwest planning area. A decision to build or not to build a sewer outfall line has far reaching consequences for the citizens of Burlington and Alamance County. In large part, the construction of this sewer line will determine whether the area becomes a net income and employment producer for the City or whether it remains rural with very low density residential development. The southwest area has all of the attributes which industrial recruiters desire, with the exception of two--roads and sewer service. Many of the planned roadway improvements can utilize existing corridors, however supplying sewer service to the area will require significant changes to the existing system. To pump sewage is an energy intensive task; it is expensive. Building the sewer outfall would eliminate the need for four pump stations; the entire southwest area, including portions of the towns of Gibsonville and Elon College could be served by gravity sewer, resulting in significant savings over the long term.

The construction of the sewer line would allow development to be more dense than would otherwise be possible. If the sewer line is not built, state requirements dictate that residential lots must be a minimum of 30,000 square feet--double the proposed lot size proposed for the area. The economics of location would dictate that the entire

southwest planning area would eventually be developed residential lots of approximately one acre if the sewer line is not built. The southwest planning area as one large subdivision would result in a considerable increase in police, fire and other city services with a minimal return in tax base. However, if the sewer line is built, the sewer outfall would be a boon to the economies of the City of Burlington, Alamance County, and eastern Guilford County. Jobs would be created and the tax base would be increased.

The provision of water service to the area is neither as costly nor as complex as the provision of sewer service. Water lines can be installed adjacent to roadways on existing rights of way and generally do not need any special pumping devices.

Given the potential benefits to the City of Burlington and Alamance County as well as the Towns of Gibsonville and Elon College, this plan endorses the building of the entire Great Alamance Creek Outfall. It is indeed the only truly reasonable and cost effective course for the long term. The expense of the construction of the outfall is a challenge for all jurisdictions who may be asked to participate. However, it is a heavy financial burden that rightfully the citizens of Burlington should not bear alone. The benefits of the outfall will extend beyond the City limits of Burlington, therefore the responsibility for building the line should also extend beyond the City limits. In light of the present financial dilemmas faced by other jurisdictions, sewer service throughout the Back Creek basin may not be possible, a smaller version with a pumping station at Gunn Creek may be the most cost effective alternative to the entire line. It would open the southwest planning area for development while limiting the cost of construction.

VII. PUBLIC FACILITIES AND COMMUNITY SERVICES

Both the public and private sector are responsible for providing a wide range of community services that support urban and rural development, including education, police and fire protection, health, recreation, libraries, and other services. Generally, most of these services are planned and provided for on an area-wide basis, and are therefore tied directly to the magnitude and direction of growth within the community. Changes in the demand for services can sometimes be addressed by simply adjusting service district lines, adding new routes, or shifting personnel, but in other cases, new facilities must be built.

This section examines some important public facility and community service needs within the southwest area and identifies where additional services and new facilities may be required in light of the anticipated growth of the region. The primary purpose and intent is to alert community officials that service demands and needs within the southwest area are likely to increase.

Public Schools

Currently, there are three separate school districts within the southwest planning area. The City of Burlington schools, Alamance County schools, and Guilford County schools. Burlington City schools and Alamance County schools will officially merge on July 1, 1996. Guilford County and Greensboro City schools are already consolidated.

At present, there are no public school facilities located within the southwest area. Students living within the City of Burlington attend the Smith, Turrentine, Williams School District. Students living outside Burlington's City limits attend either Guilford County schools (Gibsonville area) or the western or southern Alamance schools, depending on which zone they reside in. The nearest Alamance County schools to the southwest area are Elon College Elementary, E.M. Holt Elementary, and Western Middle and High schools. The closest Burlington City school facility is Smith Elementary school.

The merger of the Burlington/Alamance schools will require the drafting of new school districts. Due to the lack of any conveniently located County school facilities within or near the southwest area, it can be anticipated that Elon and Smith Elementary, Turrentine Middle, and Williams High school will become the primary school facilities to serve the southwest area. However, most or all of these schools (except Turrentine Middle) are currently over capacity, and it is questionable if these facilities will be able to handle the future growth of the area. Additionally, all of the Alamance County school facilities within the region are currently over capacity (except for Western High school).

Given these present capacity problems, it appears that a potential facility problem may develop in the future, particularly at the elementary school level. Smith Elementary school will have a capacity of 700 students when it is completed. However, given current enrollment trends the size Smith Elementary school may not be adequate to accommodate the future growth of the southwest area. The location of this new building on Delaney Drive east of Huffman Mill Road is not convenient nor readily accessible to the future residential growth areas projected to occur along Garden Road and St. Marks Church Road (north of the Interstate), and Kirkpartick Road (south of the Interstate). Additionally, when the Burlington/Alamance school merger takes place, it will not be surprising to see an increase in residential growth in many unincorporated areas throughout Alamance County, particularly in those areas where the provision of water and sewer has been made available.

Fire Protection

Fire protection in Burlington is provided by a full-time paid fire department. In the unincorporated areas of the southwest planning area, fire protection is provided by the Elon College and the E.M. Holt volunteer fire departments. These departments are funded by independent taxing districts. The Gibsonville volunteer fire department provides fire protection services only to those areas within the corporate limits of the Town. The unincorporated areas of Guilford County are served by either the Whitsett or the Mt. Hope Church volunteer fire department. Fire protection services to the Rock Creek Corporate Center and the Stoney Creek residential community are provided primarily by the Whitsett Fire Department.

The boundaries of the fire districts and station locations are shown on Figure 10, Existing Fire Stations and Service Districts Within the Southwest Area. As the City of Burlington expands into the southwest area and begins to annex land, much of the existing Elon College fire response service district will shrink. Over time, this will reduce the taxing power of the district and may force the Town of Elon College to establish a municipal full-time paid fire department. Burlington's growth into the southwest area will not significantly impact the E.M. Holt Fire District.

Continued growth of the Rock Creek Corporate Center, Stoney Creek and industrial development along the I-85 corridor will place significant demands upon both the Whitsett and the Gibsonville volunteer fire departments. Most demanding for these volunteer departments will be the provision of emergency medical services (E.M.S.), the cost of provision and maintenance of fire hydrants, and provision of fire prevention services. Currently, the City of Burlington provides fire prevention services to most of the southwest area, despite the fact that most of this area is located in Alamance County.

The location of Burlington's new Fire Station (No. 5) on Industry Drive south of I-85, and Fire Station No. 4 on S. Church Street should be adequate in the near future to

address the growth of the region and still maintain adequate fire response services. Given the building height of the new hospital and other possible mid-rise development in the area, it will be important that Fire Station No. 4 be equipped with a suitable size ladder truck and other adequate fire fighting equipment.

Police Protection

Police protection in Burlington, Elon College and Gibsonville is provided by municipal police departments. In unincorporated Guilford and Alamance County, and by agreement in the village of Alamance and the Town of Whitsett, police protection is provided by each county's Sheriff's Department.

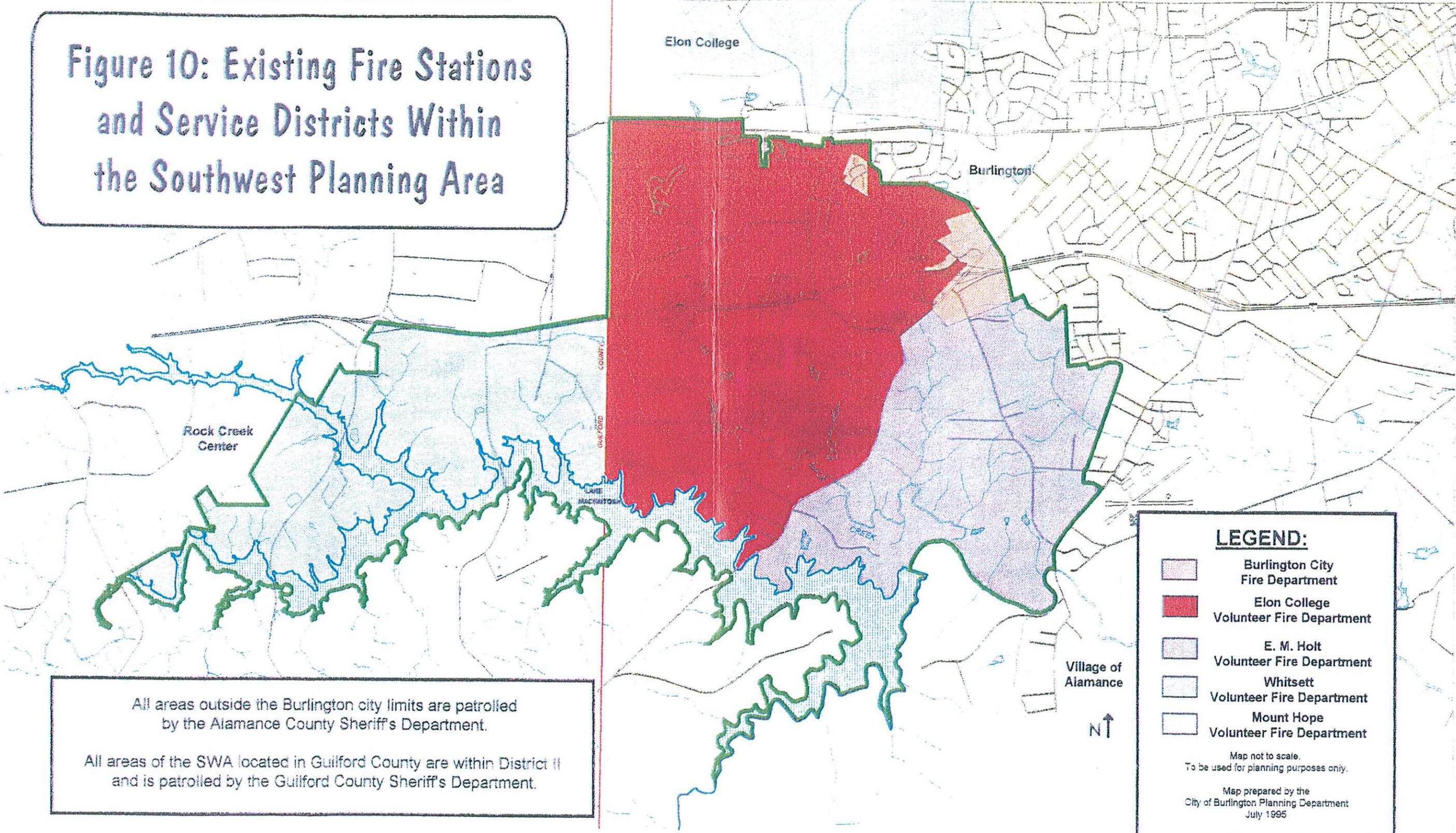
The service area for the Burlington Police Department is primarily defined by the corporate limits of the City and the location of City-owned property located outside the City. However, when the called upon, the department will respond to calls outside City boundaries. These professional courtesy arrangements are formalized as mutual-aid agreements.

The number of uniformed staff in the Burlington Police Department is currently 92 sworn officers. In Elon College the number of staff is 7, and in Gibsonville it is 8. As the southwest area grows the need for more patrol staff and support divisions will be required, particularly in areas recently annexed by the Town of Gibsonville and in other areas located south of the Interstate.

One of the more critical problems faced by the Burlington Police Department is responding to calls along I-85 within the boundaries of the City of Burlington. Since assuming this responsibility, the Burlington Police Department has had to respond to an increase in emergency calls and traffic control related situations.

A major policing problem for the Alamance County Sheriff's Department, as well as the State Highway Patrol and the DMV is the rest stop along I-85. This facility has been a focal point for illegal drugs and prostitution. There is also a perception that the proposed interchange located at St. Marks Church Road will become a major conduit for drug traffic to Davidson Park and Elon College similar to the rest stop. This however may be a misconception. Most of the traffic using this new interchange will be primarily traffic from locations within Alamance and Guilford counties. A significant amount of Interstate traffic can be expected from the business and commercial development proposed to be located around the interchange.

Figure 10: Existing Fire Stations and Service Districts Within the Southwest Planning Area



All areas outside the Burlington city limits are patrolled by the Alamance County Sheriff's Department.

All areas of the SWA located in Guilford County are within District II and is patrolled by the Guilford County Sheriff's Department.

LEGEND:

- Burlington City Fire Department
- Elon College Volunteer Fire Department
- E. M. Holt Volunteer Fire Department
- Whitsett Volunteer Fire Department
- Mount Hope Volunteer Fire Department

Map not to scale.
To be used for planning purposes only.

Map prepared by the
City of Burlington Planning Department
July 1995

Health Care

The recently opened Alamance Regional Medical Center is the largest hospital in Alamance County. The location of this facility directly south of the Huffman Mill Road/I-85 interchange will forever change the delivery and the direction of health care services within the community. With the closure of both Alamance County Hospital and Memorial Hospital in Burlington, most medical services, clinics and doctors offices will be forced to relocate and/or redirect their services to the location of the new regional hospital. This may necessitate that the City of Burlington provide additional office and institutional zoned land around the hospital, including provisions for necessary infrastructure, water and sewer, and other urban services, such as police and fire protection.

In other parts of the community where no medical facilities exist at all or the distance to the new regional hospital is too great, smaller emergency medical centers and walk-in clinics may eventually develop. But, for the most part, increased development around the new hospital can be expected to occur and this will place new demands on both the existing residents of the area as well as the City of Burlington in addressing how to best cope with this new growth.

Standards for health care facilities also change with the characteristics of the population and advances in medical science. Given the demographics of the Burlington area, it is anticipated that there will be an increase in the number of privately operated convalescent centers, nursing homes, congregate care housing, and other retirement developments required to accommodate Burlington's aging population in the coming years. The southwest area may become an attractive location for these types of facilities, particularly combined retirement/health related developments which require larger amounts of available acreage for individual dwelling units and other recreational amenities. There is a good chance that Memorial Hospital in Burlington will be converted into a nursing home and that Alamance County Hospital will be renovated for additional office space for various Alamance County agencies.

The Alamance Regional Medical Center is a new 238 bed four-story hospital consisting of 357,362 square feet of building area. The design of the facility revolves around a new outpatient medical mall concept with dual track emergency service. Two large physician office buildings/clinics, a 60 student day care center and a heliport will also be built. Based on various demographic studies, approximately 77 percent of the population of Alamance County lives within a 10 mile radius of the new hospital and almost 90 percent lives within 12 miles of the hospital site (Accurus Systems, 1992). The location of the hospital has been issue within the community because it is not centrally located within Alamance County.

Based upon data obtained from a traffic impact analysis of the project (Zook, Moore & Associates, 1992), the Alamance Regional Medical Center when completely

built out will generate a total of approximately 8,225 trips per day along the adjoining transportation road network. Most of this traffic will be concentrated on Huffman Mill Road and Kirkpatrick Road south of the Interstate. A significant increase in traffic will also occur around the Huffman Mill Road/I-85 interchange. Eventually traffic signals will be required at all the major adjoining intersections surrounding the new hospital. In addition, there will be approximately 1,700 new parking spaces provided on the new hospital site. No provisions for public transportation to the hospital are planned at this time, but as the area develops and traffic congestion at the interchange increases, the need for some form of public transportation will need to be addressed. Planning ahead for other forms of alternative transportation now will help to address the traffic problems of the future as well as provide outlets for other recreational/health benefits.

Recreation

There are currently two recreational facilities located within the southwest area, Davidson Park and the Lake Mackintosh Marina. Both of these facilities are owned and operated by the City of Burlington. There are no Alamance County or Guilford County parks or recreational facilities currently located within the area.

Guilford County, however, is commencing with plans to construct a new marina and park on approximately 67 acres of land located west of Highway 61 along the north shore of Lake Mackintosh in Guilford County. Borum-Wade Engineering has been contracted by Guilford County to begin the final design of the facility. It is anticipated that construction of the marina will begin this fall/winter and that the park will be open to the public next summer. The City of Burlington has been asked by Guilford County to maintain this park on a contractual basis. This agreement requires the City of Burlington to employ a park warden and other staff who will be responsible for operating and maintaining the facility. Funding for these new salaries will be reimbursed by Guilford County on an annual basis. This arrangement is beneficial to the City of Burlington because it provides an affordable means for the City to provide for the policing of Lake Mackintosh waters in Guilford County at no additional cost.

This recreational facility was originally planned to be a joint Guilford County and Town of Gibsonville regional park of approximately 220 acres. The Town of Gibsonville declined to participate in the project and decided instead to sell the property the Town owned adjacent to the proposed park. Recently, the Guilford County School Board and the Town of Gibsonville have conceptually agreed to a land swap and property transaction which now makes the development of a much smaller park a reality. Basically, this agreement involves swapping 10 acres of the county school board's recreational fields (located behind the Gibsonville Elementary School) for 10 acres of adjoining Town of Gibsonville property at the lake. As a condition of this agreement, Guilford County must also purchase an additional 22 acres of land from the Town of Gibsonville. Most of this land is critical to Guilford County in order to develop

necessary septic fields for the bathroom facilities at the proposed park. Funding for the park is provided by the recreational bond money approved by Guilford County voters in 1988.

In anticipation of future recreational needs and demands, the City of Burlington recently completed the development of a new *Recreation and Parks Comprehensive Master Plan Through the Year 2010* (Woolpert, 1994). This master plan identifies the following key recreational improvements for the southwest area:

Davidson Park Expansion:

Davidson Park since opening in 1989/90 has seen a tremendous amount of use. Currently the park has four lighted soccer fields, two lighted and fenced youth baseball fields, two grass volleyball courts, a large totlot/playground, two lighted tennis courts, and a walking track. The park also contains two covered picnic shelters, a comfort station, and a restroom/concession/office building. Citizen interest in locating a library or a community center, and additional soccer and baseball fields at this site would require the purchase of additional property and the expansion of the park. Also the number of parking spaces at the park would need to be substantially increased if the park is enlarged. Another consideration is that the park currently has only one point of access. Secondary access to the park would greatly relieve current traffic congestion at the main entrance area. The City's *Recreation and Parks Master Plan* recommends that Davidson Park be increased in size to approximately 75 acres by acquiring 32 acres of adjacent property between the years 1994-2000. This would increase the service area of the park to a 3 mile radius serving both the west and southwest Burlington areas. The total cost for this expansion is estimated to be \$320,000.

South Park:

The Burlington *Recreation and Parks Master Plan* also proposes a new community park be created sometime between the years 2006-2010 using the 170 acre old City landfill property located south of Anthony Road. This proposed park will be needed to serve the future development of both south and southwest Burlington within a 3 mile service radius. A combination of active and passive recreational facilities is recommended. A site master plan would be required. Since the City already owns the property, the cost to develop this park would be limited to site development and construction only. These costs have been estimated to be \$1,550,000.

Davidson Park/Lake Mackintosh/ South Park Greenway:

The need to develop a linear park or greenway system within the Burlington urban area received considerable attention during the development of the City's *Recreation and Parks Master Plan*. Based upon the established guidelines and standards of the National Recreation and Parks Association, the City of Burlington has an immediate need for 5

miles of urban bikeways and 14 miles of hiking trails. The development of a greenway system would satisfy these standards. Between the years 1994-2000, the master plan recommends that the City begin acquiring property along each greenway route and that the City start developing facilities where possible. The master plan also estimated that approximately \$1,350,000 be set aside during this time frame to accomplish this goal. Funding for this program could come from a variety of different sources including general obligation bonds, contributions, grants, foundations, and bicycle/pedestrian transportation enhancement funds available through the NCDOT.

Greenway trails are typically off-road facilities which traverse natural areas and are enjoyed by walkers/joggers and bicyclists. The trail surface can be either natural or paved and is normally 10 feet in width. Public involvement in the planning and the design of any greenway trail is strongly encouraged. The Davidson Park/Lake Mackintosh and South Park Greenway is identified as one of two major greenway systems proposed for the City of Burlington. This greenway is a 9.5 mile off-street trail designed to link these three major parks. The greenway corridor would follow along Lake Mackintosh, the Great Alamance Creek, the sewer right-of-way leading to the Alamance Regional Medical Center, and eventually connecting to Davidson Park within the right-of-way of the proposed Western Alamance thoroughfare. The majority of this greenway is proposed to be located on City-owned property and on sewer rights-of-way which will reduce the need for land acquisition. However, the Burlington City Council must decide whether to include provisions for public access and the development of the greenway trail as part of the acquisition of the easements for the sewer line to the hospital. Typically, a minimum easement width of 30 feet is adequate to accommodate both a required sewer line and a greenway trail. In addition, the City Council must decide how and where this greenway trail can be incorporated into the plans for the proposed Western Alamance Loop thoroughfare. This decision must be coordinated with NCDOT officials during the project scoping meeting.

A Feasibility Study of a proposed off-street bike/pedestrian path linking Davidson Park to Elon College is scheduled to be completed by the NCDOT in FY 1996-1997. This path would be built as an enhancement along the northern portion of the Western Alamance thoroughfare (the Cook Road extension project). The Statewide Planning Branch of NCDOT and the Town of Elon College have already approved and adopted resolutions in support of this greenway enhancement to the project. The City of Burlington has adopted a resolution in support of the inclusion of this facility to the Alamance County Urban Area Thoroughfare Plan, but the City has not technically submitted a letter of approval to NCDOT indicating that the City will agree to maintain that portion of the bike/pedestrian path within its jurisdiction. If this facility is constructed, both the Town of Elon College and the City of Burlington must adopt an intergovernmental maintenance agreement.

A Feasibility Study of the proposed greenway along the northern shoreline of Lake Mackintosh has been prepared by Greenways, Inc. at the request of the City of Burlington. This Feasibility Study is currently under consideration by the City Council.

The Burlington Recreation and Parks Commission and the Burlington Bicycle Advisory Commission have already approved and endorsed the study and have recommended to the City Council that this greenway be designed and master planned for transportation funding request purposes. Opposition to the trail has been expressed by the adjoining property owners around the lake.

As its primary focus, the City of Burlington needs to offer recreation programs and park facilities for its own citizens. Historically, the City has been serving both Burlington residents and those living in the rural communities of Alamance County. Through the next 16 years however, it will be increasingly more difficult to follow this trend. It is anticipated that the City will not be in a financial position to offer recreation programs and park facilities for a large population of citizens living in the county. The development of the Burlington *Master Parks and Recreation Plan* and the above park and recreational improvements are based on the recognition that the City of Burlington will be expanding outward into the southwest area and that over next ten years much of the area south of the Interstate and including Lake Mackintosh will be located within Burlington's corporate limits.

Similar to Burlington, the other large municipalities in Alamance County will need to assist in offering recreational programs and facilities for their own communities. Currently Gibsonville along with the cities of Graham, Mebane and the Town of Haw River offer recreation and park services. It is anticipated that the Town of Elon College, Whitsett and the village of Alamance will also need to commit to providing leisure services for their citizens in the coming years. These local governments should share recreation programs and facilities since they are so close to one another.

Alamance County also needs to supplement the recreation and park facilities that are offered through the City of Burlington. By the year 2010, it is projected that 120,920 people will live in Alamance County creating a strong need for additional recreation services and park facilities. If these increased needs are to be met, Alamance County will need to provide more recreation programs and park facilities than are offered today. Alamance County's primary role should be to offer programs and facilities on a countywide basis. If the county elects not to develop any new parks over the next 16 years, the City of Burlington should be eligible for significant financial assistance through Alamance County to help subsidize its recreation and parks system. Greater emphasis and coordination of long term recreation and park planning between Burlington and Alamance County should be initiated and undertaken immediately.

Libraries

The development of a new library branch has been an issue of much discussion and planning since 1978 when library staff completed an analysis of community needs and an evaluation of library services in Alamance County. The Alamance County Public

Libraries operate as a department of Alamance County government. The Alamance County Commissioners appoint a ten member Advisory Library Committee to make recommendations to them regarding library matters.

Together Alamance County and Chatham County are recognized by the State of North Carolina as the Central N.C. Regional Library and are given additional state funding for being a regional library. Chatham County also contracts with Alamance County for certain library services. Although the public libraries in Alamance County are funded by the county and operate as a county department, agreements between Graham, Mebane, Burlington and the county give the responsibility for providing and maintaining buildings to the municipalities where the public libraries are located.

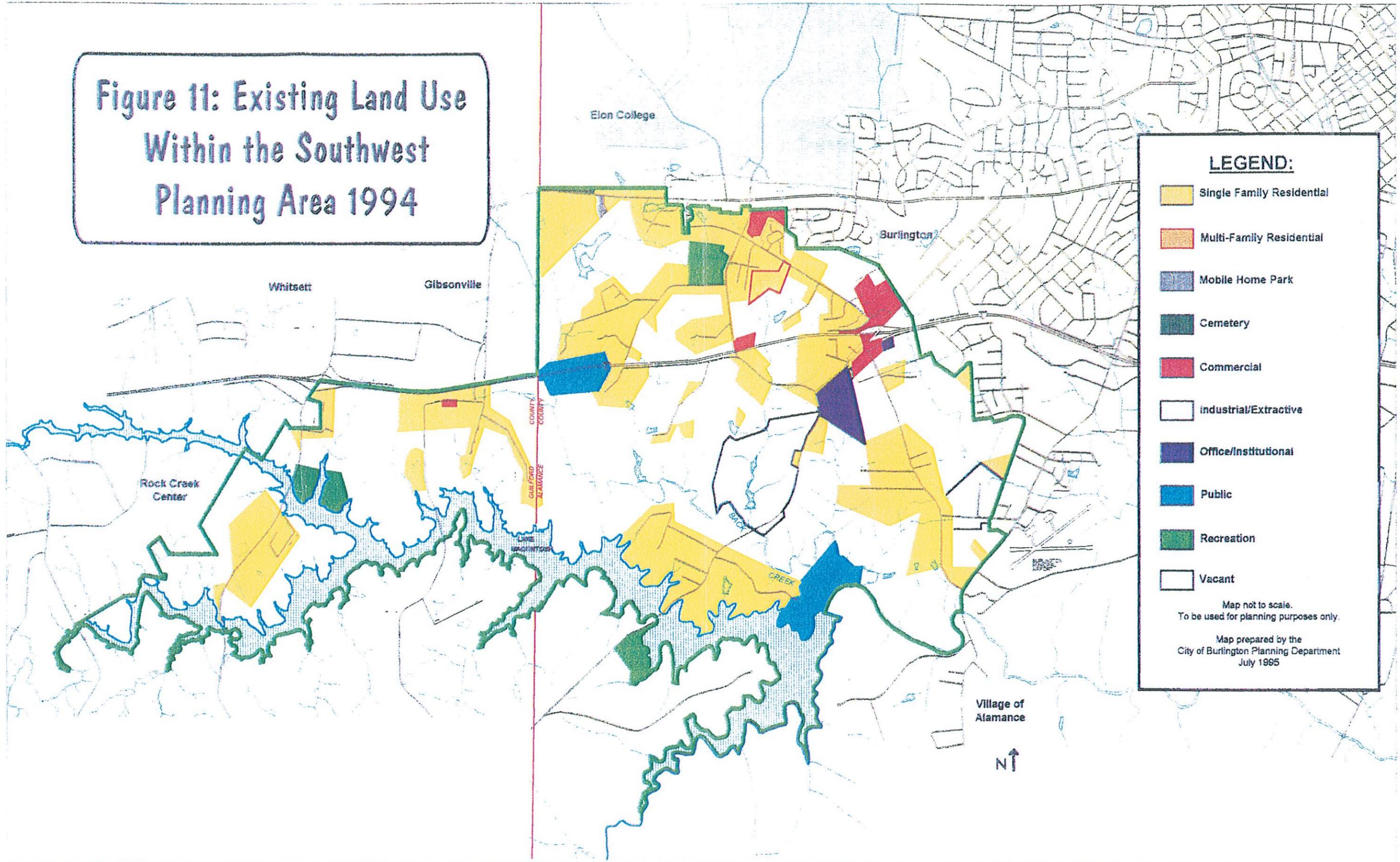
The headquarters library and main offices are at the May Memorial Library in downtown Burlington, which is a central location in the county. All of the existing three branches -- North Park, Graham, and Mebane are located to the north and east of the headquarters library. There are currently no public library facilities or services in Alamance County to the west of May Memorial Library in the Elon College/Gibsonville area. The Town of Elon College includes a four-year private college with its own library on campus to serve that educational institution, but no public library facility is available to its residents.

The May Memorial Library is currently hindered by the lack of adequate parking facilities and the limited capacity of the existing building for expansion. The Friends of the Library, a volunteer support organization of the North Carolina Regional Libraries, along with many library employees, have determined that the western portion of Alamance County needs a library branch. The May Memorial Library in Burlington is hampered by the lack of adequate parking facilities and the limited capacity of the existing building for expansion. Additionally, the areas of west Burlington and Elon College have experienced significant growth over the last ten years and there is no library facility located within a three mile radius to serve these residents conveniently. The need for a western library branch is also supported by growth projections prepared by the Burlington Planning Department which show a population increase of approximately 12.1% within this three mile area over the next twenty years.

During the past year City of Burlington officials have discussed the possibility of locating a branch library in Davidson Park. However, to accommodate a new library and needed additional park improvements, the City would need to acquire an additional 32 acres to expand the size of the park. Therefore, alternative locations for a new branch library are currently being considered. Other possibilities may include a joint Elon College/Burlington branch library or a joint Gibsonville/Elon College facility.

Regardless of where the new branch library is built, the residents of west Burlington and western Alamance County, including the southwest planning area, will have better and more convenient access to the public library system.

**Figure 11: Existing Land Use
Within the Southwest
Planning Area 1994**



LEGEND:

- Single Family Residential
- Multi-Family Residential
- Mobile Home Park
- Cemetery
- Commercial
- Industrial/Extractive
- Office/Institutional
- Public
- Recreation
- Vacant

Map not to scale.
To be used for planning purposes only.

Map prepared by the
City of Burlington Planning Department
July 1995

Village of Alamance
N↑

VIII. LAND USE

Existing Conditions

In the past, urban growth in Alamance County was located north of the Interstate corridor. This growth began when people settled near trading routes and stops on the North Carolina Rail Road. The modern highway system was superimposed on the trading routes. U.S. Highway 70 connected Raleigh to Asheville through Greensboro and Burlington; urbanized Alamance County grew there. The Interstate system located a distance from the most urbanized areas in the Piedmont to lower acquisition costs and to minimize disturbance to the urban cores. Eventually, the urban core, previously located along Hwy. 70, grew toward the Interstate.

Future improvements in sewer service and transportation will enable growth to occur on land that was once used solely for agriculture. Transportation improvements will make the area more accessible and the opening of the hospital will draw people south of the Interstate corridor. Additionally, the semi-rural setting and the water amenities will draw people from the more urban setting north of the Interstate. One of the primary reasons for developing a plan for the southwest planning area is the recognition that the area is changing rapidly.

The area south of the Interstate in Guilford and Alamance counties is much less urbanized than the area to the north. Relatively modest areas of growth have occurred to the south, usually concentrated along major thoroughfares. For example, in the southwest planning area, development has occurred along Kirkpatrick Road and Huffman Mill Road with very little development occurring away from these roads.

In the southwest area, land is used for a number of purposes, most of them associated with a rural or suburban lifestyle. Landholdings are, for the most part, larger than those in urban settings; many lots are 5 acres or greater in size, with several large farms in the 100 - 400 acre range. Pressure to subdivide these large tracts has been limited due to the lack of urban services such as sewerage and linkages to the transportation network. The land can be characterized as gently rolling with greater relief in the creek beds and closer to Lake Mackintosh.

Figure 11 shows the existing land use in the southwest area. Of the 8202 acres in the southwest planning area, residential, undeveloped, and public land are the predominant uses. Predictably, residential and commercial uses are concentrated in close proximity to the Burlington City limits. Most of the undeveloped and agricultural land is located apart from the existing road system. Public land is concentrated around Lake Mackintosh, at the NCDOT rest area, and at Joe Davidson Park.

Table 9 below shows the land use categories and their respective acreage in the southwest planning area. Undeveloped land occupies the broad middle region of the southwest planning area and in fingers up the creek beds north of the Interstate corridor. 44% or approximately 3600 acres of the southwest planning area is vacant or undeveloped land. While some of this land may be undevelopable because of watershed concerns, a great percentage is in a holding mode until water and sewer are supplied to the area.

**TABLE 9:
LAND USE IN THE SOUTHWEST PLANNING AREA
BY APPROXIMATE ACREAGES**

Land Use	Acreage	Percentage of Total Area
Residential ¹	1075	13%
COI ²	720	9%
Agricultural ³	759	9%
Vacant/Undeveloped	3590	44%
Public ⁴	2058	25%

Notes: Residential category includes all properties 10 acres or less.

²COI is an abbreviation for Commercial, Office and Industrial land uses; COI land use category includes the hospital.

³Agricultural land is defined as all land which was tilled in the aerial photographs from March, 1990.

⁴Includes City of Burlington property, Lake Mackintosh, and other park land.

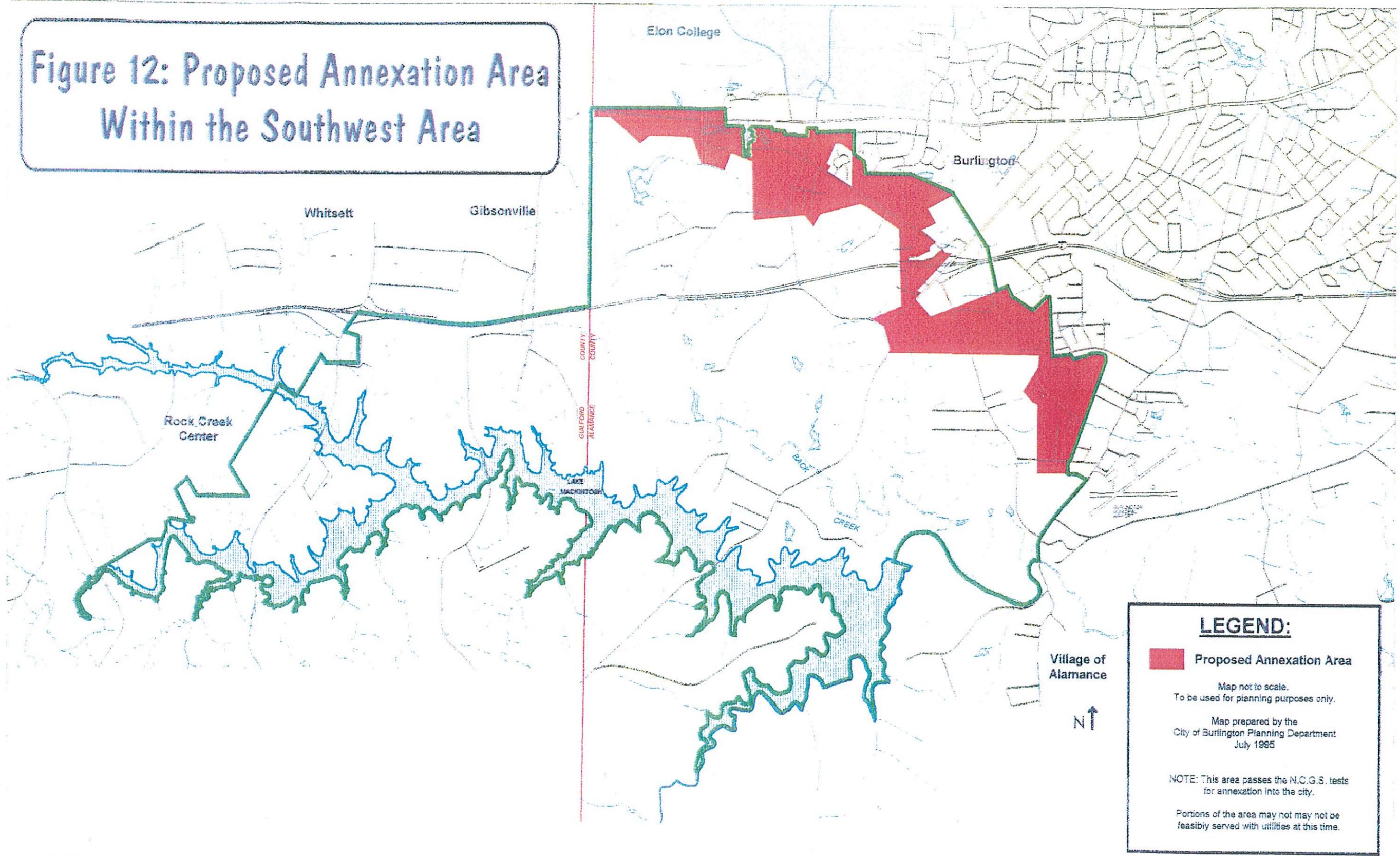
Acreages are approximate based on the following decision rules. Tax maps were used for determining total acreage. COI acreages were determined using tax maps and aerial photographs. Templates were used to determine agricultural acreage from the aerial photos. Public land was calculated using the *Burlington 2000 Comprehensive Land Use Plan* and tax maps. Public land does not include roadway right of way. Vacant and undeveloped land was the balance of the land not in the previous categories.

Farm land is scattered randomly throughout the area. Land is tilled north on Highway 70 at the Guilford County line, east to Kirkpatrick Road, and west to Highway 61. Farmland comprises approximately 759 acres or 9% of the land area.

The existing commercial, office, and industrial land uses are concentrated at the Huffman Mill Road/Kirkpatrick Road intersection and along the Interstate corridor. Recent completion of the hospital will induce further office and institutional development in this area. The pressure will increase to expand commercial development in the southwest planning area as population grows and Huffman Mill Road north of the Interstate becomes more congested.

Industrial land uses are clustered at the Willow Springs Industrial Park. Additional industrial land uses, the Martin Marietta Quarry and APAC asphalt production facilities, are located along Huffman Mill Road adjacent to Back Creek. In the future,

**Figure 12: Proposed Annexation Area
Within the Southwest Area**



LEGEND:

Proposed Annexation Area

Map not to scale.
To be used for planning purposes only.

Map prepared by the
City of Burlington Planning Department
July 1995

NOTE: This area passes the N.C.G.S. tests
for annexation into the city.

Portions of the area may not may not be
feasibly served with utilities at this time.

trucks from these operations may cause conflicts with emergency vehicles bound for the hospital. Commercial, industrial and office land uses comprise approximately 9% or 720 acres in the southwest planning area.

Land that is in public use comprises approximately one-quarter of the southwest area. Lake Mackintosh, the southern border of the planning area, is the primary component of land in public use. The City of Burlington owns all of the property under the lake and a small buffer area around it. 2058 acres in the southwest area are in public use; these include park land, the NCDOT rest area, and the area surrounding the Mackintosh water treatment plant.

Land in residential use comprises a relatively minor portion of the southwest planning area. The majority of the housing in the area is located north of the Interstate and along Kirkpatrick Road, with two small housing enclaves near Lake Mackintosh adjacent to Huffman Mill Road. Approximately 1075 acres or 13% of the total area is devoted to residential uses. As the area develops from rural to urban in character, a greater percentage of the land area can be expected to become residential.

As a result of the disbursed settlement pattern in the area, there have been relatively few conflicts based on differing land uses. Residents of the Huffman Mill Road/Harris Road area complain about speeding dump trucks traveling to and from the quarry. Virtually all residents decry the change in the rural lifestyle brought about by more people moving into the area. Yet as the area moves from rural to suburban, conflicts based on differing land uses can be expected to increase. One of the motivations for completing this plan is to anticipate the conflicts and minimize their impact on the quality of life in the area.

DEVELOPMENT SCENARIO/FUTURE LAND USE

Any planning process is an effort to guide the future. The result of the process is a development scenario which considers the factors interacting in the development of an area. In the case of the southwest planning area, it is the consideration of the future development of a relatively undeveloped region which, in all probability, will change into a highly developed one. The task for the City is to guide the process of growth to maximize positive impacts and minimize the negative impacts.

This plan has been prompted by a number of factors. The perceived need by local business and community leaders to adopt uniform land development regulations and long term growth goals for the area. The duty of the City to protect the investment in sewer infrastructure. The need to plan for future growth driven by proximity to the Interstate and to the new Alamance Regional Medical Center.

This development scenario reflects serious consideration of numerous options by

the City planning department, citizens and civic leaders. This section of the Southwest Area Plan will describe the preferred development scenario in terms of specific land use descriptions, transportation corridor changes and infrastructure provision by subregion within the southwest planning area.

Increased access to sewer and roads for all areas of the southwest planning area is necessary for the area to grow. Maintaining the quality of life in the area by retaining a rural flavor with urban convenience is also a goal of this planning effort. The following section will discuss the preferred method for promoting these changes.

The proposed land development scenario has been divided into four geographic units to allow easier description. The four units are: that portion of the southwest planning area north of the Interstate; the area east of Huffman Mill Road south of the Interstate; the area west of Huffman Mill Road south of the Interstate to the Guilford/Alamance county line; and, that portion of the southwest area in Guilford County.

North of the Interstate:

Other than the area between the hospital and the Interstate, this portion of the southwest planning area is under the most immediate pressure to develop. The area has been rapidly developing for the past 5 years. A significant portion of this area is also eligible to be annexed according to the criteria in GS 160A- 45. The area which currently qualifies for annexation is depicted in Figure 12, Proposed Annexation Area. If development proceeds at the pace of the past five years, the entire area north of the Interstate could be eligible for annexation sometime within the next decade.

Figure 13 shows the proposed future land use in the entire southwest area. The portion of the southwest planning area north of the Interstate is located within Burlington's current ETJ boundaries and as such its future land use was previously planned in the *Burlington 2000 Comprehensive Land Use Plan*. Future development is not predicted to differ significantly from recent development. Most of the land along the proposed Western Alamance Loop will remain low density single family residential in character. A corridor around the new Western Alamance Loop interchange, highly visible from the Interstate, will be rezoned from low density residential to office and institutional.

Community design in the area is considered critically important to the residents of west Burlington and Elon College. These communities consider this area to be their "front door" and they desire that land development patterns reflect that sentiment. It is anticipated that attractive office campuses will locate here. Additionally, the Western Alamance Loop with its grassy median and bikeway will contribute to a planned campus-like environment.

The area between Whitesell Farm Lane and the Collinwood Drive Extension north to Garden Road will change in land use from farming and low density residential to medium density residential. It is assumed that this area will develop in a manner similar to the Westridge Drive subdivision or the Chase Apartments located to the north and south of Garden Road, respectively. Low density single family uses abut Garden Road west of the Chase Apartments to Highway 70 and south to the Cook Road Extension, consistent with the existing land use plan. Garden Road will be widened to accommodate growth in the area.

Westview Terrace Extension will intersect with Fairview Drive to the south and Forestdale Drive to the north relieving Huffman Mill Road and S. Church Street of some residential traffic. Wilson Drive will act as a true access road running from Garden Road to the St. Marks Church Road. These roadway changes will help to alleviate some of the congestion present today.

Joe Davidson Park will likely be expanded to the west with frontage along the new thoroughfare. Areas north and east of Garden Road will remain medium density residential uses mimicking the future land use depicted in the *Burlington 2000 Comprehensive Land Use Plan*. Random Lane will be extended, providing secondary access for residents from the Western Alamance Loop.

East of Huffman Mill Road/South of the Interstate:

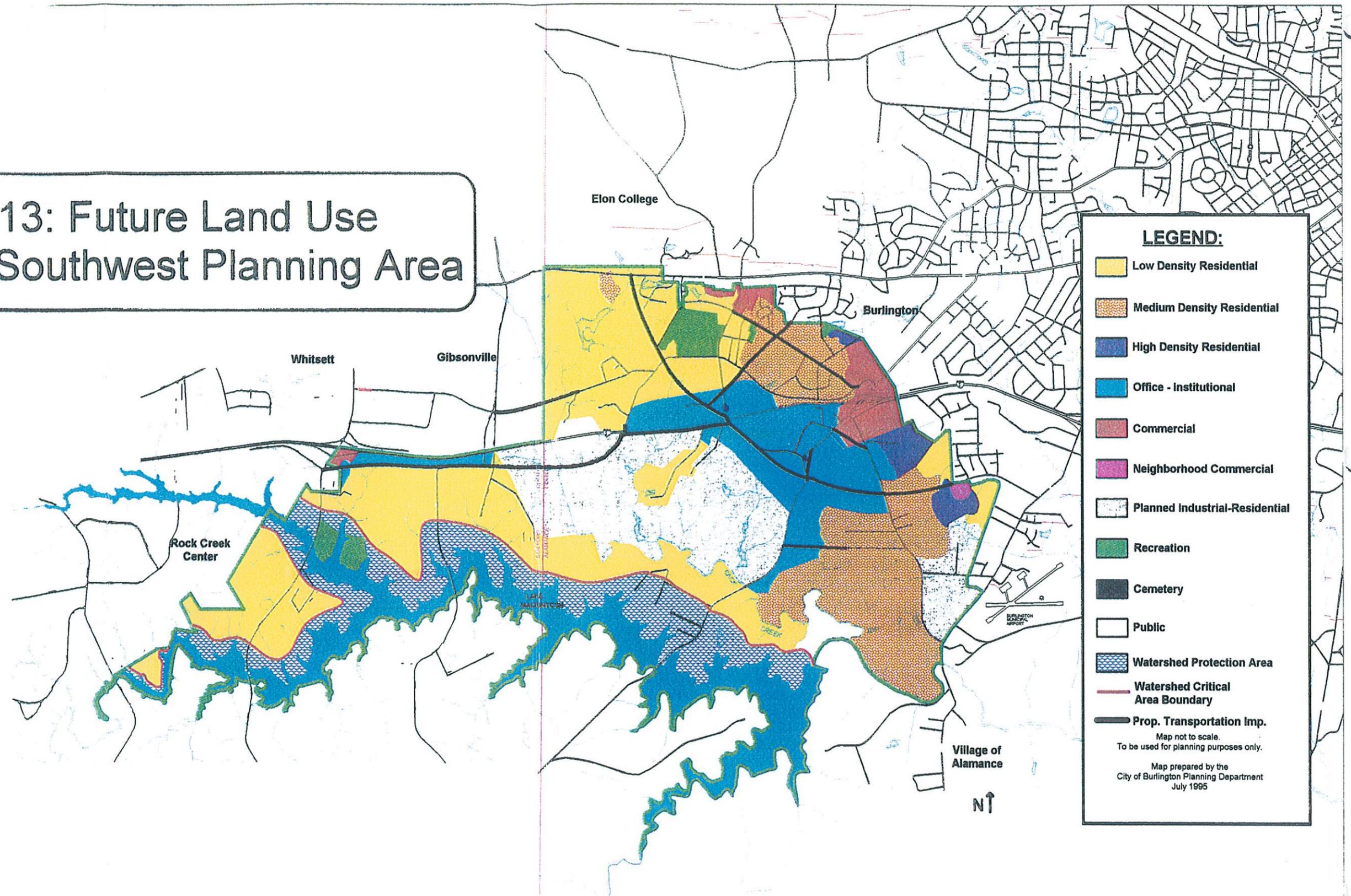
The portion of the southwest planning area east of Huffman Mill Road south of the Interstate includes many of the activities that are causing growth to occur within the entire area. Buffering these land uses while giving them room to spread is one of the objectives of this plan.

The Burlington Alamance Regional Airport, Willow Springs Industrial Park and the Alamance Regional Hospital are located inside this portion of the southwest planning area. Adjacent to the area are several large housing developments including Grand Oaks and Kellum Place. A new sewer outfall will be extended up the creek bed just west of Kennedy Road to the hospital opening the entire basin for development.

Transportation improvements within the area include the Western Alamance Loop connection with Grand Oaks Boulevard, the realignment of Huffman Mill and St. Mark's Church roads, the realignment of Kirkpatrick and Long Pine roads, and an extension of Kennedy Road to Huffman Mill Road.

The preferred development scenario recommends retaining the existing boundaries of commercial development along Huffman Mill Road to limit automobile congestion around the hospital. The development plan also recommends retaining the expanding office and institutional use boundaries around the hospital, while retaining the residential enclave on Long Pine Drive. High density residential development located on Crouse Road retains the boundaries from the *Burlington 2000 Comprehensive Land Use*

**Figure 13: Future Land Use
Within the Southwest Planning Area**



LEGEND:

- Low Density Residential
- Medium Density Residential
- High Density Residential
- Office - Institutional
- Commercial
- Neighborhood Commercial
- Planned Industrial-Residential
- Recreation
- Cemetery
- Public
- Watershed Protection Area
- Watershed Critical Area Boundary
- Prop. Transportation Imp.

Map not to scale.
To be used for planning purposes only.

Map prepared by the
City of Burlington Planning Department
July 1995

Plan. Another enclave of high density residential development straddles Gunn Creek on Grand Oaks Boulevard at its intersection with the Western Alamance Loop. This location will provide access to the Interstate via the Western Alamance Loop without congesting transportation corridors to the north. A small neighborhood commercial area is recommended for the intersection of Grand Oaks Boulevard and the Western Alamance Loop to serve the local population.

Similarly, the area south of the Western Alamance Loop along Kirkpatrick Road, proposed to be medium density residential, will enjoy easy access to the Interstate. In the area to the east, the area currently in industrial land use expands slightly to the south; the low density residential area near Harrison and Hoskins roads will remain low density residential.

Along Huffman Mill Road, Office and Institutional uses are proposed. They will provide overflow development area for the hospital and its support services. O&I uses will also limit the amount of heavy truck traffic on Huffman Mill Road.

The area from Back Creek to Harris Road will remain as low density residential. The land south of Harris Road is in the Watershed Critical Area where density is limited.

West of Huffman Mill Road in Alamance County:

This portion of the southwest area is located west of Huffman Mill Road. It contains the most recent expansion of City of Burlington extraterritorial jurisdiction (approximately 1650 acres). This portion of the southwest planning area also represents the probable furthest expansion of the City of Burlington zoning control for several years, since it is still in Alamance County. Extending land use controls into the portion of the southwest area in Guilford County would require crossing county lines, complicating administrative procedures and accomplishing very little since land use controls already exist in Guilford County.

This area will also experience the greatest transformation, since it is generally undeveloped or in agricultural use (see Figure 11). The extension of sewer lines into the area and an expanded transportation network will facilitate development.

Sewer outfall lines are proposed for the three major creekbeds in the area, including the main outfall which will be extended to the Michael Branch pump station. This will allow the entire area to be developed to a density impossible before the sewer. It will also allow the area to be served by gravity sewer, eliminating costly pumping stations.

Transportation improvements include the widening and realignment of St. Mark's Church Road as part of the Western Alamance Loop, paving Danbrook Road, and extending Rural Retreat with an overpass to connect with Highway 61 at Konica Drive. These transportation improvements will provide needed east/west traffic flow south of the

Interstate. Adding an overpass at Rural Retreat Road will also provide an important connection between Guilford County south of the Interstate and Burlington bypassing the busy Huffman Mill Road/I-85 interchange.

In the Whitesell Drive enclave, pressure has increased in the recent past to rezone the area to accommodate office-related development and higher density residential uses to serve the hospital. To accommodate the increased traffic in the area due to these land use changes, it is recommended that Whitesell Drive be extended to connect with the Western Alamance Loop and Huffman Mill Road utilizing the former route of St. Mark's Church Road. The plan recommends office and institutional land uses for the enclave.

Office and institutional land uses are proposed for the area south of the Western Alamance Loop intersection with Huffman Mill Road continuing west to the Ingle Lane/Danbrook Road intersection. This will accommodate some of the spillover development from the hospital and will add continuity to the office campuses on the northern side of the interchange.

Planned industrial residential (I1-A) is recommended for the Martin-Marietta quarry and for the large undeveloped area to the county line north of Back Creek. With the improved access of the Rural Retreat extension and sewer service to the area, properly designed industrial development could increase the Burlington tax base and employment opportunities without endangering Lake Mackintosh. The West Buckhill and East Buckhill Road area is recommended to remain low density residential. The area is entirely out of the water supply watershed of Lake Mackintosh.

To be successful, industrial uses need access to major thoroughfares. The area at the end of Charlie Ingle Road has limited accessibility. Danbrook Road and Charlie Ingle Road are gravel roads. If the area is to be successfully developed into a planned industrial/residential environment, improvement to the existing roadway network is an overriding concern.

Low density residential development is proposed for the area south of Back Creek except for the watershed critical area which requires even lower density residential development.

To provide an attractive entrance to the City of Burlington, a scenic corridor overlay district may be recommended to extend from the Guilford County line to the Huffman Mill Road Interchange. At the Alamance County line it would join with the existing scenic corridor overlay which continues through Guilford County. The corridor would extend 1500 feet on either side of the centerline of Interstate 85. Additionally, a resource conservation overlay district or special floodplain district is proposed as a means to protect the area's sensitive streams and creeks.

West of the Guilford County Line:

This portion of the plan was saved until last because it is in Guilford County. There are no plans to ask the Guilford County Commissioners to allow the City of Burlington to extend its ETJ into Guilford County. Therefore, this portion of the plan is only advisory in nature. Most of the issues and recommendations have been taken from the Rock Creek Area Plan (RCAP) adopted by the Guilford County Commissioners in 1988. However, given the length of time that has passed since that planning process, the City of Burlington will be suggesting some minor changes.

The Alamance County MPO is responsible for transportation planning within this portion of Guilford County. Therefore, we have made a recommendation to upgrade the road network that connects Alamance and Guilford County south of the Interstate. This plan recommends building a road south of the Interstate from Charlie Ingle Lane/Danbrook Road in Alamance County to the intersection of Konica Road and Highway 61 to provide access to the area and to improve traffic flow.

In the RCAP, future land use for the area was predicted to be agricultural and low density residential. This plan recommends maintaining that designation south of the Danbrook Road extension and east of Elmdale Road.

West of Elmdale and north of the Danbrook Road extension, this plan recommends office and institutional zoning to take advantage of the visibility and accessibility to the Interstate. East of Elmdale and north of Danbrook Road extension the plan recommends a continuation of light industrial zoning; this area is outside of the Lake Mackintosh Watershed and could be served by the sewer outfall.

This plan recommends no land use changes within the area protected by the Guilford County watershed ordinance.

IX. GROWTH MANAGEMENT STRATEGY AND POLICIES

Environmental quality

Issue: As the southwest area increasingly becomes more urban in character there will be a need for balancing this growth with measures to protect the area's natural environment.

Recommendations:

1. Stormwater runoff from development and drainage from agricultural activities should be of a quality and quantity as near to natural pre-development conditions as possible, with special emphasis given to watershed critical areas.
2. The existing creeks and drainage ways within the southwest area should be retained in a natural and undisturbed condition, except for reasons of public safety or to avoid excessive maintenance costs.
3. Development activities in the 100-year floodplain or near ponds and streams should be carefully controlled. If development must occur, low intensity uses such as open space, recreation, and adequately buffered agricultural or forestry activities are preferred.
4. Amend the City's land development regulations to encourage and reward higher density cluster development which preserves the natural features of the site, including existing topography, streams and significant trees and vegetation.
5. In accordance with the State Water Supply Rules (adopted by the EMC, 1992) the City of Burlington, Alamance County and Guilford County should establish a joint water quality monitoring and information sharing program by interlocal agreement to further the cooperative nature of water supply watershed management and protection.

-
6. Evaluate the impact of amending the City zoning ordinance to create a special floodplain or resource conservation overlay district for all FEMA designated flood hazard zones. This overlay is needed to establish a list of permitted uses and development densities, including amount of impervious surface for development.
 7. Establish a cooperative arrangement with federal and state agencies for public recreational use of the publicly owned land located around Lake Mackintosh, specifically for greenway development.
 8. Encourage the restriction of certain types of hunting near residential, public recreation and other public institutional uses.
 9. Discourage the transportation and storage of hazardous materials within and through the Lake Mackintosh watershed. Encourage Alamance and Guilford counties to fund a joint HAZ-MAT team to respond to emergency spills along the I-85/40 corridor within the Lake Mackintosh Watershed Area.
 10. Do not allow industries which handle and store hazardous materials to locate in floodplains or flood hazard areas.
 11. Industries and activities producing excessive noise, odor, air and water pollution and excessive truck traffic should be discouraged from locating in the southwest area, unless such adverse impacts can be mitigated or overcome.
 12. Support efforts of the Piedmont Triad region to maintain Alamance County's good air quality attainment classification.
 13. Evaluate the possibility of creating a scenic corridor overlay district for the area along the Interstate from the Guilford County boundary to Huffman Mill Road.

Transportation

Issue: A poor transportation network in the southwest area directly affects the urban area. To facilitate and effectively plan for development in the southwest planning area, the thoroughfares in this area must be improved.

Recommendations:

1. The City of Burlington should work with NCDOT to include the realignment of Kirkpatrick Road and Long Pine Road to the Huffman Mill Road Realignment Project.
2. The City of Burlington should work to include the following additions by amendment to the Alamance County Thoroughfare Plan to improve the roadway network in the southwest planning area.
 - A) **The Collinwood Drive Extension**
 - B) **The Rural Retreat Road Extension & Overpass**
 - C) **Williams Mill Road Extension**
 - D) **Kennedy Road Extension**
 - E) **The Danbrook Road Extension**
 - F) **The Garden Road Expansion**
3. The City of Burlington should work to include the following additions to improve the roadway network in the southwest planning area to be built through the subdivision process. As property is developed, the improvements mentioned (or similar alignments) should be added for the relief of congestion and for the equitable distribution of traffic throughout the area.
 - A) **The Westview Terrace Connector**
 - B) **Wilson Drive Extension**
 - C) **Fairview Drive Extension**
 - D) **Willow Oak Road Extension**
 - E) **Gwyn Street Extension**
 - G) **Whitesell Road and Inge Road Realignment**
 - F) **Random Lane Extension**

-
4. The City of Burlington should continue to work with the Alamance County MPO through the Thoroughfare Planning process to add any other roadways necessary to improve the transportation network in the southwest planning area.
 5. The City of Burlington should work with the towns of Elon College and Gibsonville as well as the NCDOT and the Alamance County MPO to ensure bicycle and pedestrian access on the Western Alamance Loop to the Alamance County Regional Medical Center and Lake Mackintosh.
 6. The City of Burlington should work with the towns of Elon College and Gibsonville as well as the NCDOT and the Alamance County MPO to ensure that the Western Alamance Loop is built as a limited access divided highway with grassy medians and bikeways.
 7. In order to minimize the impact of being bisected by I-40/85, the City of Burlington should continue to develop and acquire the necessary rights of way that will link Burlington north and south of the Interstate and ensure safe pedestrian and bicycle access.
 8. The City of Burlington should continue to integrate non-automobile oriented facilities such as bikeways and pedestrian routes throughout the City. To maximize the benefit to citizens and the transportation network, these facilities ideally will serve as a link between work, home, school, and recreation.

Utilities

Issues: Due to state requirements for the size of lots for septic tanks and fields, if the southwest area is allowed to develop without sewer service, the City will lose potentially prime industrial and office locations as well as add to urban sprawl. Lack of water and sewer will cause the southwest planning area to develop in a piecemeal and poorly planned manner.

Recommendations:

1. To facilitate compact, orderly, desirable residential growth and economic development in the region and to limit future waste disposal problems, sewer and water service should be extended into the southwest area as rapidly as possible.

-
2. To build the sewer line, the City of Burlington should pursue creative joint financing arrangements, such as cost sharing, with those jurisdictions (principally Elon College, Gibsonville, Graham, and Alamance County) that will benefit from the extension. If joint financing is not feasible, the City of Burlington may wish to adopt a short term solution independent of the other jurisdictions.
 3. For the long term benefit of the City of Burlington, serious consideration should be given to constructing the entire Great Alamance Creek outfall line to the South Burlington Waste Water Treatment Plant.
 4. The City of Burlington should assess the future load at the South Burlington Wastewater Treatment Plant and make plans to upgrade the plant, if necessary.
 5. The City of Burlington should consistently maintain its existing water and sewer system to minimize the impact of problems such as Infiltration and Inflow.
 6. To the maximum extent possible, the City should design the Great Alamance Creek outfall and trunk line easements as greenways to serve pedestrians and bicyclists to link work places to homes and recreation facilities.

Public Facilities and Community Services

Issue: As the southwest area urbanizes, increasing demands will be placed on public facility and community service providers to maintain high quality urban services over greater distances.

Recommendations:

1. The City of Burlington should keep the school system apprised of plans to expand urban services into the southwest area and the likely impact of the system expansion on school enrollment.
2. The City of Burlington should keep the rural Volunteer Fire Departments apprised of plans to expand urban services and change future land uses in the southwest area and the likely impact of expansion on fire fighting needs.

-
3. Given the building height of the new hospital and other mid-rise development in the area, the City should be certain that Fire Stations (nos. 4&5) are equipped to handle emergencies with ladder trucks and other equipment.
 4. The City planning department shall keep the Police Department informed of future annexations as well as changing land uses within the southwest area, so that the Police Department may coordinate services with surrounding law enforcement agencies.
 5. The City of Burlington and ACTS should work with the Alamance Regional Medical Center to facilitate introduction of public transportation to serve the hospital.
 6. The City of Burlington should work with the Alamance County MPO to limit congestion at the Huffman Mill Road Interchange and create other routes to allow easier movement into and out of the hospital.
 7. The City of Burlington should continue to implement the recommendations of the *Recreation and Parks Comprehensive Master Plan* prepared in 1994.
 8. The City of Burlington should continue to develop a greenway system to link major parks and other facilities.

Future Land Use

Issue: To facilitate and encourage the development of the southwest area, and to provide for greater diversity of industries and high quality employment opportunities, future land use changes should occur in a planned and orderly fashion.

Recommendations:

1. To take advantage of visibility, land bordering the Interstate should be used for light industrial and office and institutional uses.
2. Sufficient land surrounding the Alamance Regional Medical Center should be allocated for office and institutional uses to provide for future needs.

-
3. Commercial development should be limited to its present boundaries to prevent significant negative traffic impacts on the hospital and subsequent developments.
 4. Significant buffering should be maintained between industrial and residential land uses at their boundaries throughout the area.
 5. Planned development should be encouraged throughout the area to capitalize on the natural beauty of the area and minimize negative environmental impacts.
 6. Low density residential land use should be used along the Western Alamance Loop into West Burlington and Elon College.
 7. The Southwest Planning Area Future Land Use Map should be adopted as a policy guide to supplement the Burlington 2000 Comprehensive Land Use Plan.
 8. As the southwest planning area urbanizes, the City should annex those areas that meet the conditions set forth in the Burlington 2000 Comprehensive Land Use Plan.
 9. Adopt and maintain water supply watershed regulations which give the greatest protection to the City's water sources.

Intergovernmental Coordination

Issue: The village of Alamance, the towns of Gibsonville and Whitsett, the cities of Burlington and Greensboro, Alamance and Guilford counties, and Rock Creek Center have borders coincident with the southwest area. Decisions made about future land use and growth in the southwest planning area have the potential to indirectly or directly affect each of the seven jurisdictions and the corporate park. Regular consultations between governmental entities will promote better planning and infrastructure decisions by providing each entity with more thorough information

Recommendations:

1. Work with other jurisdictions in the southwest planning area to plan and delineate the future urban growth areas, annexation boundaries, and extraterritorial jurisdictions of each existing municipality within the region.
2. Work with the City of Greensboro to coordinate the expansion of water and sewer service and transportation networks in the southwest planning area and the adjacent area.
3. Work with Guilford County to coordinate the changes in future land use in the southwest planning area.
4. Continue to work with Guilford County to strengthen its watershed regulations to protect the Lake Mackintosh water supply.
5. Continue to work with the Alamance County MPO to coordinate transportation decisions.
6. Work with the Village of Alamance to minimize traffic impacts due to the development of the southwest planning area.
7. Develop a process to work with surrounding jurisdictions on matters of mutual concern as they develop.

APPENDIX A: PUBLIC PARTICIPATION PROCESS DOCUMENTS

THE SOUTHWEST AREA PLAN

MEETING ADVERTISEMENTS AND NOTIFICATIONS

THE CITY OF BURLINGTON PLANNING DEPARTMENT INVITES CITIZEN PARTICIPATION IN PUBLIC WORKSHOPS TO BE HELD ON MONDAY, OCTOBER 9 AND WEDNESDAY, OCTOBER 25, 1995. THE CONTENT AND FORMAT OF BOTH WORKSHOPS WILL BE THE SAME.

THE PURPOSE OF THESE MEETINGS WILL BE TO DISCUSS THE PROPOSED **SOUTHWEST AREA PLAN** AND TO RECEIVE PUBLIC INPUT ABOUT FUTURE LAND USE, GROWTH, AND ZONING ISSUES IN THE AREA. THE INTENT OF THE PLAN IS TO SUPPLEMENT THE GENERAL RECOMMENDATIONS MADE IN THE BURLINGTON 2000 COMPREHENSIVE LAND USE PLAN AND TO DEVELOP A STRATEGY FOR GROWTH MANAGEMENT WITHIN THE AREA.

THE OCTOBER 9, 1995 MEETING WILL BE CONDUCTED IN THE LOWER COUNCIL CHAMBERS OF THE MUNICIPAL BUILDING, 425 LEXINGTON AVENUE, DOWNTOWN BURLINGTON FROM 5:00-7:00 P.M.

THE OCTOBER 25, 1995 MEETING WILL BE CONDUCTED IN THE SOUTHWEST AREA AT THE LAKE MACKINTOSH CLUBHOUSE AT THE LAKE MACKINTOSH MARINA FROM 7:00-9:00 P.M.

QUESTIONS REGARDING THE MEETINGS SHOULD BE DIRECTED TO THE CITY OF BURLINGTON PLANNING DEPARTMENT BY CALLING 222-5110.

(INSERT BLACK AND WHITE SOUTHWEST AREA MAP)

Ads # 1 & 2

Run on 10/1 and 10/8

THE CITY OF BURLINGTON PLANNING DEPARTMENT INVITES CITIZEN PARTICIPATION IN A PUBLIC WORKSHOP TO BE HELD ON WEDNESDAY, OCTOBER 25, 1995.

THE PURPOSE OF THIS MEETING WILL BE TO DISCUSS THE PROPOSED **SOUTHWEST AREA PLAN** AND TO RECEIVE PUBLIC INPUT ABOUT FUTURE LAND USE, GROWTH, AND ZONING ISSUES IN THE AREA. THE INTENT OF THE PLAN IS TO SUPPLEMENT THE GENERAL RECOMMENDATIONS MADE IN THE BURLINGTON 2000 COMPREHENSIVE LAND USE PLAN AND TO DEVELOP A STRATEGY FOR GROWTH MANAGEMENT WITHIN THE AREA.

THE MEETING WILL BE CONDUCTED IN THE SOUTHWEST AREA AT THE LAKE MACKINTOSH CLUBHOUSE AT THE LAKE MACKINTOSH MARINA FROM 7:00-9:00 P.M.

QUESTIONS REGARDING THE MEETING SHOULD BE DIRECTED TO THE CITY OF BURLINGTON PLANNING DEPARTMENT BY CALLING 222-5110.

(INSERT BLACK AND WHITE SOUTHWEST AREA MAP)

Ad # 3

Run on 10/22

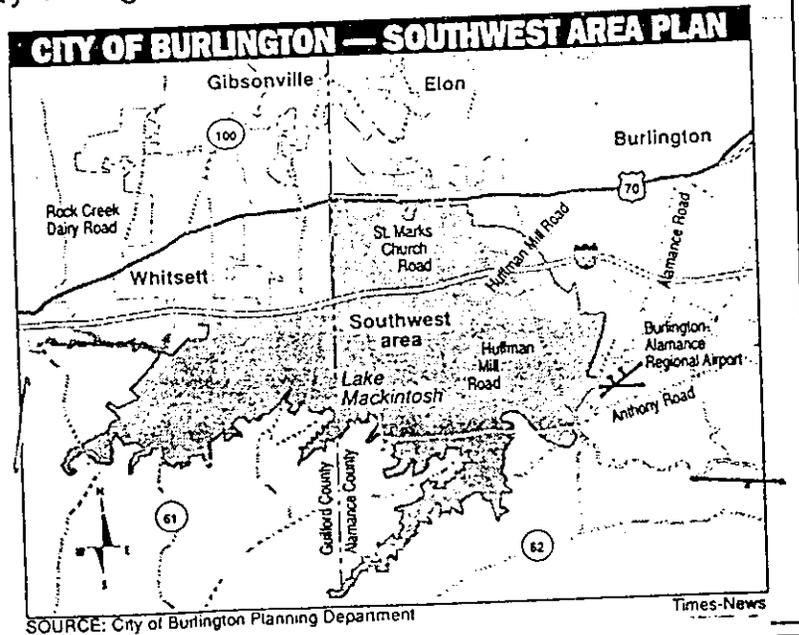
The City of Burlington Planning Department is soliciting citizen participation in public workshops to be held on Monday, October 9 and Wednesday, October 25, 1995. The content and format of both workshops will be the same.

The purpose of these meetings will be to discuss the proposed **SOUTHWEST AREA PLAN** and to receive public input about future land use, growth and zoning issues in the area. The intent of the plan is to supplement the general recommendations made in the Burlington 2000 Comprehensive Land Use Plan and to develop a strategy for growth management within the area.

The October 9, 1995 meeting will be conducted in the lower Council Chambers of the Municipal building, 425 Lexington Avenue, Downtown Burlington from 5:00-7:00 p.m.

The October 25, 1995 meeting will be conducted in the southwest area at the Lake Macintosh Clubhouse at the Lake Macintosh Marina from 7:00-9:00 p.m.

Questions regarding the meetings should be directed to the City of Burlington Planning Department by calling 222-5110.



Date

Dear Property Owner:

I would like to thank you for attending the City-sponsored Southwest Area Plan public meeting held in October. Input from these meetings have assisted City staff in preparing growth and development strategies in the area southwest of the city limits.

As a result of feedback from the public meetings, the City Planning staff has made changes to the Southwest Area Plan. We have made alterations to the future land use map and text changes to more clearly reflect City goals for roadway networks.

To provide citizens with an opportunity to review the above changes, the Planning Department will sponsor a third public meeting on the Southwest Area Plan to be held Wednesday, December 13, 1995, from 6:00 to 8:00 p.m. at the Lake Mackintosh Clubhouse. Planning staff will briefly review the changes and again provide opportunity for citizen comments.

I also would like to take this opportunity to provide you with a chance to preview these changes prior to the December 13th meeting. Revised copies of plan maps and text changes are available for review in the Planning Department between the hours of 8:30 a.m. and 5:00 p.m. If possible, please call ahead so that a staff planner or I will be available to discuss the changes. The department phone number is 222-5110.

Thank you again for attending our previous meeting and participating in this planning process.

Yours very truly,

Robert R. Harkrader, AICP
Planning Director

RRH:df

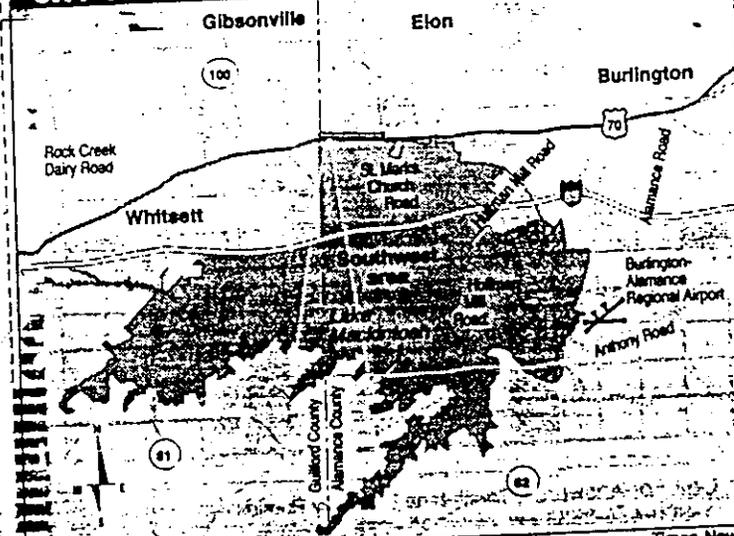
The city of Burlington Planning Department invites citizen participation in a public workshop to be held on Wednesday, December 13, 1995.

The purpose of this meeting will be to discuss changes to the proposed **SOUTHWEST AREA PLAN** compiled at previous public meetings and to receive public input about future land use, growth and zoning issues in the area. The intent of the plan is to supplement the general recommendations made in the Burlington 2000 Comprehensive Land Use Plan and to develop a strategy for growth management within the area.

The meeting will be conducted in the southwest area at the Lake Mackintosh Clubhouse at the Lake Mackintosh Marina from 6:00-8:00 p.m.

Questions regarding the meetings should be directed to the City of Burlington Planning Department by calling 222-5110.

CITY OF BURLINGTON — SOUTHWEST AREA PLAN



SOURCE: City of Burlington Planning Department

Times-News

THE SOUTHWEST AREA PLAN

PUBLIC MEETING SIGN-IN SHEETS

SIGN-IN SHEET

Southwest Area Plan Public Meeting
Wednesday, October 25, 1995
7:00-9:00 p.m.
Lake Mackintosh Marina

<u>NAME</u>	<u>ADDRESS</u>	<u>PHONE #</u>
JOHN + SANDY FRANK	3575 GARDEN RD	584-9749
Frank White	1230 Whitesell Farm Ln	584-2724
Robert M. Lewis	1802 2403 Hwy 111 ST	584-0377
David + Glenda Moss	4017 Charlie Ingle Ln.	584-6210
Rebecca Oakley	3158 Whitesell Dr.	584-0476
Joyce Hodges	3141 Whitesell Dr.	584-0716
ERIC HENRY	496 PAREVIEW DRIVE	229-4832
Richard W. Wooten	140 RANDEW LN	584-5825
Mike Taylor	3849 Rural Retreat RD	584-5023
Oskar T. Neulola	139 RANDEW LN	584-1011
Eugene Turner	2509 Ferndale DR	584-2750
Michael Meola	204 RANDEW LANE	584-7968
Edith Barakat	132 RANDEW LN.	584-2650
AS Byrd	2212 WOODLAND AVE	584-7426
Harry James	1115 Edgewood Ave	228 9897
Shelia Williams	1665 ST. MARTIN'S CHURCH	584-3215
Steve Ziff	1521 W. Paris St	229-1608

NAME:

ADDRESS:

PHONE:

Kathy Hayes

914 Buckner St Goshen

202-500

[Handwritten signature]

Jim Faulkner

4025 CHARLIE INGLE

584-6578

JEAN "

" " "

"

SIGN-IN SHEET

Southwest Area Plan Public Meeting
Wednesday, October 25, 1995
7:00-9:00 p.m.
Lake Mackintosh Marina

<u>NAME</u>	<u>ADDRESS</u>	<u>PHONE #</u>
<u>George Moody</u>	<u>1842 E. Buck Hill Rd</u>	<u>584 1096</u>
<u>John Moody JR</u>	<u>BURLY 27215</u> <u>1719 St. MARKS Ch. Rd</u>	<u>584 7278</u>
<u>Betty Agresta</u>	<u>3134 Forestdale Dr.</u>	<u>584-3235</u>
<u>Chick Agresta</u>	<u>" "</u>	<u>" "</u>
<u>Raymond Payne</u>	<u>1848 W Buck Hill Rd</u>	<u>584 9522</u>
<u>Edith Conklin</u>	<u>1824 W Buck Hill Rd</u>	<u>584 9220</u>
<u>Vern Johnson</u>	<u>3843 GABRIEL LN</u>	<u>584-5447</u>
<u>Herence Green</u>	<u>1559 Huffman Mill Rd</u>	<u>584-1461</u>
<u>Worth Whitcomb?</u>	<u>1844 St Marks Ch Rd.</u>	<u>538-0827</u>
<u>Edith Conklin</u>	<u>1824 W. Buck Hill Rd</u>	<u>584-9220</u>
<u>James Payne</u>	<u>1966 W Buck Hill Rd</u>	<u>584-9481</u>
<u>James Payne</u>	<u>" "</u>	<u>" "</u>
<u>James Payne</u>	<u>" "</u>	<u>" "</u>
<u>ARAN HORTON</u>	<u>1057 PACE RD 27215</u>	<u>421 9747</u>
<u>St. John</u>	<u>2553 INGLEDAIRY RD</u>	<u>449-7170</u>
<u>Julie Small</u>	<u>2287 Small Ct</u>	<u>584-4013</u>
<u>Terry Small</u>	<u>2287 Small Ct</u>	<u>584-4013</u>
<u>Don and Linda Wilson</u>	<u>208 Random Lane</u>	<u>584-5848</u>

NAME:

ADDRESS:

PHONE:

RONALD E. HAMMOND 1865 ST. MARIES CH. RD. 584-3215

DALTON M. BROWN 2029 Englemtn Ct 222-1800

Sandra Small 2221 Huffman Mill Rd 584-6771

Mary A. Baker 1314 Cedarcrest Dr 227-5754

Delva Smith 1751 St. Maries Ch Rd 584-4381

Carl Wicker 1667 Huffman Mill Rd 584-2782

Dolan Hoffman 3764 Hoffman Place 584-7955

Margaret High Blonde Dr. 584-7308

Jack Crawford 2228 Huffman Mill Rd 584-6886

Dorothy Crawford " " " "

[Signature] 3158 Small Ct 584 6053

E. J. Schmidt 1625 ST. MARIES CH. RD. 584-7947

Doug Went 1412 Greenwood Ln 226-6179

SIGN-IN SHEET

Southwest Area Plan Public Meeting
Wednesday, December 13, 1995
6:00-8:00 p.m.
Lake Mackintosh Marina

<u>NAME</u>	<u>ADDRESS</u>	<u>PHONE #</u>
<u>Dawn Payne</u>	<u>1960 W. Buckhill</u>	<u>584-9481</u>
<u>James & Gayne</u>	<u>1960 W. Buckhill Rd</u>	<u>584-9481</u>
<u>Chris Washburn</u>	<u>Guilford Co.</u>	<u>373-3334</u>
<u>Kim Jonett</u>	<u>4215 Shepherd Dr. Burlington</u>	<u>584-4761</u>
<u>David & Glenda Moss</u>	<u>4017 Charlie Ingle Ln.</u>	<u>584-6210</u>
<u>Wanda & Raymond Payne</u>	<u>1848 W Buck Hill</u>	<u>584-8522</u>
<u>Edith Conklin</u>	<u>1824 W Buck Hill Rd</u>	<u>584-9220</u>
<u>Joy Rouse</u>	<u>Realtor ^{9519 Paradise} Burlington</u>	<u>584-6488</u>
<u>Margaret A. Loy</u>	<u>1570 Loydon Buseinger</u>	<u>228-8423</u>
<u>Joe Ellis Loy</u>	<u>1570 Loy Lane Burlington</u>	<u>228-8422</u>
<u>David Loy</u>	<u>1147 S. Arch St</u>	<u>229-6984</u>
<u>Nancy Fargione</u>	<u>2804 Teoxler Rd. Burlington</u>	<u>229-7071</u>
<u>Edith Conklin</u>	<u>1824 W. Buck Hill Rd</u>	<u>584-9220</u>
<u>JOHN REARDON</u>	<u>421 Greenfern Ct</u>	<u>584-4231</u>
<u>Bob Thibeault</u>	<u>2804 Teoxler Rd</u>	<u>229-7071</u>
<u>Jack & Betty Crawford</u>	<u>2928 Huffman Ml. Rd</u>	<u>584-6886</u>
<u>Rose Holland</u>	<u>P.O. Box 1734 Burl. NC</u>	<u>227-9506</u>

SIGN-IN SHEET

Southwest Area Plan Public Meeting
Wednesday, December 13, 1995
6:00-8:00 p.m.
Lake Mackintosh Marina

<u>NAME</u>	<u>ADDRESS</u>	<u>PHONE #</u>
<u>W C Rouse</u>	<u>2519 Ferndale Dr. Burt</u>	<u>584 6288</u>
<u>Mr. & Mrs. A. S. Byrd</u>	<u>2212 Woodland Ave. Burt.</u>	<u>584-7426</u>
<u>HAROLD E. HARVEY, DR.</u>	<u>3700 HARRIS RD.</u>	<u>538-0988</u>
<u>Bryan Pennington</u>	<u>2286 Huffman Mill Rd</u>	<u>589-8514</u>
<u>Alton Howley</u>	<u>4304 Hickory Nut Pt</u>	<u>421 9481</u>
<u>Jesse D Bode</u>	<u>8 DENISE DR BURLINGTON</u>	<u>227-9506</u>
<u>Jim & JEAN FAULKNER</u>	<u>4025 CHARLIE TRAIL LN</u>	<u>584-6578</u>
<u>MIKE TAYLOR</u>	<u>3849 RURAL RETREAT LN</u>	<u>584-8023</u>
<u>ERIC HENRY</u>	<u>4016 PARKVIEW DRIVE</u>	<u>229-6422</u>
<u>Amigan Carter</u>	<u>706 Huffman Mill Rd Apt C7</u>	<u>584-3006</u>
<u>Mary Ann Spiker</u>	<u>137 Georgetown Drive</u>	<u>538-0312</u>
<u>Lee Wilson</u>	<u>1507 ST. MARKS CH. RD.</u>	<u>584-9487</u>
<u>Delna Shutt</u>	<u>1751 St. Marks Ch Rd</u>	<u>584-4381</u>
<u>Walt Whitstead</u>	<u>1844 St Marks Ch Rd.</u>	<u>538-0827</u>
<u>Budd Baker</u>		
<u>Ron & Shelia Hammond</u>	<u>1465 St-Marks Ch. Rd</u>	<u>584-3211</u>
<u>Harold Harvey</u>	<u>3742 HARRIS RD.</u>	<u>584-6860</u>

THE SOUTHWEST AREA PLAN

MINUTES OF THE PUBLIC MEETINGS

Minutes of the Southwest Planning Area Public Meeting

October 9, 1995

Location: Municipal Building, lower Council Chamber, 5:00 -6:30 p.m.

Burlington City Staff Present:

Bob Harkrader, Planning Director
Wes Armstrong, Planner II
Kathy Mills, Planner I
Natasha Euliss, Intern

Burlington City Planning Director Bob Harkrader introduced the Southwest Area Plan and explained the maps hanging on the walls.

Approximately 10 people were present at the meeting. The following comments and questions were recorded by city staff.

- Lake Mackintosh is half as big as necessary.
- The entire county should have land use controls.
- O-I zoning is a good idea north of the interstate, in the Whitesell Lane area.
- O-I zoning would also be a good idea south of the interstate in the area presently zoned Medium Density.
- The watershed regulations will remain approximately the same as those now enforced by Alamance County.
- There was a connector street at Rural Retreat Road before Interstate 85/40 was built.
- Garden Road could be widened.
- What is the time frame for the proposed Rural Retreat bridge?
- What is the treatment capacity of the South Burlington Treatment Plant?
- Is the only treatment plant north of the interstate?
- The city will be in a 'squeeze' if we plan for the future because the city is located between the Triad and Triangle.
- This plan will help with managing growth and development.
- Light industrial developments similar to Konica and AT&T will not overtax the infrastructure in the area like commercial development will.
- Industrial and economic development will keep property taxes low for homeowners.
- "Bedrooms don't support cities."
- What is the time frame for the proposed sewer system? Within the next 5 years?
- Everyone wants control of his property.
- Growth and change in the southwest area is inevitable - the plan will try to manage it.
- There is already too much O-I zoning in Burlington.
- The Rural Retreat Road/Saint Marks Church Road area should be zoned commercial instead of O-I.
- What is the time frame for the annexation?
- Is the city planning to annex additional property after SWAP passes?
- Public sewer is the lifeblood of development.
- Sometimes, even if the city provides services, it doesn't mean that the property will be annexed.
- The area south of Rural Retreat Road is now primarily residential, after the Cook Road expansion 18,000 cars per day travel along the new road. Will people really flock to the area to build residential?
- The Cook Road Expansion will probably be a limited access facility, thus alleviating much of the traffic.

- The NC 87 connector, when completed, will bring a large number of big trucks through the area.
- Traffic pressures currently exist in the area.
- Commercial zoning brings more traffic to an area.
- This plan proposes no commercial development from highway 70 to highway 62 south - only office/institutional and light industrial/residential land uses would be permitted.
- The buffer area around the city's water source needs to be wider to provide more protection.
- The county has very strict guidelines concerning the watershed and the city needs to be very careful and protect our water source.
- Look for alternative transportation modes (alternatives to one-person/one-car).
- Try to develop new greenspace and greenways, for instance new greenways from Davidson Park to Hospital and from Hospital to Lake Mackintosh.
- Work to minimize urban sprawl by concentrating development in pockets.

Minutes of the Southwest Area Plan Public Meeting

October 25, 1995

Location: Lake Mackintosh Clubhouse, 7:00-9:30 p.m.

Representatives of the City of Burlington:

City Councilman David Huffman
City Manager William Baker
Planning Director Robert Harkrader
Wes Armstrong, Planner II
Kathy Mills, Planner I
Natasha Euliss, Planning Department Intern.

City Planning Director Bob Harkrader began the evening by introducing the City staff present and explaining the several maps exhibited on the wall at the front of the room. Approximately 50 people attended this meeting.

The following comments and questions were addressed by city staff.

- Mixed reviews concerning the area just south of the interstate that's currently residential.
- Spot zoning has occurred 'up and down' the interstate.
- The SWAP will over tax residents.
- The City is looking for input from residents concerning the land between the Huffman Mill Road interchange and the Saint Mark's Road bridge.
- Garden Road may need to be included on the local TIP for widening.
- Need a speedbump placed in the center of Collinwood Drive near the new area that has been extended into the Westridge area.
- O & I zoning is generally compatible with the residential areas.
- There are no commercial strips on the south side of the interstate now. The future land use map will protect this area.
- With the new road proposed, the area will grow.
- When the hospital moved to the SWA, the entire transportation system in the city was 'uprooted.' The southwest is the area of future growth for the City.
- One of the objectives of this plan is to prevent the same kind of traffic congestion that exists now on the north side of the interstate to spill down into the southern side. No continuation of the commercial strip zoning south of Interstate 85/40.
- The hospital site was already chosen before the City knew about the plans.
- The hospital agreed to bear the costs of pumping their sewage.
- The state of North Carolina gives cities over 25,000 in population the right to extend their maximum extraterritorial jurisdiction to three (3) miles.
- Land use controls must be in place before the City of Burlington will spend millions of dollars constructing water and sewer lines.
- The city should just 'leave people alone.'
- Much of the land in the SWA is currently unzoned and has no safeguards.
- Some landowners said they were currently 'unzoned and happy.'
- One resident stated that if his seven (7) acres were surrounded with land zoned light industrial, it would increase his taxes and devalue the land. He also stated that the land in this is not suited for industrial use.
- The current use of property seems to be ignored by the City.

-
- If the area is left unzoned, anything can go on the land.
 - The extension of Random Lane is not needed.
 - Within the proposed light industrial area, most residents at the hearing wanted it zoned residential instead.
 - The majority of the residents of the area do not want public utilities.
 - Guilford County protects Lake Macintosh for the area.
 - Progress is going to come to the SWA. The residents and the City of Burlington need to work together and come up with a good plan.

Minutes of the Southwest Area Public Meeting

Wednesday, December 13, 1995

Location: Lake Mackintosh Marina, 6:00-8:00 p.m.

Burlington City Staff Present:

William R. Baker, City Manager
Bob Harkrader, Planning Director
Wes Armstrong, Planner II
Kathy Mills, Planner I
Natasha Euliss, Intern

Approximately 30 to 40 people were present at the meeting. The following comments and questions were addressed by city staff.

- The tax rate of residential properties zoned for industrial use probably will not change until the use changes from residential to industrial.
- What is the purpose of the watershed critical area?
- When will water and sewer lines be extended into the southwest area?
- If the utilities are extended, will the watershed critical area regulations change?
- Will the industrial area across from the airport ever change to residential?
- Extend the low density residential zoning to the East Buckhill road area.
- Why is a change proposed for the I-2 property across from the hospital to be zoned O-1?
- Please keep the I-2 across from the hospital.
- The area behind the rest area, end of Danbrook Road, should remain residential.
- Why was the zoning proposed for the area in the Comprehensive plan changed from R-30 to I-1A?
- Is the hospital completely tax exempt?
- Has the hospital location sped up the process of development/annexation/zoning?
- Will the Huffman Mill Road/Kirkpatrick Road intersection be relocated?
- Usually city utilities are cheaper for city residents than for county residents?
- Assessment fees apply if a trunk line is extended down your road - current rates are approximately \$10 per foot for water lines and \$12 per foot for sewer lines - although you are not legally required to tap on. Assessment fees can be paid on a payment plan of 8% for 5 years.
- The area downhill from the hospital cannot be served by the newly acquired pump station at the hospital.
- Residents often fight annexation, then ask to be annexed after water problems occur.
- Approximately 95% of all new water and sewer lines are run by the developer - not the city.
- Will Danbrook Road be extended to NC 61?
- Major developments can change road plans.
- Citizens need better notification about the public meetings.
- This plan will go before the planning and zoning board the 4th Monday in January.
- Groundwater contamination by new industries is a concern for residents of the area.
- Did the hospital have to meet any environmental requirements for annexation?
- A few participants expressed concern regarding groundwater flow into Lake Macintosh and its possible impact.

THE SOUTHWEST AREA PLAN

WRITTEN COMMENTS AND VISITORS TO THE
PLANNING DEPARTMENT

Citizens seen at the Planning Dept.
 concerning SWAP.

DATE:

IN PERSON / Telephone

DATE	Time	Name	In Person	Telephone
11 Dec	1:15 hrs	John Schmolt	X	
		Worth Whitesell	X	
2 Dec	30 mins	Bob Lewis	X	
		Schlagets sp? ask RLT	X	
3 Dec	9:30-9:40 am	Mrs. David Small		X
	10:30 am-11:00 am	Mrs. Gresson	X	
	11:15 am-11:30 am	Mike Taylor		X
	1:45 pm-2:00 pm	STAN BYRD	X	
4-445		Susana Small	X	
		Sandra		

DAWN PAYNE
1960 W. BUCKHILL RD.
BURLINGTON, NC 27215

11/30/95

CITY OF BURLINGTON
PLANNING DEPARTMENT
PLANNING DIRECTOR AND STAFF

TO ALL CONCERNED:

I AM PUTTING MY THOUGHTS IN WRITING AS SUGGESTED BY THE PLANNING STAFF. I REALIZE THAT PEOPLE HAVE JOBS AND RESPONSIBILITIES, BUT PLEASE REMEMBER THAT THIS IS MORE THAN JUST AN AREA ON A MAP. THERE ARE INDIVIDUAL PEOPLE, HOMES AND BUSINESSES THAT HAVE BEEN A PART OF EACH OTHERS LIVES IN THIS "SOUTHWEST AREA" FOR MANY YEARS.

I AM A RESIDENT OF THIS AREA AND MORE THAN AWARE OF THE CHANGES THAT HAVE OCCURRED IN THE PAST FEW YEARS (PLEASE BE SENSITIVE TO THE FACT THAT THESE RESIDENTS DID NOT LOCATE TO THE CITY). HOWEVER, THESE CHANGES TO DATE HAVE NOT CHANGED THE USE OF THE OTHERS PROPERTY, TAX EVALUATION OR THE QUALITY OR WAY OF LIFE OF THE MAJORITY OF THE RESIDENTS LIVING IN THE AREA.

IF THE CURRENT PROPOSAL IS ALLOWED TO GO UNCHANGED THIS CERTAINLY WILL NOT BE THE CASE. IT HAS BEEN MY EXPERIENCE THAT THE CITY OFFICIALS HAVE ALWAYS PLACED QUALITY OF LIFE AND THE PROTECTION OF THE ENVIRONMENT HIGH ON THE PRIORITY LIST. THE PROPOSAL OF ANY INDUSTRIAL SITES IN THE SOUTHWEST PLANNING AREA IS A POTENTIAL THREAT TO WATER QUALITY AND QUALITY OF LIFE (TO ALL CITIZENS).

LIABILITY IS SOMETHING WE ALL WANT TO AVOID AT ALL COST. IT IS CERTAINLY A FACT THAT AS IT CURRENTLY STANDS ANYTHING CAN LOCATE IN THIS AREA, BUT THE WAY TO HANDLE THIS IS WITH THE APPROPRIATE ZONING. THE OTHER CONCERNS WITH THE CURRENT PROPOSAL (I RECOGNIZE THE DRAWING IS A DRAFT AND NOT TO SCALE) ARE THAT INDIVIDUAL TRACTS HAVE MULTIPLE ZONINGS (CREATING A USAGE PROBLEM) AND THAT SOME OF THE INTERSTATE FRONTAGE PROPERTY REMAINED AS RESIDENTIAL (WHEN THE STAFFS WRITTEN PROPOSAL INDICATED THESE SHOULD BE O & I). ALSO, IT IS CONFUSING THAT THERE ARE SOME INDUSTRIAL ZONES AND BUSINESSES THAT CURRENTLY EXIST IN THIS AREA AND THERE SEEMS TO BE A CONCERN ABOUT REMOVING THEM (GRAVEL, CONCRETE AND PAVING OPERATIONS) AND THEN WE TURN RIGHT AROUND AND ADD AN AREA I ESTIMATE TO BE AS MUCH AS 700-800 ACRES OF THAT SAME EXACT ZONING.

I WOULD LIKE TO LIST SOME SUGGESTIONS THAT THE PLANNING STAFF ALSO INDICATED FOR THIS AREA AT ONE TIME-

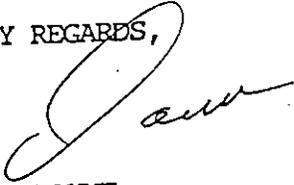
- * TO PRESERVE THE INTEGRITY OF ESTABLISHED RESIDENTIAL NEIGHBORHOODS
- * QUALITY GROWTH WITH ATTENTION GIVEN TO PRESERVING QUALITY OF LIFE
- * DEVELOPMENT SHOULD COME WITH PROTECTING THE ENVIRONMENT
- * ENCOURAGE INDUSTRIES TO LOCATE IN OLDER INTERCITY LOCATIONS
- * MAINTAIN LOW DENSITY RESIDENTIAL DEVELOPMENT OUTSIDE THE CITY LIMITS
- * ENCOURAGE AND MAINTAIN EXISTING AGRICULTURAL AND FOREST MANAGEMENT
- * PROHIBIT NONPOINT SOURCE POLLUTION THROUGHOUT THE WATERSHED

I WOULD LIKE TO SEE BURLINGTON/ALAMANCE COUNTY CONTINUE TO BE A PLACE WE CAN ALL BE PROUD OF AND SAY I HAD A PART IN MAKING IT WHAT IT IS. I WOULD HATE TO SEE DECISIONS MADE NOW THAT DOWN THE ROAD MAY BE DISASTROUS FOR THE ENTIRE COMMUNITY FROM POLLUTION OF MANY TYPES TO AN INADAQUATE LABOR FORCE.

I GUESS WHAT I AM TRYING TO SAY OR ASK IS PLEASE CONSIDER THAT THIS ENTIRE AREA IS AND HAS BEEN RURAL AND I CAN NOT HELP BUT BELIEVE THAT THE ZONING SHOULD REFLECT THE CURRENT CHARACTER OF THE AREA.

THANK YOU FOR THE TIME AND EFFORT THAT IS INVOLVED IN ALL THESE MATTERS.

MANY REGARDS,



DAWN PAYNE

dp

cc:

all city council members
mayor

COMMENT SHEET

If you would like to give input on the Southwest Area Plan but would prefer to do so on paper, please comment below and return to:

City of Burlington Planning Department
c/o Kathy Mills
P.O. Box 1358
Burlington, NC 27216-1358

According to the proposed plan for future land use within the southwest planning area, my property located on Tax Map 31-26 11A has been colored green and indicated as recreation.

Since the property has recently been rezoned and is currently in the initial stages of being developed, I want to go on record as vehemently opposed to any action the city might take to incorporate any of my property into a city facility.

As a result, I respectfully request that my property be indicated as rezoned, i.e. low density R-12 residential and depicted in the future land use plan for the southwest planning area in yellow.

Sincerely,

Michael Carter
25 Oct. 1995

Thank You!

The following is made with regards to the SouthWest Area Plan (SWAP)...

Please take in consideration facilitates for alternative means of transportation i.e. sidewalks, greenways, bike paths, etc... Burlington has so few of these facilities, especially compared to it's neighbor's to the west (Greensboro) and the east (Raleigh, Durham, Chapel Hill).

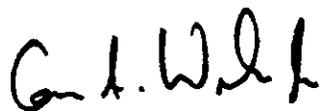
I visit each of these cities from time to time. It's amazing how much these facilities get used. In all cases, actual usage is far ahead of what was estimated. For a comparison, examine the usage of Burlington's walking tracks. Who would have thought so many people would drive to these facilities, to simply walk in circles?

Also, look at the people who use the facility (the walking track). It's a diverse collection of people of all ages, races and genders. The same holds true for sidewalk and greenway usage. You see the same diversity, no matter where the facilities are located.

It's not hard to incorporate these facilities into planning, if it's done up front. One of the main reasons Burlington suffers from a lack of these facilities is that is next to impossible to add them after the fact. In most cases, the right-of-ways don't exist or if they do, cost is too much of a prohibiter.

I write now so that these facilities ~~can~~ be incorporated into SWAP, even if the funding does not come available for years. We must plan for these now, if we have any hope of implementing them in the future.

Gene Wicker, Jr.



Computer Technical Specialist
Burlington Industries
Secretary/Treasurer
Burlington Bicycle And Pedestrian Advisory Commission

October 30, 1995

Mr. Robert Harkrader
City of Burlington
Dept of Planing and Community Development
Burlington, N.C. 27215

Dear Mr Harkrader,

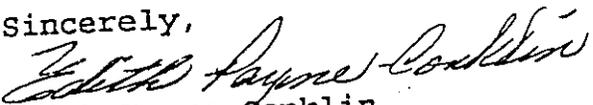
The purpose of this note is to express my thanks to you for the public meeting held Wednesday, October 25th, concerning the industrial zoning of property adjacent to the southwest side of Burlington and to voice my concern of the proposal as it now stands. If such meetings are indeed held for the purpose of finding out the interest and feelings of the citizens, then this meeting was worth the time invested by all. There could be no question that the people living in this area are very much opposed to industrial zoning.

There are 10 homes located on East and West Buckhill Roads. We have nice homes in a quiet community and want very much for our tranquility to remain. If this area is zoned Industrial we would then be facing environmental pollution, noise, and congestion. Property taxes would increase which would certainly create a hardship for those of us on fixed incomes. I can not believe that forcing older people off their property is the "American way".

Please understand we are not opposed to zoning. We recognize it's importance for future development and to protect our current environment. While some see a need for industrial usage along both sides of Interstate 85/40, I cannot understand using this beautiful area of the county for industrial growth.

I urge you to propose Low Density Residential zoning for this area. Thank you for your further study and consideration.

Sincerely,


Edith Payne Conklin
1824 West Buckhill Rd.
Burlington, N.C. 27215

cc: City Council Members
Joe Barbour, Mayor
Caroline Ansbacher
Dr. Sam Powell
David Maynard
David Huffman

APPENDIX B: LIST OF HAZARDOUS CHEMICALS

Corporations

T.S. Designs, Inc.

Hazardous Chemicals

Aquatac T-2000
Plastisol Screen Ink
Screen Ink A-1, A-9 & A-11
T S Blend
T S Cleaner
Wilflex MP Textile Inks

Konica Warehouse

Heterocyclic (MK-6)
Silver Halide Emulsion 0-2
Silver Halide Emulsion 0-8
Silver Halide Emulsion 0-4
Silver Halide Emulsion 0-5
Silver Halide Emulsion 0-9
Silver Halide Emulsion P-2
Silver Halide Emulsion P-4
Silver Halide Emulsion P-5
Silver Halide Emulsion P-8
Silver Halide Emulsion P-9
Silver Halide Emulsion R-1
Silver Halide Emulsion R-5
Silver Halide Emulsion R-7
Silver Halide Emulsion R-8
Silver Halide Emulsion R-9
YK-7
YK-9

Injectronics, Inc.

Guard It
Hydraulic Oil AW68 DTE 16M
Isopropanol
Paint (Crystal Blue)
Paint Thinner

APAC-Carolina, Thompson-Arthur

Asphalt
Fuel Oil No. 2
LPA Tapco 206

Burlington Chemical Company #2

A-Carrier CDM APG 225
Alcosperse 175
Ammonium Sulfate
Ammonium Sulfate FCC
APG 225
APG 325 50%
Aqua Ammonia 26
Aqua Clean Degreaser Additive
APG 325 50%
Aqua Ammonia 26
Aqua Clean Degreaser Additive
Aquatreat AR-6
Aquatreat AR-900A
Arcosolv DPM
Arcosolv DPM
Acetic Acid (Glacial)
Acetic Acid 56-S
Acetic Acid 84%
Acid Substitute
Burcosoft RHM
BC Antifoam 100 Special
BC Antimigrant DP-30
BC CAR Soft
BC CHEM OX Powder
BC DEVELOPER BON-NS
BC STABILIZER H-1
Bspers NB-200 (149)
Burcene SB
Burco 1032-T
Burco 1032-V
Burco 1032-S
Burco ADR Salt
Burco AMSU-33
Burco BP-TD
Burco BRM Super
Burco CH-35 LA
Burco Color Lock
Burco DAD
Burco Direct Leveler GRA
Burco Dispersant R
Burco ELA
Burco Finish BA New
Burco HDPA
Burco LBOL
Burco Level TFX-7
Burco Lubricant SG & NS
Burco Machine Clean UPD
Burco MSP Liquid ROX
Burco NP-Q Salt (NPPQ)
Burco Reduct T
Burco Reducer RDT
Burco Scour CB New & CS-LF
Burco Scour 9A % All

Burcolye PF
Burcosoft CIF & DAGM & TPD & DJ
Burcosoft MM-LF
Burcosoft 190
Burcosoft SPL-3
Burcosoft AFK-4
Burcosoft TKS & PES
Burcosperse NB-100
Burcovel 200
Burcovel N Plus
Burcovel OS
Burcovel P&G & UP
Burcovel WNS
Burcowet BWA & CPB
Burcowite RKH-10
Burcowite RKH-10-CF
Burcowite EHS-0 & RSB
Butyl Propasol
Bwite BSB & BT Sp
Carbon Dioxide (liquid)
Cerelese 2001
DC Antifoam GPC
Dequest 2066
Developer Bon Acid
Ecostone L
EDTA 100 (Kelate 100)
Emulsogen EL 360
Epsom Salt
Ethox GMS-5
Formaldehyde Solution
Formic Acid Solution
Hipochem Burco X89020
Hipochem Enzyme 500
Hipochem X-89107
Hydrogen Peroxide
Liquid Soda Ash
Lowmar P1
Marasperse N-22
MSP 40% Liquid
MSP Solid
Neodol 25-7 & 375
Neodol 91-8 & 91-6
Neofix RP-70
Nitric Acid
Novawet D-75
Pat Soft 1416
Pat Soft 3335
Phosphated 91-2.5
Pomofix OHK-B
Raycafix ED HI
Raycalev GR
Salt Buttons
Soda Ash

Burco SS-400
Burco TX-199
Burcodye D6-LF & RD
Burcofix C & FR-30
Burcofix NF-CF & N-50 & TGN
Burcofix SB-TNT
Burcofluor S & SB
Burgogen NH 70%
Burcolan NBA
Burcolan Salt 88
Burcolev CJB 167%
Burcolew H-CDB New & NH & PRB
Burcolube G & JWL

Sodium Chloride
Sodium Hydroxide
Sodium Hydrosulfite
Sodium Metabisulf
Sodium Metasilicate
Sodium Percarbonate
Sodium Silicate
Sodium Sulfate
Sodium Thiosulfate
Sodium Zirconia Silica
Sulfotex OA
Sulfuric Acid
Thiourea Dioxide
Trycol 6974
Trydet 2682
Trymeen 6606
TSPP
UREA
Uvitex RSB
Varsol
Zinc Hydrosulfite

BIBLIOGRAPHY (Abbreviated)

Soil Survey of Alamance County, North Carolina, United States Department of Agriculture, Soil Conservation Service, April, 1960.

Environmental Impact Statement for the Great Alamance Creek Water Supply Project, City of Burlington, NC, Olsen Associates, Inc. Engineers and Architects, March, 1976.

An Archeological Reconnaissance of the Great Alamance Creek Water Supply Project Region, J. Ned Woodall, Wake Forest University, July, 1976.

Natural Areas Inventory, Guilford County, North Carolina, Dr. Rosanne K. Ross & Dr. Roy J. Coomans, N.C. Natural Heritage Program, February, 1991.

Alamance County Flood Damage Prevention Ordinance, Alamance County, North Carolina, 1994.

Alamance County Flood Insurance Study, Alamance County, North Carolina, Federal Emergency Management Agency, April, 1987.

Alamance County Water Supply Watershed Ordinance, Alamance County, North Carolina, 1994.

Classifications and Water Quality Standards Assigned to the Waters of the Cape Fear River Basin, Division of Environmental Management, Raleigh, North Carolina, 1991.

Water Supply Watershed Protection Rules, Division of Environmental Management, Raleigh, North Carolina, 1992.

Guilford County Watershed Protection Ordinance, Guilford County, North Carolina, 1994.

City of Burlington Flood Damage Prevention Ordinance, City of Burlington, North Carolina, 1994.

The Story of the J.D. Mackintosh Water Supply and Treatment System, City of Burlington, North Carolina, 1987.

Comprehensive Plan, Guilford County, North Carolina, Guilford County, NC, 1986 (statistical data revisions, 1993).

Recreation and Parks Comprehensive Master Plan Through The Year 2010, City of Burlington, North Carolina, Woolpert, Charlotte, NC, 1994.