Checking Up on Reality Check

Land-Use Planning Workshop

University of North Carolina at Chapel Hill

Department of City and Regional Planning

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2010 LAND-USE PLANNING WORKSHOP

UNIVERSITY OF NORTH CAROLINA AT CHAPEL HILL
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EXECUTIVE SUMMARY

Introduction

In 2009 the Urban Land Institute and Triangle Tomorrow held a meeting in Raleigh of over 300 local planners, municipal officials, professionals and interested citizens in the Triangle area called Reality Check. This meeting was held to take a closer look at the projected growth of the Triangle over the next 20 years and to come up with plans to direct that growth in more compact and sustainable forms. As a part of this event, groups were set up and given tables with legos representing a unit of the population. The groups were then asked to plot out where development should occur and at what density levels. The result of this process was the creation of three scenarios of varying densities.

Jared Weiner, a 2009 graduate of the Department of City and Regional Planning at UNC Chapel Hill, wrote his Master's Project on Reality Check, including its processes and results. While researching and analyzing Reality Check, he realized that although three scenarios had been created there was no baseline scenario to compare them to. This sparked the recommendation of a project that became the basis for an applied graduate workshop for the Planning Department at UNC which was completed at the beginning of May 2010. The purpose of the workshop was to take the outcomes of Reality Check and develop a comparative analysis of Baseline and Reality Check scenarios. This analysis consisted of two parts: the development of a Baseline scenario with a finer tuned Reality Check scenario and a comparative analysis of the costs and benefits associated with more compact development versus current development practices.

PART I

General Methods

The first section of the project focuses on the development and comparison of the Baseline and Reality Check scenarios for the year 2030. Each student was assigned a jurisdiction to focus on. They met with the local planners of each jurisdiction in order to better understand the current and potential development pressures facing each area. Using this information, and prepared with population and employment projections obtained from various planning authorities, each student created a Baseline and Reality Check scenario for his/her assigned jurisdiction. Shifts in population and employment between scenarios were then analyzed using ESRI's ArcGIS to visually explore how the region will grow over the next 20 years under current development patterns and as a denser, more compact region.

Results

The Baseline scenario forecasts development patterns for 2030 if growth continues as it has in the past 20 years. Under this scenario, future population and employment growth occurs at low densities and in a sprawling manner. Conversely, the Reality Check scenario produces more dense and transit-oriented development. This pattern of growth is largely based on the three Reality Check guiding principles: transit, vibrant centers, and open space. These principles most affected population and employment growth patterns in the three core counties of Durham, Orange, and Wake. As a result, the core counties are projected to see increased population and employment density around existing urban centers including Chapel Hill, the City of Durham, Raleigh, and the

Research Triangle Park area in 2030. This growth will be concentrated around existing and future rail and bus transit stations.

PART II

Environmental Effects of Reality Check Scenario vs. Baseline Scenario

A two-prong approach was used to analyze the difference in the environmental impact of the different growth scenarios: a qualitative analysis of academic literature and a matched-pairs comparison of similar areas. Both approaches concluded that growth under a Reality Check scenario is more sustainable and more environmentally beneficial than growth under the Baseline scenario.

The qualitative review of academic literature drew heavily from Michael P. Johnson's 2001 article *Environmental Impacts of Urban Sprawl: A Survey of the Literature and Proposed Research Agenda*. From this article we identified three major categories of environmental impacts of urban sprawl: climate change and energy consumption, impacts on human health, and viability of ecosystems. For the purposes of this analysis we identified "sprawling communities" as those demonstrating growth similar to what is predicted in the Baseline scenario, and "compact communities" as those more closely aligned with the growth predicted in the Reality Check scenario. We then conducted a review of recent academic literature for information on each of these three categories.

From the review of literature, we conclude that the construction of sprawling communities requires a greater expenditure of energy and resources than the construction of compact communities. Compact communities result in lower energy use for transportation, and an increase in land available for carbon sinks. A sprawling growth pattern negatively impacts the health of residents and has led to an increase in obesity, asthma, as well as automobile and pedestrian fatalities. Finally, we found that sprawl results in more impervious surfaces and less land available for wildlife habitat, farmland, and open space.

The second part of this analysis assessed the impact of growth patterns on water and sewer infrastructure costs, impervious surface area, and green space by identifying matched pairs of rural, suburban and urban areas with shared characteristics. We followed the model set forth in Philip Berke, Yan Song and Mark Stevens' 2009 article, *Integrating Hazard Mitigation into New Urban and Conventional Developments*. One community in each pair exhibits characteristics associated with the Reality Check scenario and one follows the more traditional pattern of growth seen in the Baseline scenario. This comparison allowed us to analyze differences in the environmental impacts of each scenario across a variety of community types.

From the matched-pairs analysis, we conclude that communities that apply the Reality Check principles will have lower water and sewer infrastructure costs and lower energy costs associated with water and sewer use. In addition, neighborhoods designed according to the Reality Check principles have significantly less overall impervious surface area, as well as less per person and per dwelling unit. More analysis is needed to determine the exact differences in open and green space conservation.

Transportation: Reality Check vs. Baseline Scenario

The Baseline and Reality Check scenarios developed during Phase I of this workshop highlight the differences in a regional vision for future growth and development. Perhaps no issue is more central to these different visions than transportation. The ability of residents to travel to various destinations in the region conveniently and expeditiously—to their places of employment, to recreation, to commerce, etc.—is a critical component of economic vitality and quality of life.

Likewise, the effects of transportation patterns, investments, and infrastructure have significant cost implications for individuals, for whom transportation is typically a large percentage of household budgets, and for the regional leaders, who must weigh complex and difficult decisions about economic, fiscal, environmental, and social costs. These costs are difficult to measure and even more so to forecast. However, this section will present—in very general terms—the cost savings resulting from transportation patterns in the Reality Check scenario versus the Baseline scenario.

Based on examinations of regional estimates generated in various scenarios developed by local Metropolitan Planning Organizations (CAMPO and DCHC), the DCRP transportation study group devised a method for estimating the number of vehicles miles traveled (VMT) daily and annually under the two different scenarios.[1] Our final estimates concluded that the VMT reductions under the Reality Check scenario would result in savings of approximately $512,060,435 annually.

Predictably, a development scenario in which population density increases generates fewer VMT than one in which growth perpetuates more low-density sprawl because the distances between households and destinations are shortened. We then compared these annual reductions in VMT to cost savings based on previous research about various costs per VMT. A summary of the cost savings of the Reality Check scenario over the Baseline scenario is presented below:

Costs per VMT	Best Estimate of Savings
Environmental Costs (2010 Dollars)[2]	$16,645,854
Social Costs (2010 Dollars)[3]	$343,356,850
Vehicle Operating Costs (2009 Dollars)	$152,057,730
Total VMT Cost Saving	**$512,060,435**

Money Matters: Comparing the Revenues & Costs

Implementing the Reality Check scenario instead of continuing the Baseline scenario, produces two major benefits: increased region-wide revenues to local governments and decreased costs. In combination, these outcomes strengthen the ability of Triangle-area local government to serve its residents.

[1] In both charts and text, "MPO" represents the model developed by CAMPO and DCHC, and "DCRP" refers to our model.

[2] Environmental costs are considered external costs normally borne by society as a whole rather than individuals that include those associated with noise pollution, air pollution, water pollution, and climate change.

[3] Social costs for this study are focused on nonmonetary and monetary externalities, government infrastructure and services, privately bundled and provided goods and services, and personal nonmarket costs.

Tax revenues are expected to increase because the Reality Check scenario shifts tax base growth to established, existing centers. While some county governments lose a portion of their tax base growth from the Baseline scenario in the Reality Check scenario, on the regional level, overall tax receipts to local governments are expected to increase. This is due mostly to the county taxes and municipal taxes of local governments in existing, established centers. This dual taxation is not present in a Baseline scenario that projects more growth in unincorporated county areas. This conclusion was reached using the Baseline and Reality Check population and employment growth projections, current tax rates, and current municipal and county borders.

When comparing the Baseline scenario to the Reality Check scenario, public service costs decrease because the governmental expenditure of providing public services to a controlled-growth situation is less than the expenditure for providing public services in a less controlled-growth situation. We used per employee and per resident cost derivative of public services developed by Rutgers University for estimating costs in uncontrolled and controlled growth scenarios. The cost to each county government in the region is calculated under each scenario. The findings show a decrease in costs in the Reality Check scenario that can be attributed to decreased road infrastructure costs, school construction costs, municipal fuel costs, and fire and police service costs.

The combined benefits of these outcomes are clear; by concentrating growth in established centers municipal tax bases increase and the cost of providing services decrease. An overall fiscal benefit for the region is the result.

Conclusion

This report provides a set of growth scenarios and cost implications based on the degree to which various counties and municipalities in the region adopt a "vibrant centers" approach to growth management, infrastructure investment, and public service allocation. As population in the area increases dramatically over the next twenty years, policies regulating land use, transportation, open space, fiscal activity, and the like have far-reaching implications for quality of life, environmental protection, regional efficiency, economic growth, and public amenities. The purpose of this study has been to demonstrate the relative benefits of envisioning and implementing sustainable, carefully planned, and high-quality growth patterns which maximize the current and projected capacity of certain areas.

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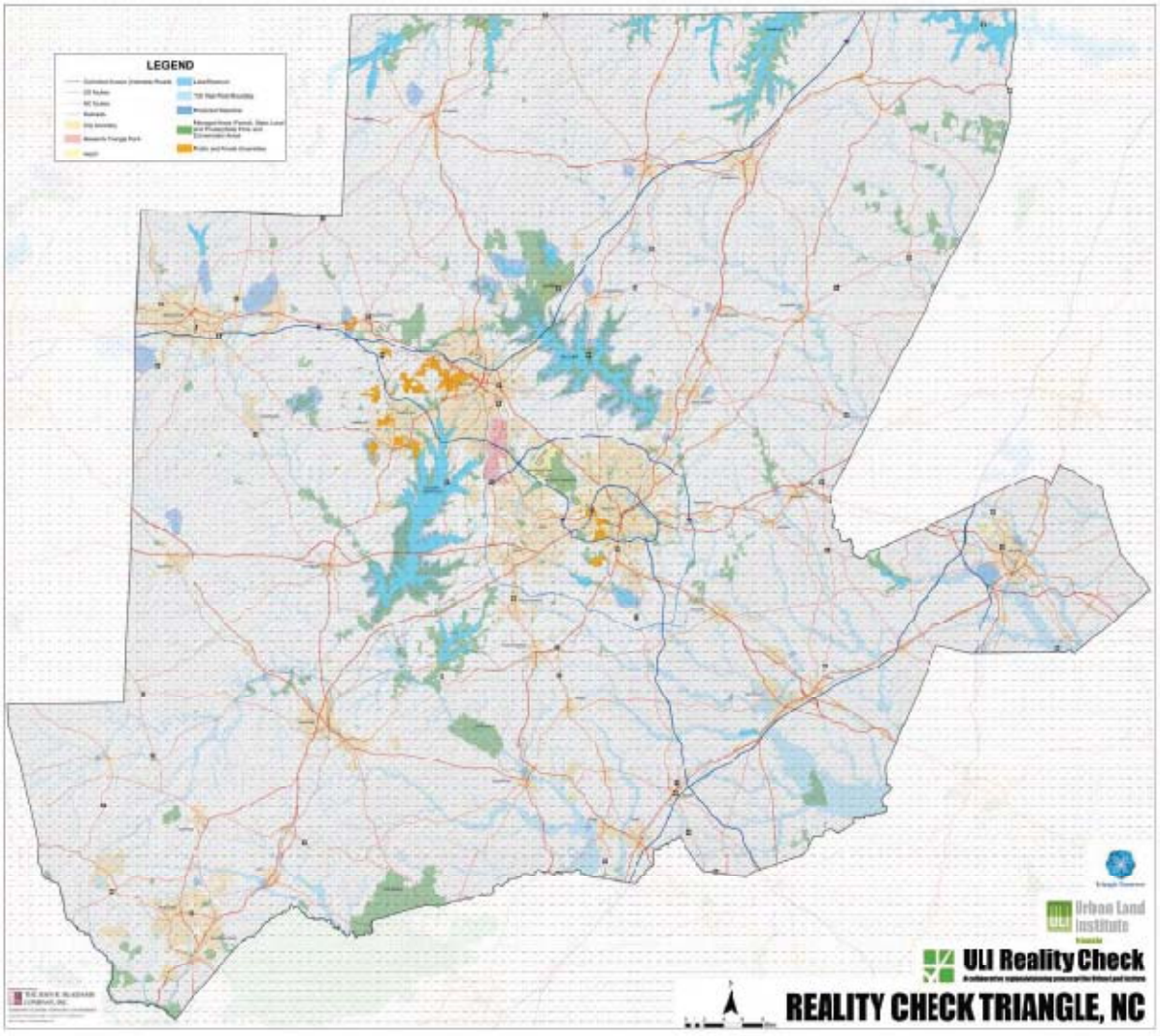
REALITY CHECK COUNTY PROFILES



INTRODUCTION

A county profile was developed for each of the 15 counties included in the Reality Check study area. These profiles were based on interviews with planners, county comprehensive plans and other planning documents. Baseline and Reality Check scenarios were created for each county to project population and employment growth in 2030. These individual county scenarios were then compiled to create a region-wide, comprehensive scenario, seen in the figures below.

Figure1.0: 2007 Reality Check Area Population Density

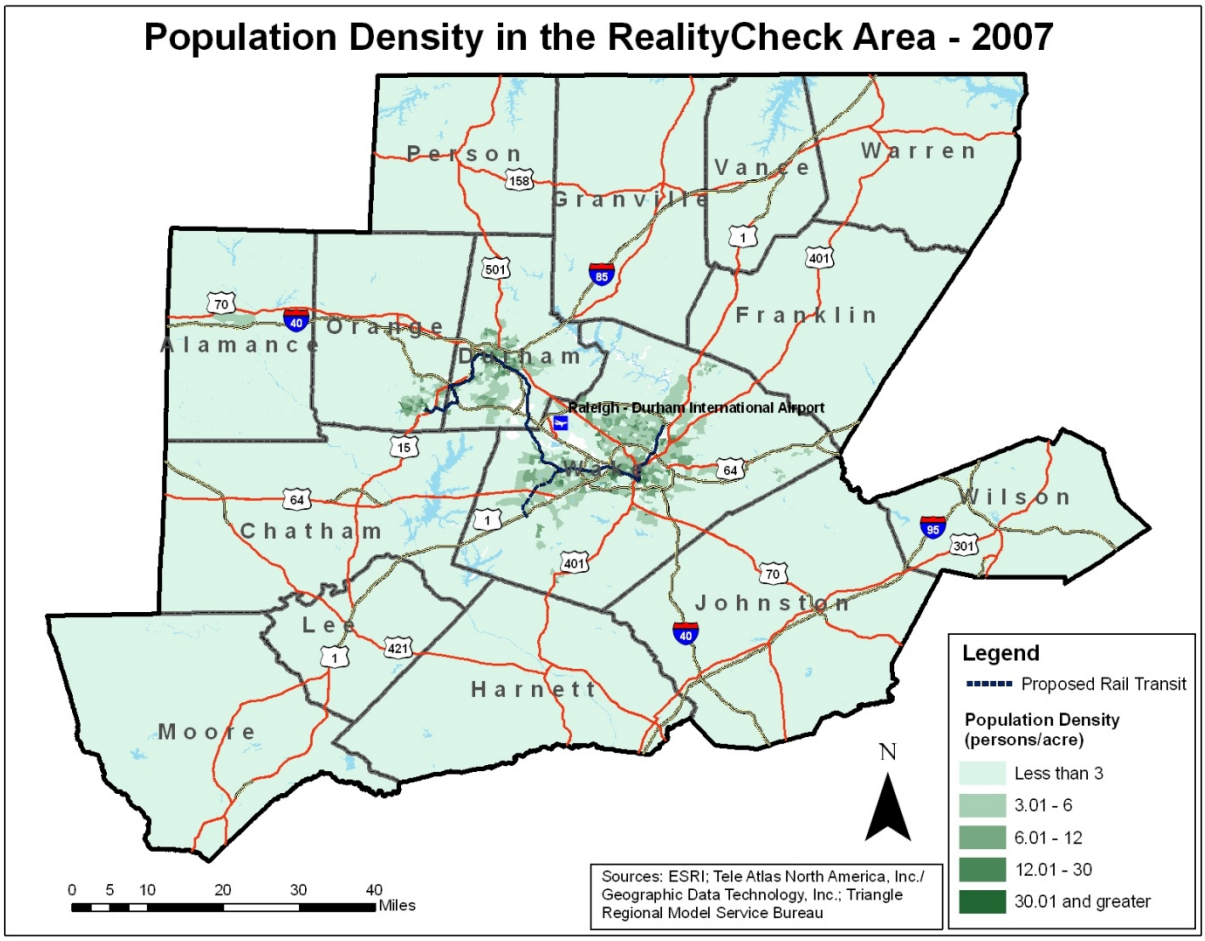


Figure 1.1: 2007 Baseline Scenario Population Density

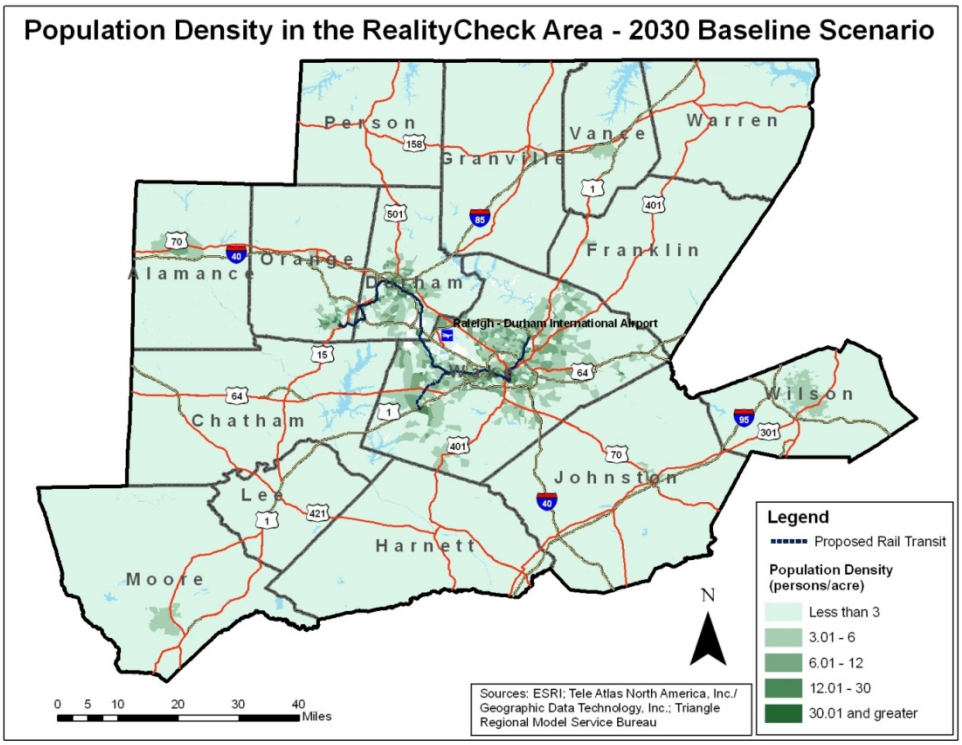


Figure 1.2: 2007 Reality Check Scenario Population Density

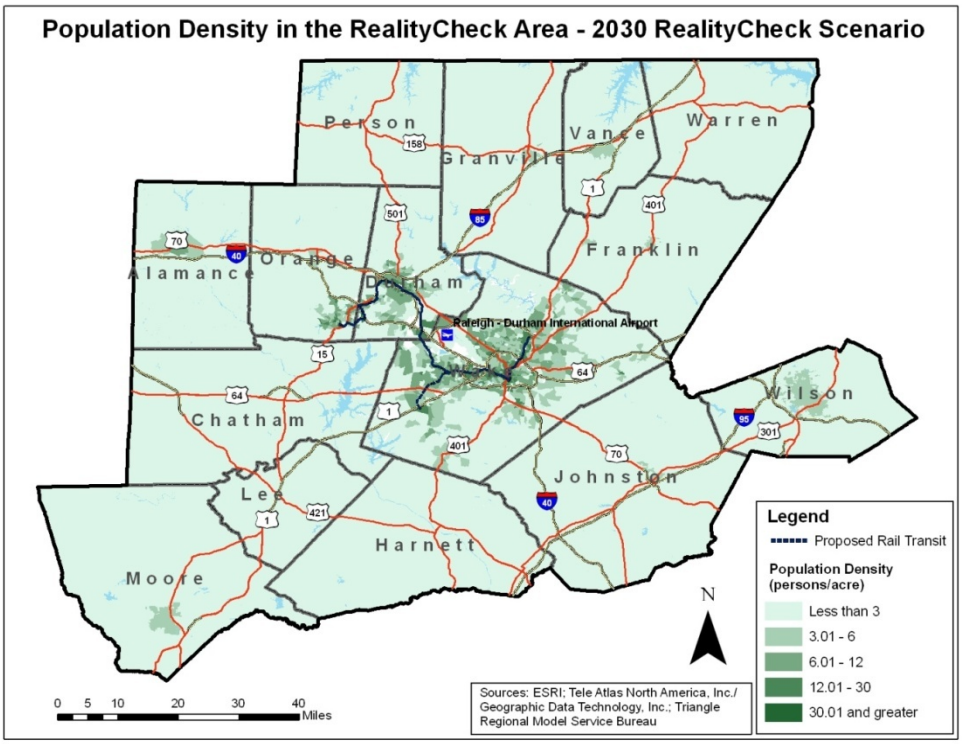


Figure 1.3: 2008 Reality Check Area Employment Density

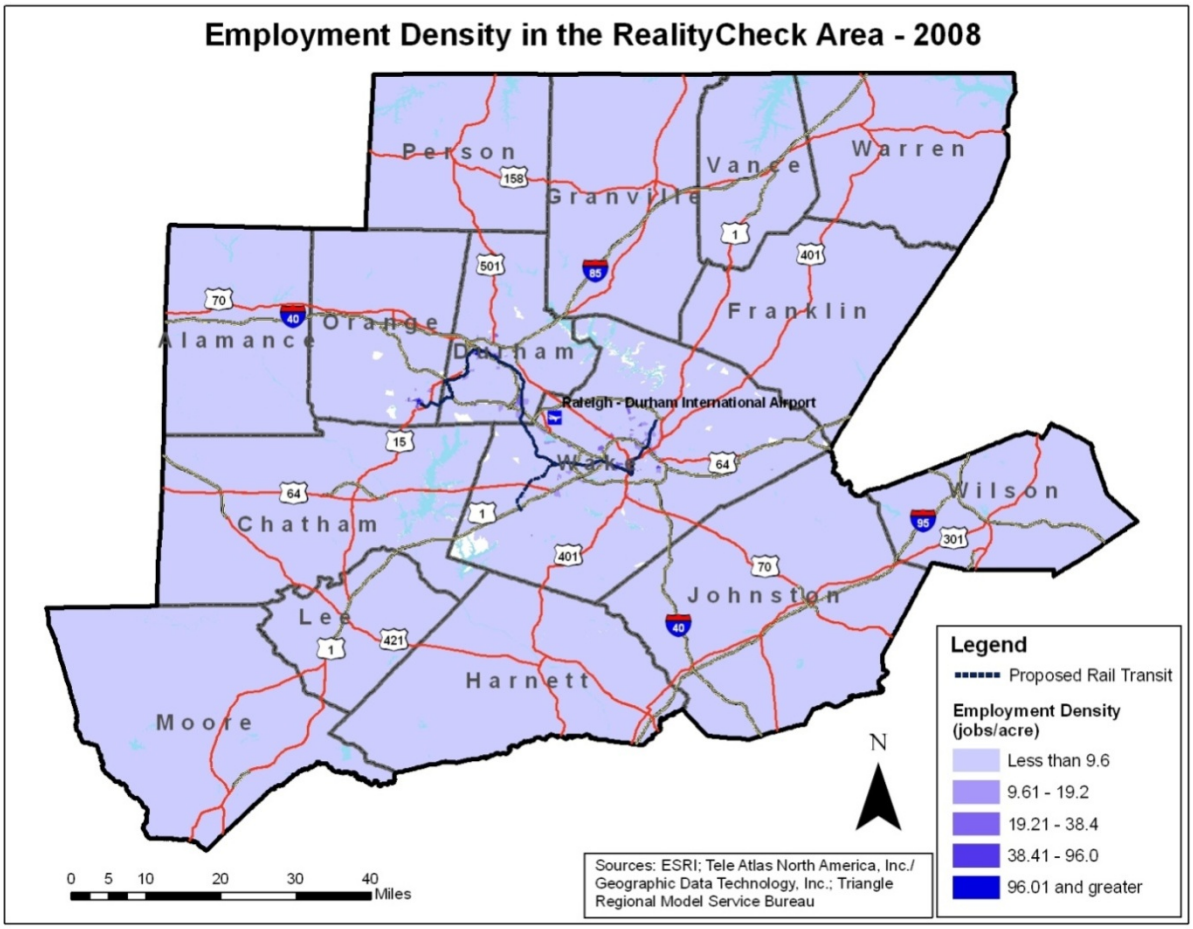


Figure 1.4: 2008 Baseline Scenario Employment Density

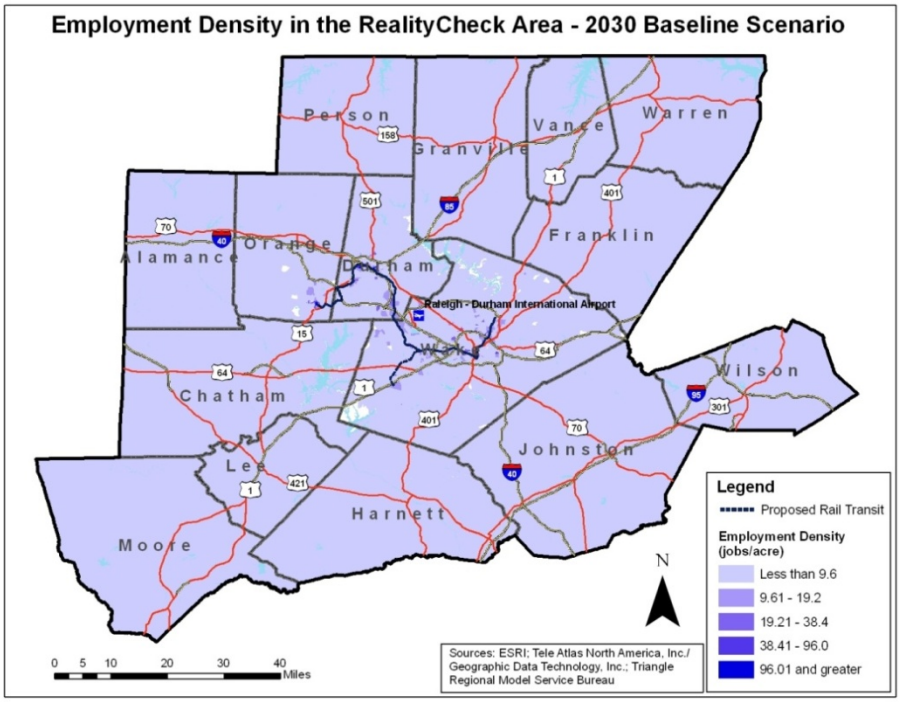
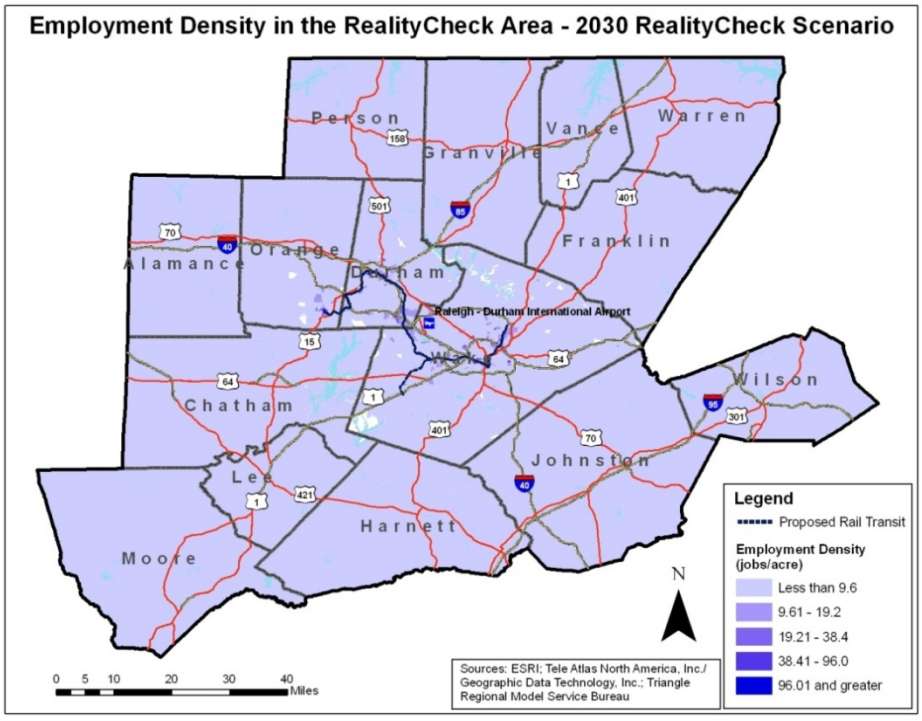


Figure 1.5: 2008 Reality Check Scenario Employment Density



CORE COUNTY PROFILES

DURHAM COUNTY, NC

The following Information is based on the Durham Comprehensive Plan and an interview with Keith Luck, Durham City-County Assistant Planning Director, conducted on February 9, 2010.

BACKGROUND

Durham County covers a total area of 298 square miles. As of July 1, 2008, the Census Bureau estimated the county population to be 262,715. The county is adjacent to Person, Granville, Wake, Chatham, and Orange Counties. Durham is divided into 6 townships: Carr, Durham, Lebanon, Mangum, Oak Grove, and Triangle; but the only incorporated municipality is the City of Durham.

Since the 1950s, Durham has shifted from an economy founded on agricultural and manufacturing into one driven by knowledge-based industries. Renewed growth began during the 1980s with the construction of multiple housing developments and the beginning of downtown revitalization efforts. The present-day economy is anchored by the Research Triangle Park, 80% of which is located in Durham, and Duke University. Today, Durham continues to grow and thrive with new industry.

2030 POPULATION GROWTH

BASELINE SCENARIO

Population—Baseline Scenario			
	2007	2030	Change
Durham County	**254,740**	**353,630**	**+ 98,890**

The Baseline Scenario was calculated based on the projections provided by the Durham-Chapel Hill-Carrboro MPO for 2035 using a linear extrapolation to estimate population growth for 2030. These projections were made with the help of Durham City-County planners and are the best estimate of what growth will look like under the current comprehensive plan and land use policies in place.

Under this scenario, the Durham County will see a 38.8% increase in population. The largest increases in population are projected to occur in the southwestern and central portions of the county within the suburban tier. The population growth is also projected to extend into the rural tier in the northern part of the county.

REALITY CHECK SCENARIO

Population—Reality Check Scenario			
	2007	2030	Change
Durham County	**254,740**	**370,826**	**+ 116,086**

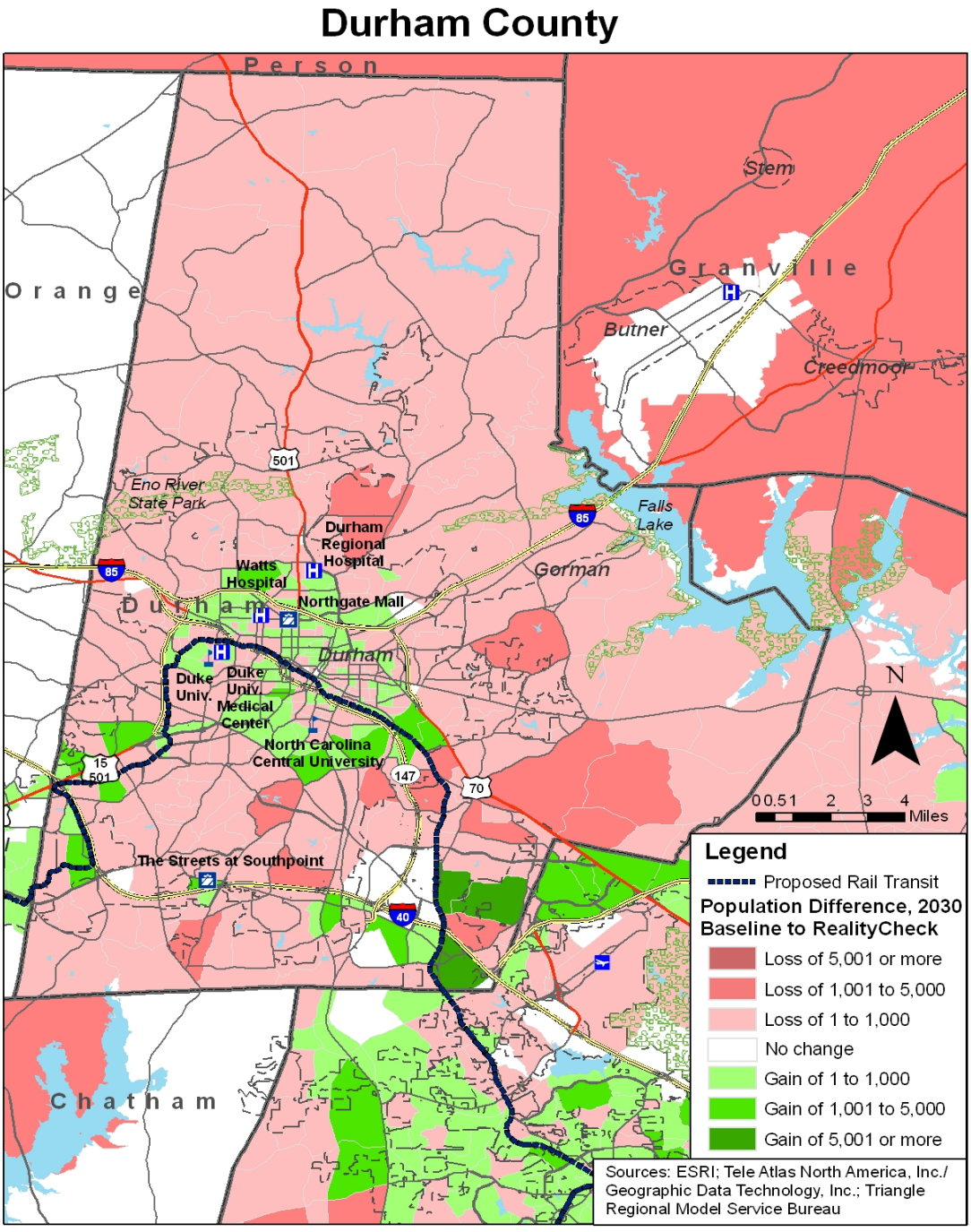
The Reality Check Scenario was calculated using the baseline projections and several reallocation guidelines. Under this scenario, the county will see a 45.6% increase in population. This scenario assumes that an additional 17,196 people will relocate to Durham from the surrounding rural counties.

Areas designated as compact neighborhoods and suburban transit areas in the Land Use Element of the Comprehensive Plan were areas identified by the Planning Department as most suitable to support dense development. The urban tier is the densest area in Durham County. This tier can handle a slight intensification of density with infill development. However, it will take creative approaches to reach higher densities because the residents are resistant to change. Better downtown bus service and policies to address offsite impacts, however, could justify density increases. Compact neighborhoods are areas intended to tie transit to future development. These areas are planned along the spine of the future light rail transit line and are ideal for denser development. The Suburban Transit Areas are additional areas located along future transit routes that are designated to encourage development supportive of transit.

Future growth was distributed based on standard densities required to support transit. The density was graded with highest density around existing and proposed transit stops and decreasing outwards. The areas designated as transit stops have a minimum density of 12 dwelling units per acre which is required to sustain high quality transit such as rail. The immediately surrounding areas have a minimum density of 10 dwelling units per acre. And the wider areas beyond that have a minimum density of 4 dwelling units per acre. Typically, density of at least 6 dwelling units per acre is required to sustain other types of transit including bus service. One dwelling unit is roughly equal to 2.35 people or 3.2 jobs.

Under this scenario, no growth will occur in the rural tier or in the outskirts of the suburban tier. Instead, all development is concentrated around the downtown within the urban tier and transit stops in the suburban tier. Population was added to each TAZ while trying to maintain a balance with employment opportunities. The overall ratio of total population to total employment in 2030 is 1.15 for Durham, so this was the target ratio for each TAZ within the county. Because there were already more jobs than people in the downtown tier, more people were added in this area compared to the suburban tier.

Figure 1.6: Durham County Population Difference 2030 Baseline to Reality Check Scenario



2030 EMPLOYMENT GROWTH

BASELINE SCENARIO

Employment—Baseline Scenario			
	2007	2030	Change
Durham County	**228,771**	**322,704**	**+ 93,933**

The Baseline Scenario was calculated based on the projections provided by the Durham-Chapel Hill-Carrboro MPO for 2035 using a linear extrapolation to estimate employment growth for 2030. These projections were made with the help of Durham planners and are the best estimate of what growth will look like under the current comprehensive plan and land use policies in place.

Under this scenario, the county will see a 41.1% increase in employment. The largest increases in employment are projected to occur in the southwestern portion of the county along the outskirts of the suburban tier. The largest concentration of growth is estimated to be in the southern-most corner of the county around Research Triangle Park.

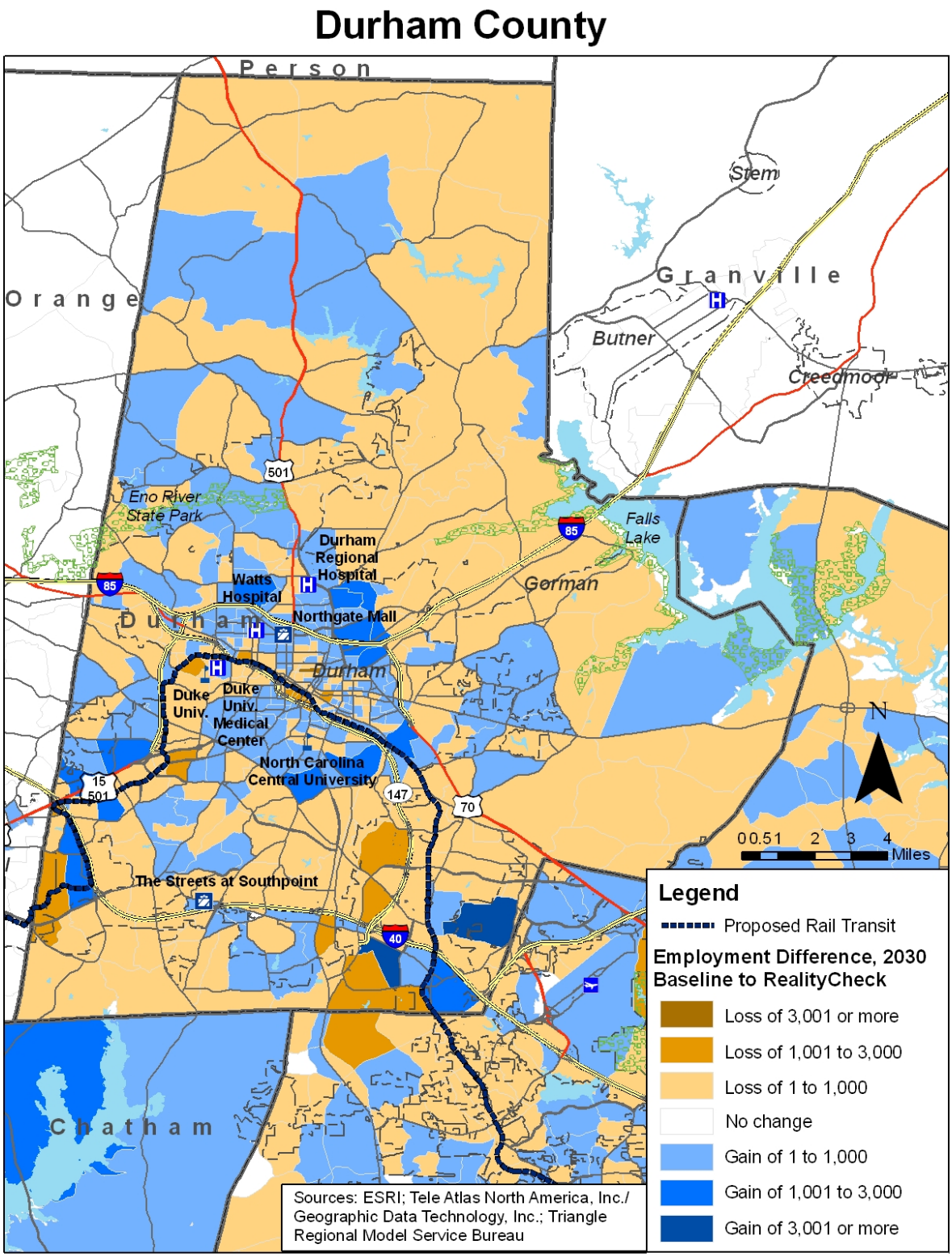
REALITY CHECK SCENARIO

Employment—Reality Check Scenario			
	2007	2030	Change
Durham County	**228,771**	**322,704**	**+ 93,933**

The Reality Check Scenario was calculated using the baseline projections and the same reallocation guidelines used in the Reality Check Scenario for population. Under this scenario, the county will see the same increase in employment as under the Baseline Scenario, however; it will be distributed differently.

Again, no growth will occur in the rural tier or the outskirts of the suburban tier. Instead, all development is concentrated around the downtown, within the urban tier and transit stops in the suburban tier. Because there were already more jobs than people in the downtown tier, more jobs were added in the suburban tier.

Figure 1.7: Durham County Employment Difference 2030 Baseline to Reality Check



ORANGE COUNTY, NC

The following information is based on interviews with Karen Lincoln, AICP, Transportation Planner, Orange County Planning & Inspections Department, and David Bonk, Long Range and Transportation Planning Manager, Town of Chapel Hill Planning Department in February 2010.

BACKGROUND

Orange County covers a total area of 400 square miles. As of July 1, 2008, the Census Bureau estimated the county population to be 126,532. The county is adjacent to Caswell, Person, Durham, Chatham, and Alamance Counties. The county includes the historic town of Hillsborough; Chapel Hill, the home of the University of North Carolina; and Carrboro, a former railroad and mill town.

Orange County is located in the rolling hills of the North Carolina Piedmont between the Research Triangle Park and the Triad cities of Greensboro, Winston-Salem and High point. The economy is anchored by the University of North Carolina, its historic communities, its high quality of life, and its ideal location between the Triangle and Triad. Orange County residents are in close proximity of multiple historical, social, cultural, and recreational resources.

2030 POPULATION GROWTH

BASELINE SCENARIO

Population - Baseline Scenario			
	2007	**2030**	**Change**
Orange County	**127,344**	**156,958**	**29,614**
Carrboro	17,264	18,569	1,305
Chapel Hill	50,440	63,986	13,546
Hillsborough	10,687	16,991	6,304
Unincorporated County	48,953	57,412	8,459

The Baseline scenario represents the projected growth in population into year 2030 using the year 2007 as the baseline. Since 2003 until 2008, Orange County has been growing by 0.9% a year. In 2008, Orange County held 3% of the population in the 13-county triangle region. Orange County is expected to grow 23.3% by the year 2030 and add an additional 29,614 residents based on the projections provided by the Durham-Chapel Hill-Carrboro MPO for 2035 using a linear extrapolation to estimate population growth for 2030.

Chapel Hill is the largest and fastest growing town in the county with a 26.9% increase in population from 2007 to 2030. The town expects to gain about 13,500 new residents. According to town planners, new development projects are planned to bring additional residents to the downtown area and the Carolina North campus expansion. There are also possibilities for residential redevelopment projects along the major transportation corridors such as NC 54, US 15/501, and Martin Luther King Jr. Blvd.

There is less expected growth in the towns of Carrboro and Hillsborough with the addition of 1,305 and 6,305 new residents being expected respectively. Historic Hillsborough will have very little development due to historic neighborhood preservation efforts by the town but will still increase substantially for a small town and reach its growth capacity. Eastern Hillsborough has been identified by planners as an area for possible residential growth.

The unincorporated rural county area is projected to see slow growth and add only 8,459 new residents. Due to water and sewer, as well as watershed development limitations, development in the rural county is constrained to low-density residential. Future population increases in the rural areas are expected to be minimal and the area is to remain zoned for low-density residential in an effort to protect watershed quality.

REALITY CHECK SCENARIO

Population - Reality Check Scenario			
	2007	**2030**	**Change**
Orange County	**127,344**	**179,334**	**+ 52,000**
Carrboro	17,264	18,569	**+ 1,305**
Chapel Hill	50,440	86,362	**+ 35,922**
Hillsborough	10,687	16,991	**+ 6,304**
Unincorporated County	48,953	57,412	**+ 8,459**

The Reality Check Scenario was calculated using the baseline projections and several reallocation guidelines. To create a denser, more transit-supportive scenario for Orange County, several adjustments were made in effort to increase population in the county by 2030. Under this scenario, Orange County will add an additional 22,376 residents and increase the population by 40.8% to 179,334 people in 2030.

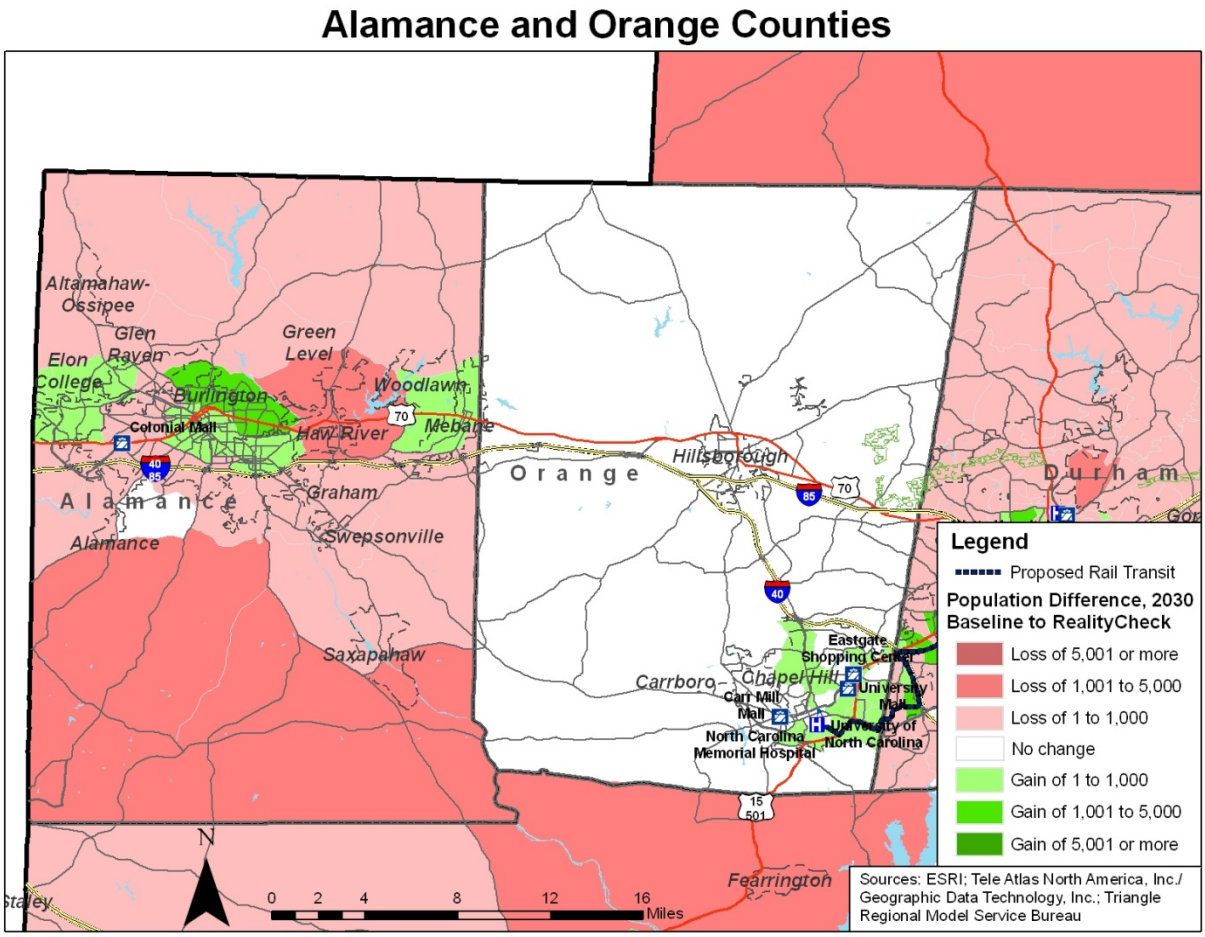
The main difference between the Baseline scenario and the Reality Check scenario is the absorption of additional population from counties in the regional triangle area. To create a denser, compact Orange County, 22,376 residents are absorbed by Chapel Hill from outside counties. The focus of the additional population growth is distributed in Chapel Hill so that the town will be able to sustain quality transit for residents. Chapel Hill long range planners have determined that Chapel Hill has the potential to grow about 20% over the 2035 DCHC/CAMPO projection, to about 89,000 people. In the Reality Check scenario, Chapel Hill will have a percent change in growth from 2007 to 2030 of about 71.2% with a total population of 86,362.

The additional residents are distributed in those areas identified by the town of Chapel Hill as potential residential development sites such as Carolina North, the downtown area, the NC 54 corridor, and along US 15/501 South. These areas already have existing transit infrastructure and are prime locations to handle the 12 dwelling units per acre density needed to support transit. In addition, this is where much of the employment growth is expected within the county, so the increased population will help support the job/housing balance needed for successful transit.

The towns of Hillsborough and Carrboro are expected to grow as projected in the Baseline scenario. Both communities will see modest levels of growth and see a total increase of around 7,700. The

rural unincorporated parts of Orange County are expected to also grow slowly and at a low-density mainly due to watershed protection development management. For this scenario, it is assumed that the unincorporated area will grow as projected in rural areas identified in watershed protection areas and the TAZs not located near a transportation corridor.

Figure 1.8: Orange County Population Difference 2030 Baseline to Reality Check



2030 EMPLOYMENT GROWTH

BASELINE SCENARIO

Employment - Baseline Scenario			
	2008	**2030**	**Change**
Orange County	**79,883**	**117,893**	**+ 38,010**
Carrboro	6,343	7,019	+ 676
Chapel Hill	55,557	84,925	+ 29,368
Hillsborough	9,484	16,828	+ 7,344
Unincorporated County	8,499	9,121	+ 622

The baseline employment scenario for Orange County is based on scaled TAZ projections from the 2035 DCHC/CAMPO Long Range Transportation Plan using a linear extrapolation to estimate population growth for 2030. Orange County is looking to gain over 38,000 jobs over the next 20 years, primarily centered on Hillsborough and Chapel Hill. The county will see a 47.6% increase in employment, while Chapel Hill and Hillsborough will increase 52.8% and 77.4% respectively.

Hillsborough growth is expected to continue within their extraterritorial jurisdiction, since a majority of the existing development is under strict historic preservation guidelines. The Hillsborough Economic Development District could handle all of the anticipated job growth. Chapel Hill is expected to have more jobs than residents in 2030, primarily fueled by the growth of UNC and the Carolina North Development. Unlike Hillsborough, much of this employment growth is expected to grow within existing town limits on redeveloped properties. Chapel Hill's growth is predicted to go along existing major thoroughfares, like NC 86, US 15-501, and NC 54.

Although Hillsborough and Chapel Hill will grow significantly, Carrboro and the unincorporated Orange County will see minimal job opportunities. Carrboro will see a modest increase of 10.7%, due to the restrictions of the town's limits. The unincorporated parts of the county will see an increase of 7.3% over the 22 year span. This minimal development expectation is due to existing zoning regulations that limit growth.

REALITY CHECK SCENARIO

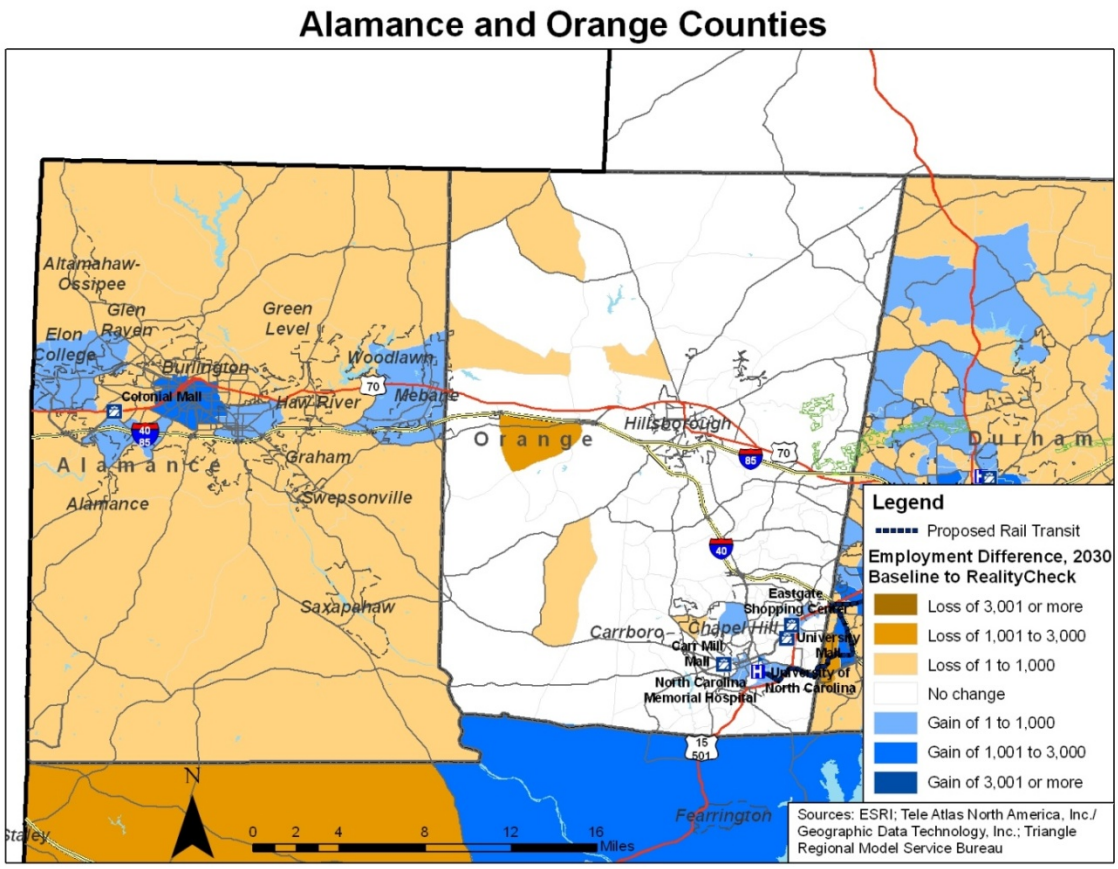
Employment - Reality Check Scenario			
	2008	**2030**	**Change**
Orange County	**79,883**	**117,893**	**+ 38,010**
Carrboro	6,343	7,019	+ 676
Chapel Hill	55,557	87,152	+ 31,595
Hillsborough	9,484	16,828	+ 7,344
Unincorporated County	8,499	6,894	-1,605

Under a denser Reality Check scenario that promotes vibrant centers, transit, and open space there is a shift in the employment locations within Orange County. The county itself is not expected to anticipate any more jobs under the denser scenario, but rather a redistribution of county jobs to employment centers. Hillsborough and Carrboro are relatively small communities with substantial growth restrictions in place. Thus, these two communities are expected to experience the same amount of growth that is present in the Baseline scenario.

Chapel Hill on the other hand is expected to gain significantly from this denser scenario, gaining an additional 2,000 jobs. This is a growth rate of 56.9%, which is an additional 4.1% over the baseline projection. Primarily fueled by the stability and potential growth of the university, the Town could handle more jobs in 2030 than originally predicted. Several policies and examples support these claims, including the success of Chapel Hill Transit, discussions from the Town's Sustainable Community Visioning Task Force, existing TOD developments (East 54, Southern Village, Meadowmont, etc.), and the plan for future bus rapid transit and light rail within the community. Much of these jobs are expected to be placed in TAZs along the major thoroughfares, as in the Baseline scenario.

On the other hand, the unincorporated part of Orange County, especially the rural northern section, is expected to have a decrease in jobs. A decrease of 18.9% was implemented to support the denser developments within Chapel Hill. After discussions with Orange County and Chapel Hill planners and analyses of existing data, we determine that this scenario would be possible following the goals of vibrant centers, transit, and open space.

Figure 1.9: Orange County Employment Difference 2030 Baseline to Reality Check



WAKE COUNTY, NC

This information based on the Wake County Land Use Plan and interviews with Sherry Taylor, Long-Range Planner, and Bryan Coates, Planner II conducted on February 16, 2010.

BACKGROUND

Wake County covers 860 square miles. The Census Bureau estimated the county's population to be 10,985 as of July 1, 2008. Wake County is adjacent to Durham, Granville, Franklin, Nash, Johnston, Harnett, and Chatham counties. It includes twelve municipalities: Apex, Cary, Fuquay-Varina, Garner, Holly Springs, Knightdale, Morrisville, Raleigh, Rolesville, Wake Forest, Wendell, and Zebulon.

Wake County has jurisdiction over determining short-range and long-range urban service areas and water supply watersheds. Much of the land in Wake County is in the municipal boundaries or extraterritorial jurisdiction of cities and towns or is subject to eventual annexation according to municipalities' agreements. The short-range urban service areas are expected to be urbanized and served by municipal services in the next ten years, and the long-range urban service areas are likely to be urbanized and receive services from municipalities in the foreseeable future, but not within ten years.

Some high-density development is already taking place in Wake County. The Veridea development in Apex will have approximately 6,000 residential units in buildings up to ten stories tall and a large amount of commercial space. Wendell Falls development, near Wake Med East, is currently on hold but would be the densest development in Eastern Wake, with 10,000 units. However, the county's water supply watersheds are zoned for low density to protect water quality and the northeastern part of the county and Swift Creek watershed is home to expensive, low-density residential development. A loss in employment opportunities is estimated to mainly take place in watersheds, which will remain mostly residential.

Most municipalities in Wake County are supportive of transit. In addition to Triangle Transit Authority, which has been extending service in the county, Wake Forest is funding its own circulator, and Knightdale and Garner have expressed interest in providing their own transit service as well. Rail transit has been proposed for the following corridors:

- Durant Road/Triangle Town Center – Downtown Raleigh (light rail along Atlantic Avenue)
- Cary – Apex (light rail, long-term)
- Downtown Raleigh – Clayton (commuter rail, long-term)

Changes to roads will also affect development patterns:

- The completion of 540 will spur development along this loop. A tolled 18-mile extension from NC 55 to Fuquay-Varina will open in 2012; Knightdale-Garner would be the last phase.
- The completion of the 64 bypass has opened up the northeastern part of the county for development.
- Capitol Boulevard and Glenwood Avenue are slated to be widened and have at-grade crossings removed in the long term.

According to Wake County planners, municipalities in Wake County do not intend to limit growth due to water supply, but instead would likely seek out new water sources when they are needed.

2030 POPULATION GROWTH

BASELINE SCENARIO

Population - Baseline Scenario			
	2007	**2030**	**Change**
Wake County	**832,590**	**1,560,026**	**+ 727,436**
Raleigh	331,139	461,285	+ 130,146
Cary	103,928	135,160	+ 31,232
Apex	17,318	39,968	+ 22,650
Garner	19,895	25,418	+ 5,523
Remainder of County	360,310	898,195	+ 537,885

Wake County population figures for 2007 and 2030 are based on traffic analysis zone (TAZ) level projections developed by the Capital Area Metropolitan Planning Organization (CAMPO). For all TAZs, CAMPO's population projections for 2005, 2015, 2025 and 2035 were interpolated to Reality Check's baseline and future years and scaled to sum to the county-level North Carolina Office of State Budget Management projections used in Reality Check. The totals for key municipalities presented below are approximate since TAZ and municipal boundaries generally do not correspond. Additionally, current municipality boundaries were applied for 2030, although Wake County anticipates that municipalities will ultimately annex all land outside of watersheds.

Under this scenario, the population will increase by 87%, or 727,436. Overall most of this growth will take place outside of the largest municipalities although Raleigh will still receive the most population of any of the cities in the county.

REALITY CHECK SCENARIO

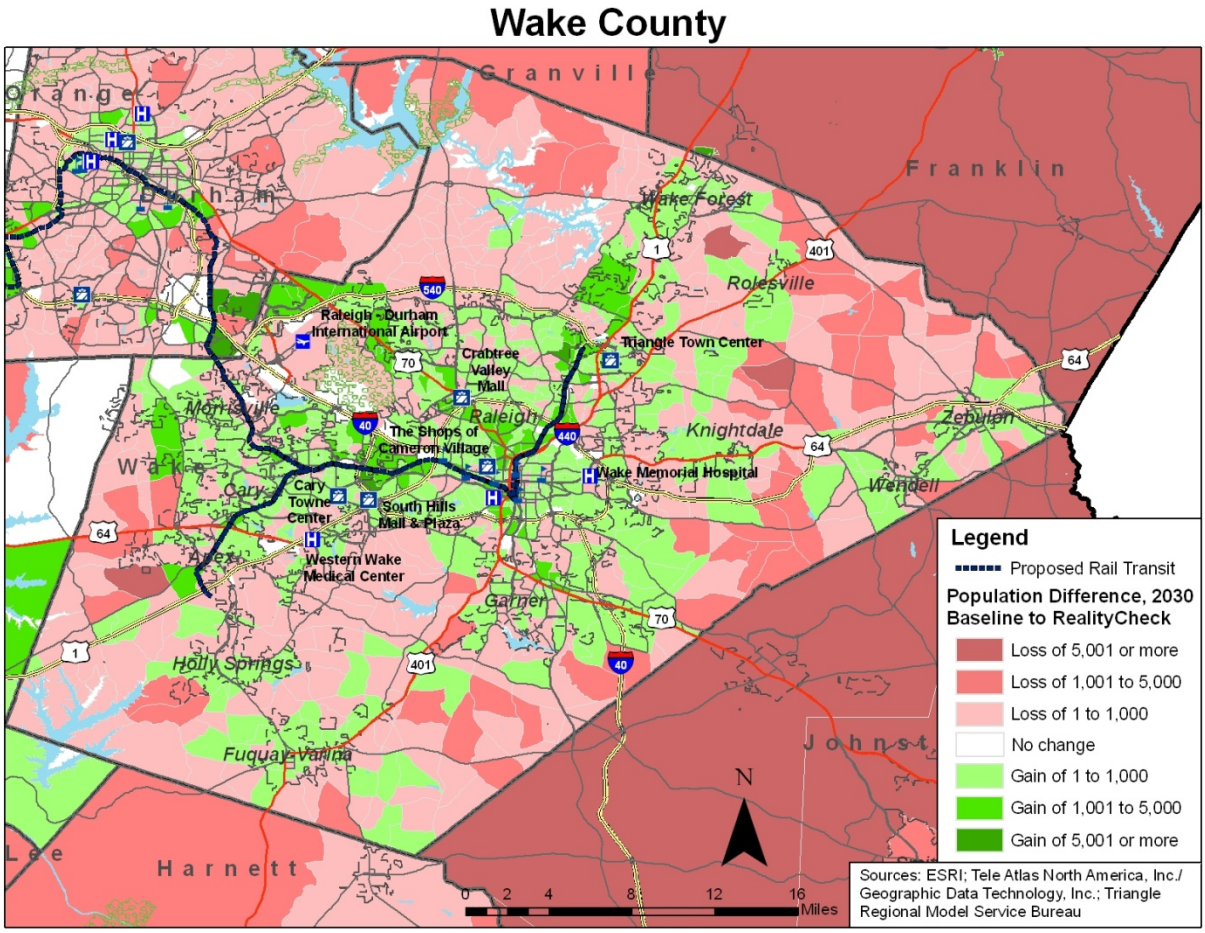
Population – Reality Check Scenario			
	2007	**2030**	**Change**
Wake County	**832,590**	**1,603,537**	**+ 770,947**
Raleigh	331,139	604,568	+ 273,429
Cary	103,928	151,435	+ 47,507
Apex	17,318	40,356	+ 23,038
Garner	19,895	33,692	+ 13,797
Remainder of County	360,310	773,486	+ 413,176

In the Reality Check scenario, approximately 165,000 future Wake County residents were relocated from watershed areas and municipalities' long-term annexation areas to transit corridors and infill redevelopment areas. It is estimated that Wake County would inherit an additional 43,532 future residents from counties to the east, primarily Johnston County. The highest-priority receiving TAZs

were identified through review of regional rail transit plans and municipal comprehensive plans as well as discussions with local planners. Other receiving TAZs were selected for their centrality in the county (such as zones in central Cary and within the Interstate 440 beltway in Raleigh) and proximity to proposed bus service enhancements. Under this scenario, the county will see a 93% increase in population.

Maximum densities were 24 dwelling units per acre (du/acre) in downtown Raleigh, 12 du/acre around proposed light rail and commuter rail stations, 8 du/acre in areas identified for redevelopment and 6 du/acre in other areas as described above. Jobs could be substituted for dwelling units at a ratio of 3.2 jobs per dwelling unit. Household size was assumed to be 2.35 people, consistent with the region today. If a receiving TAZ already exceeded these thresholds, no reductions were taken.

Figure 1.10: Wake County Population Difference 2030 Baseline to Reality Check



2030 EMPLOYMENT GROWTH

BASELINE SCENARIO

Employment - Baseline Scenario			
	2008	2030	Change
Wake County	**560,244**	**816,927**	**256,683**
Raleigh	312,827	362,906	50,079
Cary	77,071	105,313	28,242
Apex	11,218	26,365	15,147
Garner	14,681	17,570	2,889
Remainder of County	144,447	304,773	160,326

TAZ-level employment projections, also provided by CAMPO, were interpolated to yield projections for Reality Check's base and future years and scaled to Woods & Poole's projected employment totals for Wake County. The employment totals presented above for key municipalities are approximate since TAZ and municipal boundaries generally do not correspond and current municipality boundaries were applied for 2030. This scenario results in Wake County seeing 46% increase in employment. Most of this growth will take place in Raleigh. However, percentage-wise, the largest increases are projected to occur in Apex and Cary, which will see 135% and 37% growth respectively.

REALITY CHECK SCENARIO

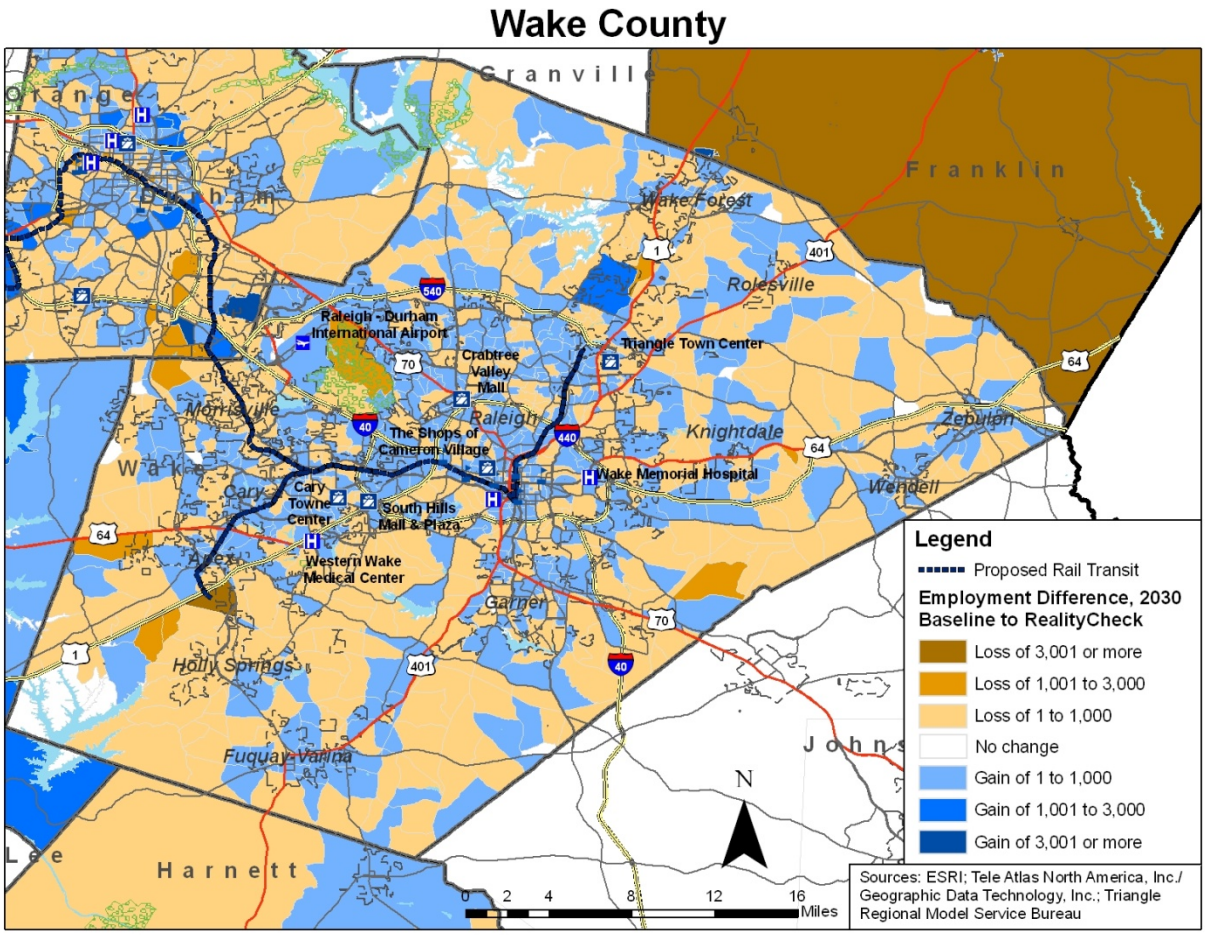
Employment – Reality Check Scenario			
	2008	2030	Change
Wake County	**560,244**	**818,408**	**258,164**
Raleigh	312,827	388,405	75,578
Cary	77,071	107,377	30,306
Apex	11,218	22,803	11,585
Garner	14,681	19,473	4,792
Remainder of County	144,447	280,350	135,903

In the Reality Check scenario, approximately 25,000 future Wake County jobs were relocated from watershed areas and municipalities' long-term annexation areas to transit corridors and infill redevelopment areas. Additionally, 1,481 jobs originally expected to locate in Alamance County were shifted to Wake County. This scenario still results in Wake County experiencing approximately 46% increase in employment growth, since most of the employment growth was shifted within the county rather than taken from other counties. Receiving TAZs were selected via criteria similar to those for the population scenarios, with particular emphasis on areas that local planners felt would experience strong job growth.

Maximum employment densities were 76.8 jobs per acre in downtown Raleigh, 38.4 jobs/acre around proposed light rail and commuter rail stations, 25.6 jobs/acre in areas identified for redevelopment and 19.2 jobs/acre in other areas. These maximum densities reflect the

substitution of jobs for dwelling units at a ratio of 3.2 jobs to one dwelling unit (most TAZs contain a combination of jobs and dwelling units). If a receiving TAZ already exceeded these thresholds, no reductions were taken.

Figure 1.11: Wake County Employment Difference 2030 Baseline to Reality Check



RURAL COUNTY PROFILES

ALAMANCE COUNTY, NC

Data has been gathered based on interviews and emails with Jessica Hill, Alamance County Planner, and Mike Nunn, Burlington-Graham MPO Transportation Planner throughout February 2010.

BACKGROUND

Comprising 435 square miles, Alamance County is situated just west of Orange County and squarely between the Triangle and Triad regions. For the sake of the ULI Reality Check exercise, Alamance was considered to be part of the 15-county Triangle area even though the Greensboro area also influences growth patterns in the county. The North Carolina Office of State Budget and Management (OSBM) estimated the 2008 population to be 145,995. The Reality Check exercise assumed the 2007 population to be 143,155 with 81,969 jobs, and this exercise accepted those Reality Check numbers.

Alamance County is comprised often incorporated municipalities: Alamance, Burlington, Elon, Gibsonville, Graham, Green Level, Haw River, Mebane, Ossipee, and Swepsonville. The fastest growing areas of Alamance County include Mebane and other eastern portions near Orange County and corridors leading to Orange County. Growth is also occurring near Elon and the Guilford County line. Both jobs and housing have concentrated around the I-40 corridor, which splits Alamance County as it runs east-west through the central region. Rural growth pressures have been minimal.

The Burlington-Graham MPO provided population and employment data at pre-defined "TAZ Subareas." These subareas, given an alphabetical identifier, consist of between 4 and 34 TAZ areas, depending on the level of urbanity of a particular subarea (where more urban subareas contain larger numbers of TAZ areas). This subarea distinction was deemed to be a sufficient breakdown of Alamance County, given its dual urban and rural characteristics. Alamance is surely not a core county of the Triangle, poised to experience rapid growth, but it also is not a rural county with small population centers. For these reasons Alamance County was evaluated at this "Subarea" level as distinguished by the Burlington-Graham MPO.

The Burlington-Graham MPO furnished a data set (to henceforth be referred to as the "MPO data") that provided the 2002 estimated population and employment figures for each subarea. The same file included a 2035 projection of both population and employment. In order to establish the distribution of the 2007 population and employment figures that were provided by the Reality Check exercise, the 2002 MPO data was expanded in each subarea so that the new sum would be the 2007 Reality Check totals. This expansion maintained the same distribution proportions shown in 2002—that is, it was assumed the growth rate was the same in every subarea from the 2002 MPO data to the 2007 calculated subarea figures. This should not present any serious concern because the 2007 population was only 7,400 greater than the 2002 MPO data and the 2007 employment was actually 3,572 less than the 2002 MPO data. These differences are relatively small and should not contribute much error from the true distribution.

2030 POPULATION GROWTH

BASELINE SCENARIO

Population - Baseline Scenario			
	2007	2030	Change
Alamance County	**143,155**	**187,943**	**+44,788**
Subgroup A	2,866	3,687	+ 821
Subgroup B	5,309	6,832	+ 1,523
Subgroup C	7,437	10,217	+ 2,780
Subgroup D	2,020	2,491	+ 471
Subgroup E	9,915	14,550	+ 4,635
Subgroup F	5,937	8,340	+ 2,403
Subgroup G	8,530	11,535	+ 3,005
Subgroup H	1,414	1,727	+ 313
Subgroup I	3,148	4,145	+ 997
Subgroup J	8,997	12,037	+ 3,040
Subgroup K	16,138	19,891	+ 3,753
Subgroup L	7,813	9,743	+ 1,930
Subgroup M	7,603	10,324	+ 2,721
Subgroup N	3,696	5,253	+ 1,557
Subgroup O	3,236	4,218	+ 982
Subgroup P	5,338	6,579	+ 1,241
Subgroup Q	1,030	1,384	+ 354
Subgroup R	4,018	5,137	+ 1,119
Subgroup S	8,424	10,984	+ 2,560
Subgroup T	3,273	4,406	+ 1,133
Subgroup U	13,907	17,008	+ 3,101
Subgroup V	7,207	9,312	+ 2,105
Subgroup W	3,010	4,377	+ 1,367
Subgroup X	2,889	3,769	+ 880
Subgroup Y	2,866	3,687	+ 821
Subgroup Z	5,309	6,832	+ 1,523
Subgroup ZZ	7,437	10,217	+ 2,780

The Baseline scenario was calculated from the 2035 MPO data and normalized to the 2030 Reality Check population and employment numbers. According to the 2035 MPO data, Alamance was projected to have a population of 224,090 with 147,440 jobs. This estimate is considerably different than the 2030 Reality Check figures that were presented as part of the visioning exercise. Reality Check projected the Alamance population to be only 187,946 with only 102,622 jobs in 2030. This is a stark underestimate compared to the MPO data, but nonetheless, in an effort to retain continuity with the Reality Check exercise, the Reality Check projections were used in preference to local estimates.

The 2035 MPO data still provided a large role in establishing the distribution of the 2030 growth. It was assumed that the 2030 baseline would see growth occur in the same distribution as the 2035 MPO data by percentage of total projected growth. That is, Subarea A was projected by the MPO to

absorb 1.8% of all projected population growth in Alamance County between 2002 and 2035, so it was assumed in the baseline that Subarea A would absorb 1.8% of all projected population growth from 2007 to 2030. This was repeated for each subarea for both population and employment figures.

Under this scenario, population will increase by 31.3% between 2007 and 2030, adding 44,788 new residents. It should be noted that the baseline growth was confirmed with county planners. Mebane was projected to grow substantially as well as the rural areas between Mebane and Swepsonville, along Highway 54. Projected job growth was concentrated around the I-40 corridor. Rather stagnant growth was expected in the urbanized areas of Burlington and Graham. This projection as a baseline/business-as-usual model made sense as it called for continued suburbanization with the majority of growth locating in currently rural-dominated subareas.

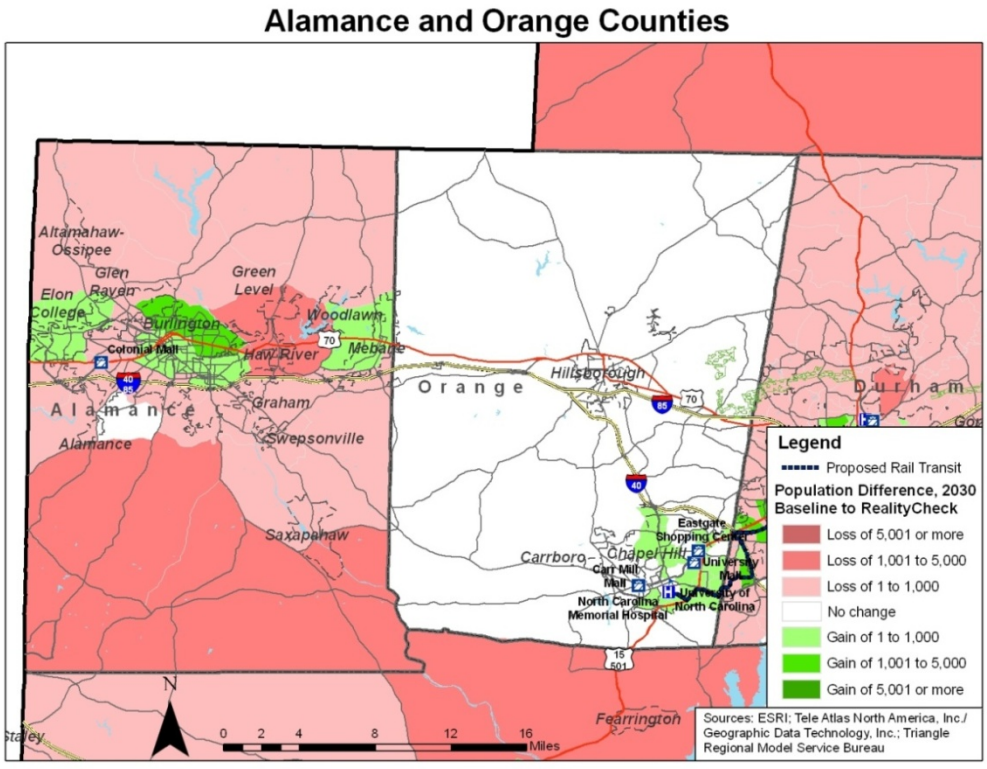
REALITY CHECK SCENARIO

Population – Reality Check Scenario			
	2007	**2030**	**Change**
Alamance County	**143,155**	**180,877**	**+ 37,722**
Subgroup A	2,866	3,256	+ 390
Subgroup B	5,309	6,258	+ 949
Subgroup C	7,437	10,976	+ 3,539
Subgroup D	2,020	2,316	+ 296
Subgroup E	9,915	13,626	+ 3,711
Subgroup F	5,937	7,201	+ 1,264
Subgroup G	8,530	9,752	+ 1,222
Subgroup H	1,414	1,727	+ 313
Subgroup I	3,148	4,358	+ 1,210
Subgroup J	8,997	12,659	+ 3,662
Subgroup K	16,138	20,859	+ 4,721
Subgroup L	7,813	10,093	+ 2,280
Subgroup M	7,603	8,872	+ 1,269
Subgroup N	3,696	4,393	+ 697
Subgroup O	3,236	3,938	+ 702
Subgroup P	5,338	5,859	+ 521
Subgroup Q	1,030	1,227	+ 197
Subgroup R	4,018	4,601	+ 583
Subgroup S	8,424	10,858	+ 2,434
Subgroup T	3,273	3,899	+ 626
Subgroup U	13,907	18,322	+ 4,415
Subgroup V	7,207	8,946	+ 1,739
Subgroup W	3,010	3,575	+ 565
Subgroup X	2,889	3,306	+ 417
Subgroup Y	2,866	3,256	v390
Subgroup Z	5,309	6,258	+ 949
Subgroup ZZ	7,437	10,976	+ 3,539

In order to establish the Reality Check Vibrant Centers growth projection, interviews were conducted with the county planner, Jessica Hill. Ms. Hill was asked to gauge the ability of already urbanized areas to accept additional growth under a regional growth management model envisioned by the Reality Check exercise. Greenfield development was minimized and growth was redirected inwardly to the existing municipal limits of Burlington, Graham, and Mebane. Burlington has the infrastructure to accommodate a great deal of growth, especially on its northeast side. Graham also has an ability to increase its density if a vibrant center model were adopted. Mebane is still believed to attract a significant amount of growth, but the vibrant center model showed most of this growth to occur closer to the existing Mebane town limits as opposed to the baseline model which called for considerable growth in currently rural areas. It was assumed that commuter rail and light rail would not be in the 2030 Alamance County Reality Check growth model as even the most ambitious of current plans for these rail projects do not extend into Alamance. The extent of Triangle Transit service in Alamance County is only express bus service to Mebane. Alamance also experiences growth pressures from its west in Guilford County and its largest city, Greensboro. The vibrant centers projection did not suppose that any Alamance County growth would be lost to Guilford County, instead that growth due to Guilford County would still arrive in Alamance but only take on a slightly different form—one of Elon and Gibsonville growing within their current subareas and not in the rural subareas to the north and south. The Alamance County planner, Jessica Hill, provided her estimates for growth in population and jobs within each subarea under a regional vibrant centers model.

Under this scenario, population will increase by 26.4% between 2007 and 2030, adding 37,722 new residents. This estimate called for 7,066 fewer people than the baseline, and it was assumed all of these people would instead locate within the core counties. This is reasonable considering most of the baseline population growth in Alamance was projected to be in rural areas from people mostly working in a core county.

Figure 1.12: Alamance County Population Difference 2030 Baseline to Reality Check



2030 EMPLOYMENT GROWTH

BASELINE SCENARIO

Employment - Baseline Scenario			
	2007	**2030**	**Change**
Alamance County	**81,969**	**102,622**	**+20,653**
Subgroup A	310	369	+ 59
Subgroup B	547	647	+ 100
Subgroup C	2,669	3,520	+ 851
Subgroup D	3,932	5,191	+ 1,259
Subgroup E	2,243	2,853	+ 610
Subgroup F	450	537	+ 87
Subgroup G	998	1,188	+ 190
Subgroup H	1,061	1,365	+ 304
Subgroup I	739	879	+ 140
Subgroup J	3,691	4,744	+ 1,053
Subgroup K	13,926	17,047	+ 3,121
Subgroup L	5,842	7,155	+ 1,313
Subgroup M	2,678	3,184	+ 506
Subgroup N	640	761	+ 121
Subgroup O	8,327	10,562	+ 2,235
Subgroup P	8,081	10,252	+ 2,171
Subgroup Q	770	966	+ 196
Subgroup R	6,566	8,014	+ 1,448
Subgroup S	2,691	3,396	+ 705
Subgroup T	1,008	1,198	+ 190
Subgroup U	5,736	7,322	+ 1,586
Subgroup V	1,903	2,401	+ 498
Subgroup W	2,640	3,412	+ 772
Subgroup X	4,521	5,659	+ 1,138
Subgroup Y	310	369	+ 59
Subgroup Z	547	647	+ 100
Subgroup ZZ	2,669	3,520	+ 851

The baseline employment scenario was calculated in the same exact manner of the population baseline scenario with data from the same dataset.

Under this scenario, the county will see a 25% increase in employment. Largest increases in employment are in Mebane and along the I-40 corridor, which is an existing jobs center.

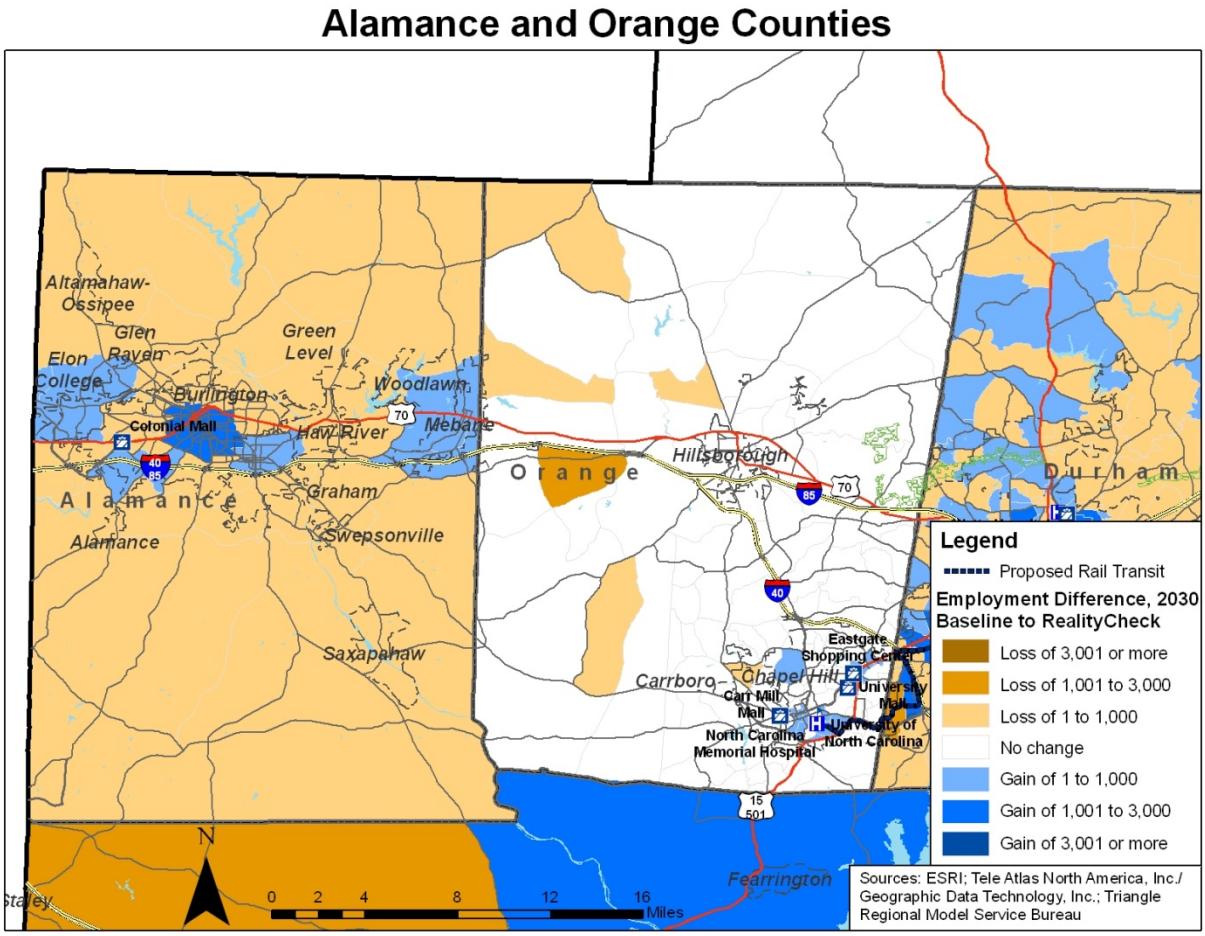
REALITY CHECK SCENARIO

Employment - Baseline Scenario			
	2007	**2030**	**Change**
Alamance County	**81,969**	**101,141**	**+19,172**
Subgroup A	310	340	+ 30
Subgroup B	547	617	+ 70
Subgroup C	2,669	3,590	+ 922
Subgroup D	3,932	5,291	+ 1,359
Subgroup E	2,243	2,708	+ 465
Subgroup F	450	520	+ 70
Subgroup G	998	1,101	+ 103
Subgroup H	1,061	1,262	+ 201
Subgroup I	739	879	+ 141
Subgroup J	3,691	4,838	+ 1,148
Subgroup K	13,926	18,258	+ 4,332
Subgroup L	5,842	7,659	+ 1,816
Subgroup M	2,678	3,001	+ 324
Subgroup N	640	728	+ 89
Subgroup O	8,327	9,622	+ 1,295
Subgroup P	8,081	10,316	+ 2,235
Subgroup Q	770	877	+ 107
Subgroup R	6,566	7,247	+ 681
Subgroup S	2,691	3,249	+ 558
Subgroup T	1,008	1,148	+ 139
Subgroup U	5,736	7,025	+ 1,289
Subgroup V	1,903	2,232	+ 329
Subgroup W	2,640	3,096	+ 456
Subgroup X	4,521	5,536	+ 1,015
Subgroup Y	310	340	+ 30
Subgroup Z	547	617	+ 70
Subgroup ZZ	2,669	3,590	+ 922

The Reality Check employment scenario was calculated in the same exact manner of the population baseline scenario with interviews from Jessica Hill, an Alamance County planner.

Under this scenario, the county will see a 23% increase in employment. Job growth was still expected to concentrate along already existing job centers along the I-40 corridor. A small number of jobs were assumed to be lost to the core counties.

Figure 1.13: Alamance County Employment Difference 2030 Baseline to Reality Check



CHATHAM COUNTY, NC

The following information is based on interviews with Jason Sullivan and Benjamin Howell on February 9, 2010.

BACKGROUND

Chatham County, NC is a predominantly rural and suburban county with a total area of 709 square miles. The county includes the cities of Siler City and Pittsboro, as well as a small portion of Cary (most of which is situated in Wake County). As of the 2000 census, Chatham had a total population of 49,329, but has experienced substantial growth in recent years. As of 2008, the North Carolina State Office of Budget and Management estimated that the county's population was 63,007, a growth rate of 28% in just eight years. The most rapid growth in the area has occurred in the county's northeast quadrant, as residents seeking the benefits of the county's rural character and relatively inexpensive land have relocated to Chatham.

Chatham County has been subdivided into eight regions for the purpose of this analysis. These sub-regions are aggregations of census block groups and/or Transportation Analysis Zones (TAZs) which we felt comprised logical areas based on their recent histories and land use characteristics. Additionally, we considered that Chatham is effectively situated in two regions, with the eastern half of the county more closely associated with the "Triangle" region and the western half considered more a part of the "Triad" region. The regions of analysis are as follows:

1. "Pittsboro": Block groups in and around the city of Pittsboro.
2. "Siler City": Block groups in and around Siler City
3. "Cary": Block groups around the portion of Chatham County containing the town of Cary, including the area extending to the eastern shore of Jordan Lake.
4. "Northeast": The large swath of land east of Highway 87 extending to the western short of Jordan Lake. This area includes major developments such as Governor's Club and Briar Chapel, as well as a large number of permitted and/or planned communities.
5. "Southeast": Block groups within most of the southeast quadrant of the county, including the Moncure industrial area
6. "Industrial": The southeastern-most tip of the county, which, along with the corner of the "Southeast" region, houses Chatham's industrial sector
7. "Southwest": Block groups west of Highway 87 and south of Highway 64, excluding those included in the Siler City area
8. "Northwest": Block groups west of Highway 87 and north of Highway 64, excluding those included in the Siler City area

Using a combination of place-level Census information for 2008 and overall county population estimates from the North Carolina State Office of Management and Budget the 2008 population was distributed as realistically as possible to estimate the growth occurring in Chatham County. For example, the population growth rates estimated by the U.S. Census Bureau for Pittsboro and Siler City were applied to the 2000 Census and the 2008 American Community Survey population data. It was also assumed that higher rates of growth have occurred in the Northeast area compared to

the overall county based on information from county planners. The following assumptions were made about employment distribution:

- In the Pittsboro, Siler City, Cary, Northwest, and Southwest regions, the proportion of overall employment was comparable to their proportion of the overall population.
- In the Northeast region, the percentage of overall county employment is lower than the percentage of overall county population in the county.
- The Southwest and Industrial areas each have approximately 6.7% of the county's employment.

2030 POPULATION GROWTH

BASELINE SCENARIO

Population - Baseline Scenario			
	2008	**2030**	**Change**
Chatham County	**63,133**	**91,491**	**+ 28,358**
Pittsboro	4,689	6,155	+ 1,466
Siler City	10,279	14,232	+ 3,953
Cary	2,502	3,626	+ 1,124
Industrial	565	819	+ 254
Northeast	17,832	27,147	+ 9,315
Northwest	6,602	9,567	+ 2,965
Southeast	3,996	5,791	+1,795
Southwest	16,668	24,155	+7,487

The Baseline growth scenario assumes that future population growth will generally retain the pattern that has been observed in recent years by county planning staff. Growth under this scenario will be diffuse, particularly in the Northeast and Southwest sections. Algorithmically, this growth scenario is rooted in the application of recent estimated growth trends, calculated by the percentage of overall county growth occurring within particular regions.

Under this scenario, population will increase by 44.9% between 2008 and 2030, adding a total of 28,358 new residents.

REALITY CHECK SCENARIO

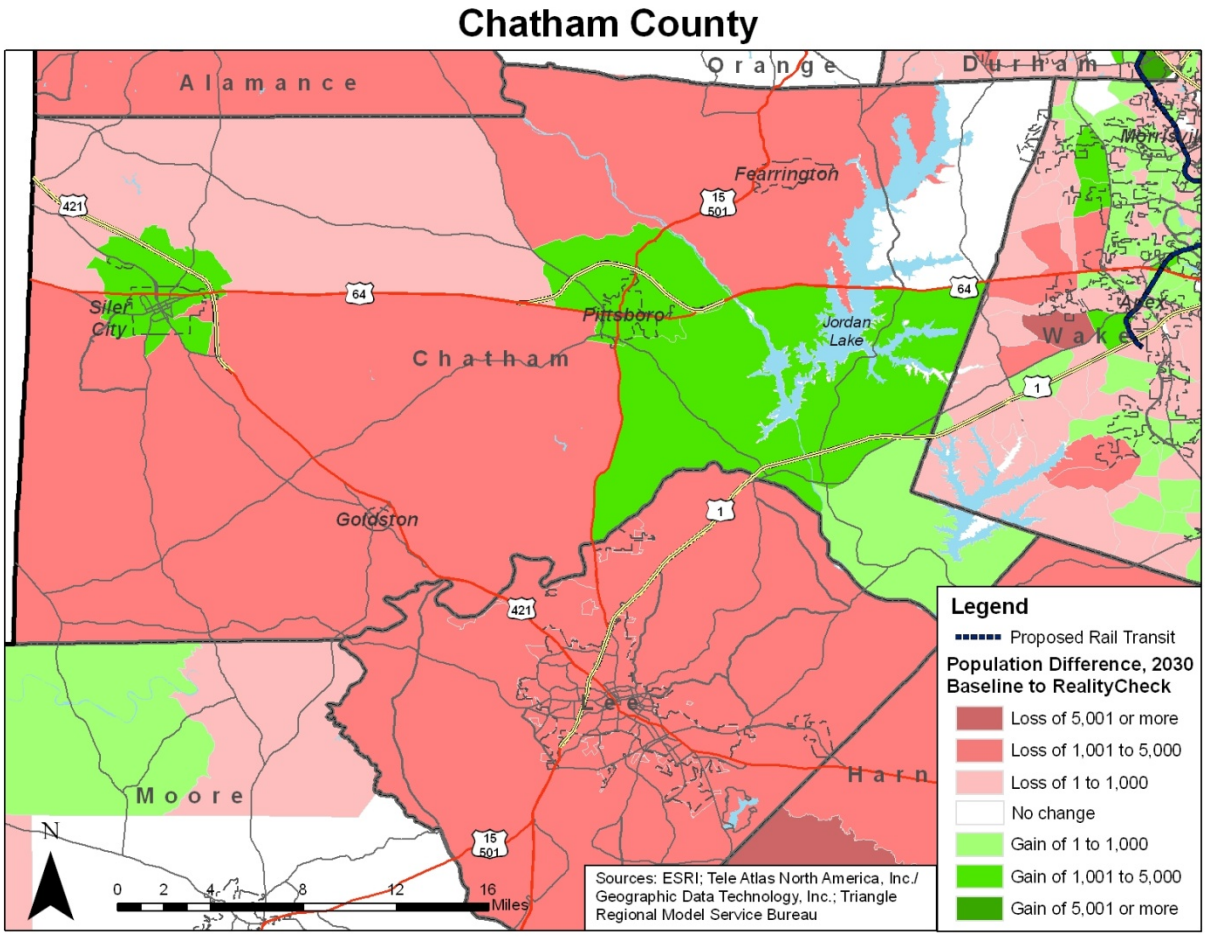
Population - Reality Check Scenario			
	2008	**2030**	**Change**
Chatham County	**63,133**	**91,491**	**+ 28,358**
Pittsboro	4,689	8,354	+ 3,665
Siler City	10,279	17,196	+ 6,917
Cary	2,502	3,626	+ 1,124
Industrial	565	1,073	+ 508
Northeast	17,832	23,421	+ 5,589
Northwest	6,602	9,271	+2,669
Southeast	3,996	7,586	+ 3,590
Southwest	16,668	20,973	+ 4,305

The Reality Check scenario was calculated with consideration to a "vibrant centers" policy approach to growth management. This type of growth emphasizes increased densities, reduced automotive commutes, preserved ecologically valuable and sensitive areas, and promoted development in transit-friendly patterns. The following policy goals were the foundation of the Reality Check growth scenario:

1. Growth in Chatham County, wherever possible, should occur in the sub-regions of Pittsboro and Siler City.
2. Expand the residential base in parts of the Southeast and Industrial regions to capitalize on the growth of industrial facilities in these areas. Naturally, this growth should occur sensitively with respect to the Jordan Lake watershed, but should be robust enough to offer employees in this area the opportunity to live near their places of employment.
3. Sensitive agricultural and natural vegetative lands in the rural portions of the county should be preserved whenever possible.

Under this scenario, the county will see still see a 44.9% increase in total population; however, it is distributed in a different pattern.

Figure 1.14: Chatham County Population Difference 2030 Baseline to Reality Check



2030 EMPLOYMENT GROWTH

BASELINE SCENARIO

Employment - Baseline Scenario			
	2008	**2030**	**Change**
Chatham County	**40,810**	**62,726**	**+ 12,916**
Pittsboro	3,030	3,977	+947
Siler City	6,642	9,197	+ 2,555
Cary	1,617	2,343	+ 726
Industrial	2,733	5,847	+ 3,114
Northeast	8,975	13,664	+ 4,689
Northwest	4,266	6,182	+ 1,916
Southeast	2,774	5,906	+ 3,132
Southwest	10,771	15,609	+ 4,838

The Baseline growth scenario assumes that future employment growth will generally retain the pattern that has been observed in recent years by county planning staff. Employment growth under this scenario will be diffuse, similar to the population growth, particularly in the Northeast and Southwest sections. Algorithmically, this scenario is rooted in the application of recent estimated growth trends, calculated by the percentage of overall county growth occurring within particular regions. With respect to employment, the Baseline scenario assumes a comparable ratio of jobs to population as in the current distribution.

Under this scenario, the county will see a 53.7% increase in employment. There will be a total of 12,916 new jobs in the county by 2030.

REALITY CHECK SCENARIO

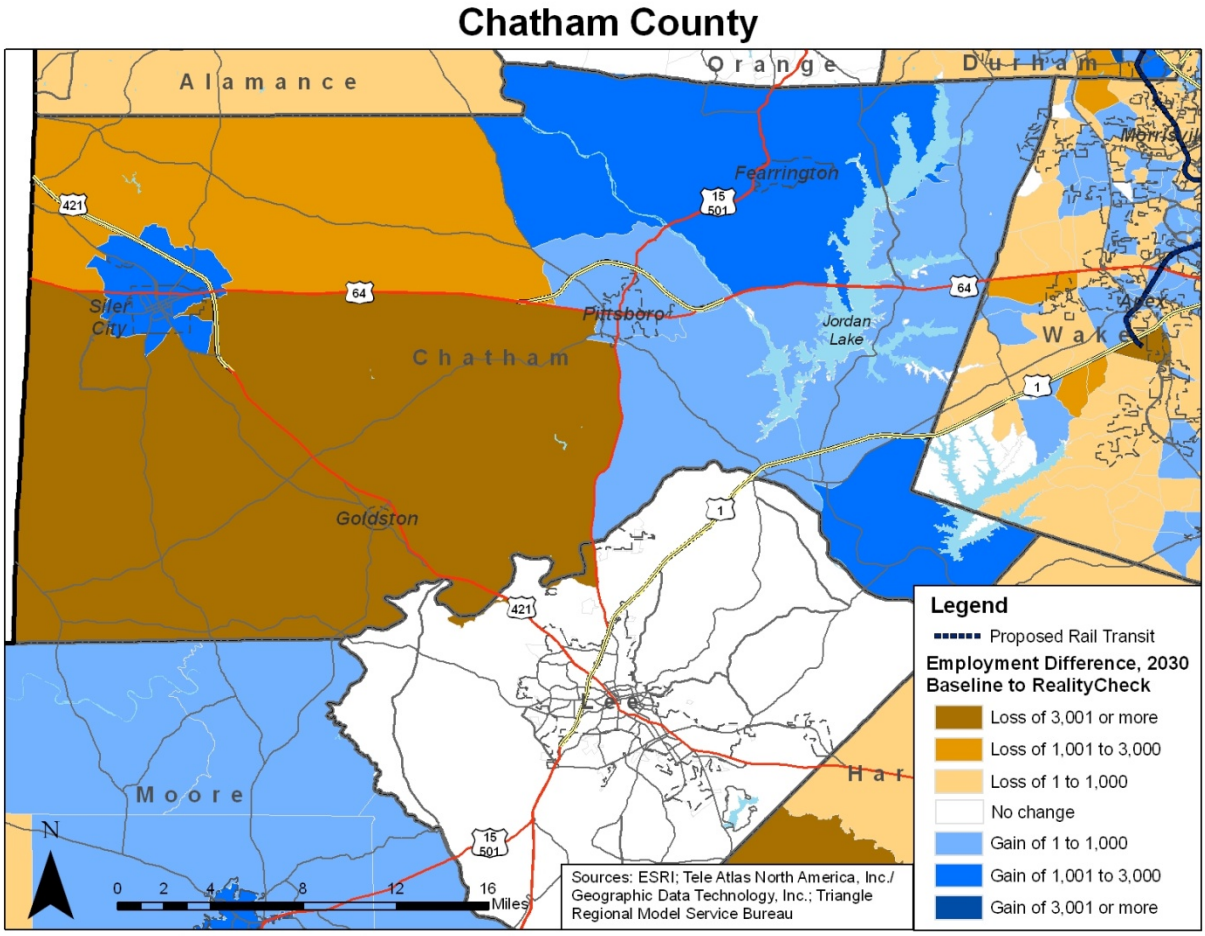
Employment - Reality Check Scenario			
	2008	**2030**	**Change**
Chatham County	**40,810**	**62,726**	**+ 21,916**
Pittsboro	3,030	4,972	+ 1,942
Siler City	6,642	10,474	+ 3,832
Cary	1,617	2,707	+ 1,090
Industrial	2,733	7,404	+ 4,671
Northeast	8,975	14,836	+ 5,861
Northwest	4,266	4,551	+285
Southeast	2,774	6,689	+ 3,915
Southwest	10,771	11,089	+318

The Reality Check Scenario was again calculated with a greater focus on a "vibrant centers" policy approach to growth management which increased densities, reduced automotive commutes, preserved ecologically valuable and sensitive areas, and promoted development in transit-friendly patterns. The following policy goals were considered:

1. Growth in Chatham County, wherever possible, should occur in the sub-regions of Pittsboro and Siler City.
2. Employment centers should be located in the same sub-regions to promote a more viable jobs-housing balance and reduce the number of residents who live in Harnett County but commute to jobs in other counties within the region. This is especially true in the Northeast region.
3. Sensitive agricultural and natural vegetative lands in the rural portions of the county should be preserved whenever possible.

Under this scenario, the county will still see a 53.7% increase in total employment; however the 12,916 new jobs would be distributed following the designated policy goals listed above.

Figure 1.15: Chatham County Employment Difference 2030 Baseline to Reality Check



FRANKLIN COUNTY, NC

The following information is based on interviews and emails with Scott Hammerbacher, Franklin County Planning Director, Donna Wood, Franklin County Planner and Ann Ayers, Wake County Planner.

BACKGROUND

Franklin County encompasses 494 square miles. In 2007, Franklin County had a population of 56,470. It lies northeast of Wake County and is a 30 minute drive from the Raleigh-Durham Airport and about the same distance from Research Triangle Park. Not surprisingly, a majority of Franklin County residents work outside the county. In 2008, Franklin County had only 3% of the total population of the 15-county triangle region.

Franklin County is comprised of five municipalities: Town of Bunn, Town of Youngsville, Town of Franklinton, Town of Centerville, and the Town of Louisburg, which serves as the county seat. A portion of the Town of Wake Forest also lies in Franklin County, and is the fastest growing portion of the county though it currently only has 638 residents. The two largest towns are Louisburg with a population of 3,111 and Franklinton with a population of 1,745.

2030 POPULATION GROWTH

BASELINE SCENARIO

Population - Baseline Scenario			
	2007	**2030**	**Change**
Franklin County	**56,456**	**86,842**	**+ 30,386**
Louisburg	3,111	4,417	+ 1,306
Franklinton	1,745	5,057	+ 3,312
Wake Forest	638	15,132	+ 14,494
Unincorporated County	50,962	62,236	+ 11,274

The Baseline scenario was calculated using growth trends over the past 20 years.

Franklin County is growing rapidly. Its population has increased by 37% since 1995 and is expected to increase by 47% between 2007 and 2030, adding 26,577 new residents.

Development is primarily occurring within unincorporated area of the county, and within the towns' extraterritorial jurisdictions. The bulk of future growth is expected to occur in the southwestern part of the county near the Franklin Park Industrial Center, which is located adjacent to US Highway 1north of the Town of Youngsville, and in Wake Forest along the border with Wake County. This growth coincides with areas where County water and sewer services are located.

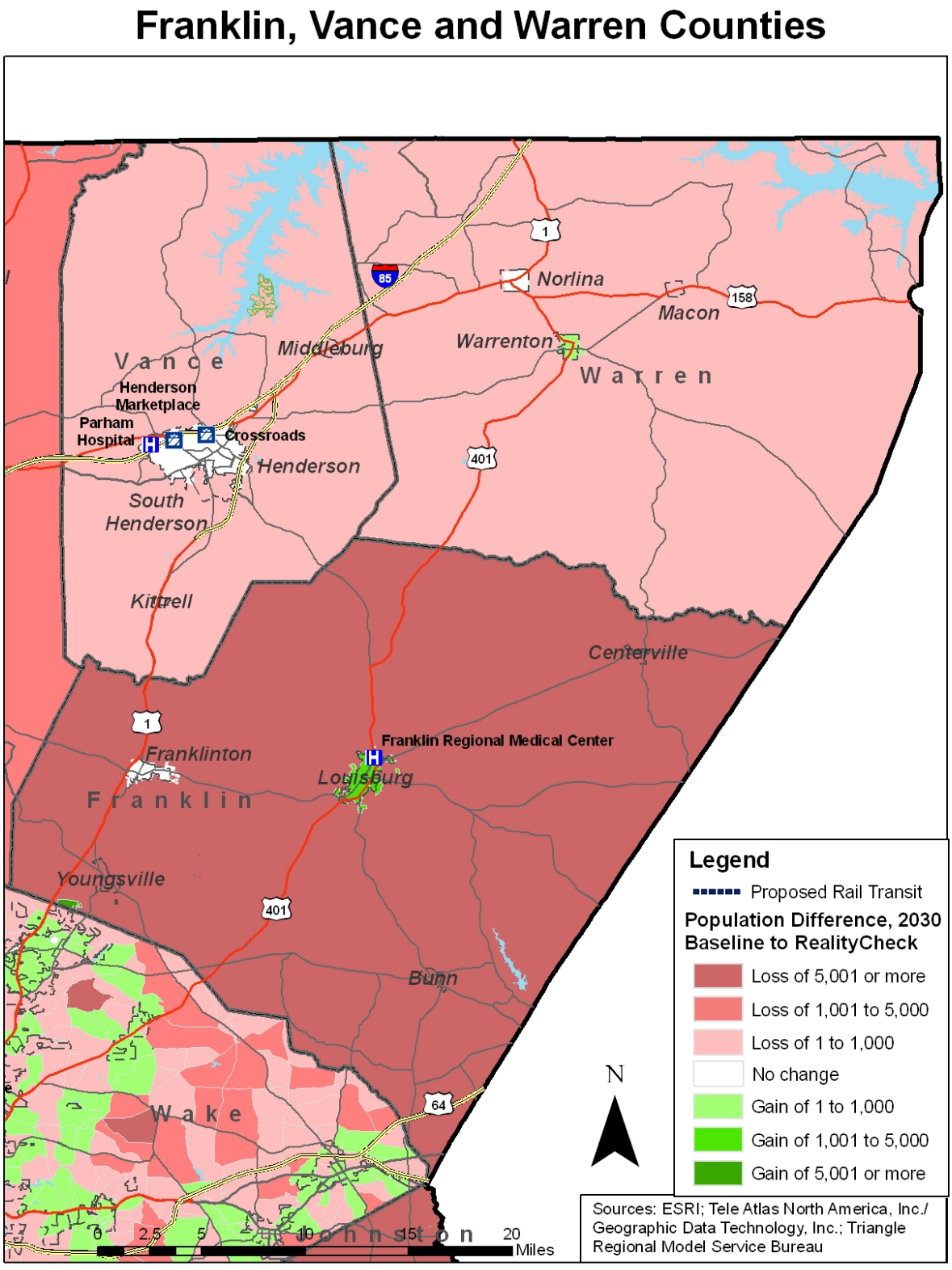
REALITY CHECK SCENARIO

Population - Reality Check Scenario			
	2007	**2030**	**Change**
Franklin County	**56,456**	**71,930**	**+ 15,474**
Louisburg	3,111	6,222	+ 3,111
Franklinton	1,745	5,057	+ 3,312
Wake Forest	638	22,379	+ 21,741
Unincorporated County	50,962	38,272	+ 2,222

In terms of land, Franklin County could add 100,000 more people by 2030, but in terms of schools, sewer, water, and other infrastructure, that is not possible. The current sewer capacity in Franklin County could not support much more growth. With infrastructure improvements, Planning Director Scott Hammerbacher thinks they could direct more growth into towns within the county. In addition, Franklin County is expecting to receive a stimulus grant to widen US 401. If that is accomplished, then Louisburg will grow considerably, and could possibly double in size by 2030. Franklinton is not likely to grow beyond a baseline scenario. Wake Forest, however, has the infrastructure available to grow considerably, by half again as much as is expected under the Baseline scenario.

Even if infrastructure improvements expand the growth numbers in the incorporated areas, most of the growth would still be expected in the unincorporated county, with the majority in the southwestern corner by Wake County. For the purposes of this project, future citizens of Franklin County who are expected to have a commute time of thirty minutes or longer were transferred from the unincorporated county to the core counties. As such, 23,964 people were removed from the unincorporated county growth estimates and placed in the core counties in the Reality Check scenario.

Figure 1.16: Franklin County Population Difference 2030 Baseline to Reality Check



2030 EMPLOYMENT GROWTH

BASELINE SCENARIO

Employment - Baseline Scenario			
	2007	**2030**	**Change**
Franklin County	**21,944**	**31,847**	**+ 9,903**
Louisburg	1,197	1,736	+ 539
Franklinton	741	1,074	+ 333
Wake Forest	8,220	11,919	+ 3,699
Unincorporated County	11,786	17,118	+ 5,332

Employment data at the municipal level for Franklin County was unavailable. The North Carolina Employment Security Commission Labor Market Information Division stated that employment data is not calculated for municipalities with populations below 5,000. As such, employment estimates at the municipal level represent the best guess of Franklin County planning staff.

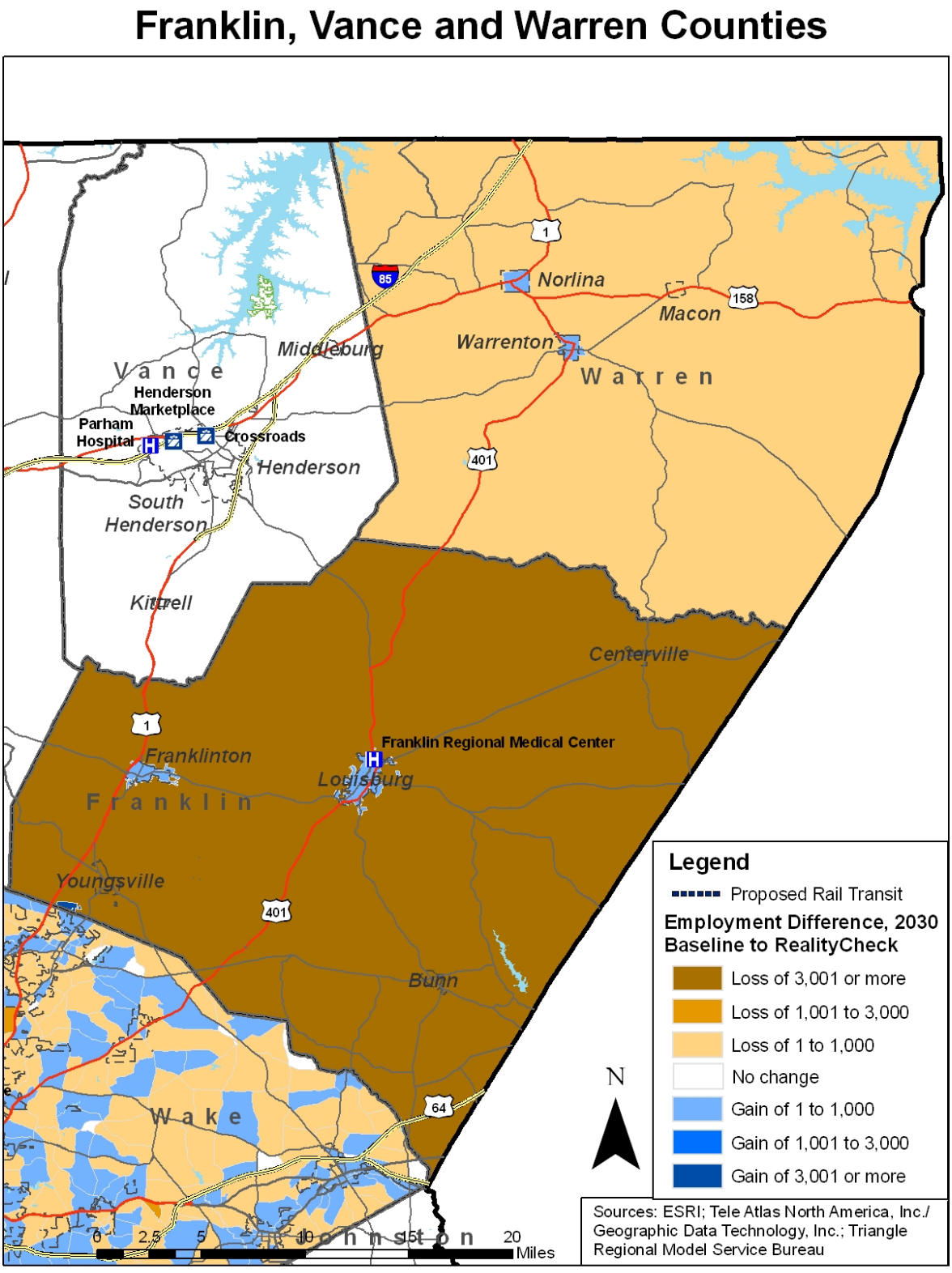
Hammerbacher anticipates future jobs occurring along the US 1 and US 401 corridors in addition to within the towns. Franklin County is located only 21 miles northeast of Raleigh. Three interstates (40, 85, and 95) are easily reached from the county. Research Triangle Park, the world's largest research complex is only 35 miles southeast of the county seat. All of these factors are expected to lead to employment growth, particularly in the southwest corner of the county.

REALITY CHECK SCENARIO

Employment - Reality Check Scenario			
	2007	**2030**	**Change**
Franklin County	**21,944**	**31,847**	**+ 9,903**
Louisburg	1,197	2,394	+ 1,197
Franklinton	741	1,482	+ 1,482
Wake Forest	8,220	16,440	+ 8,220
Unincorporated County	11,786	11,531	+ 996

Non-residential growth is following residential growth in Franklin County, so Hammerbacher expects that jobs will increase as population increases, in the same areas and in approximately the same proportions. Therefore, as population increases local employment opportunities will also increase, maintaining an adequate job-housing balance.

Figure 1.17: Franklin County Employment Difference 2030 Baseline to Reality Check



GRANVILLE COUNTY, NC

The following information is based on interviews with Melissa Hodges, Butner Town Planner, and Cheryl Hart, Planning Director for the City of Oxford.

BACKGROUND

Granville County has a total area of 537 square miles with Oxford as the county seat. According to Melissa Hodges, it appears the Town of Butner has several factors that could lead to expanded growth, and other factors that may limit growth potential. The Town of Butner recently incorporated and completed its first comprehensive plan for 2020 in order to prepare for the growth that a revived economy will bring. Currently, growth has been slow but steady, with not many homes being built or jobs created. Butner hopes that the opening of the new Central Regional Hospital will attract new residents and jobs. Also, the city is working to attract tenants for an available light industrial space that is a substitute for the overcrowding Research Triangle Park.

2030 POPULATION GROWTH

BASELINE SCENARIO

Population - Baseline Scenario			
	2007	**2030**	**Change**
Granville County	**55,667**	**73,847**	**+ 18,180**
Butner	6,648	13,928	+ 7,280
Oxford	8,641	9,964	+ 1,323
Unincorporated County	40,378	49,955	+ 9,577

As mentioned earlier, Butner has pro and anti-growth factors that will play out over the next 20 years in the town's development.

Pro Growth Factors:

- Located close to I-85 Corridor
- More available land than neighboring Creedmore
- Transfer of Development Rights program currently being discussed
- Great light industrial prospects, similar to RTP
- Rail is utilized, could possibly be used for public transit

Anti Growth Factors:

- Not as developed as Creedmore
- Expansion of Sewer Treatment plant necessary to accommodate more growth, and expansion may be very difficult
- Will be very difficult to get citizens on board with highly dense or multifamily development
- Industrial properties can get truck or rail, but few can get both

Melissa expects that 80% of the Granville County population growth will locate between Butner and Creedmore, with roughly equal weight to each.

In speaking with Cheryl Hart, the City of Oxford is much less likely to receive growth than Butner and Creedmore. This is mostly due to the distance between Oxford and Research Triangle Park. Another major limit on development is the amount of available land within the city limits. Additional land does exist in the Oxford extraterritorial jurisdiction however. Cheryl estimates that there is enough land in the city limits to accommodate an additional 1500 homes. Using the standard 2.3 persons per home, we have put together the following projections.

For the base line scenario, Cheryl expects 7-8% of the population growth in Granville County to locate in Oxford. This amounts to around 1,440 people.

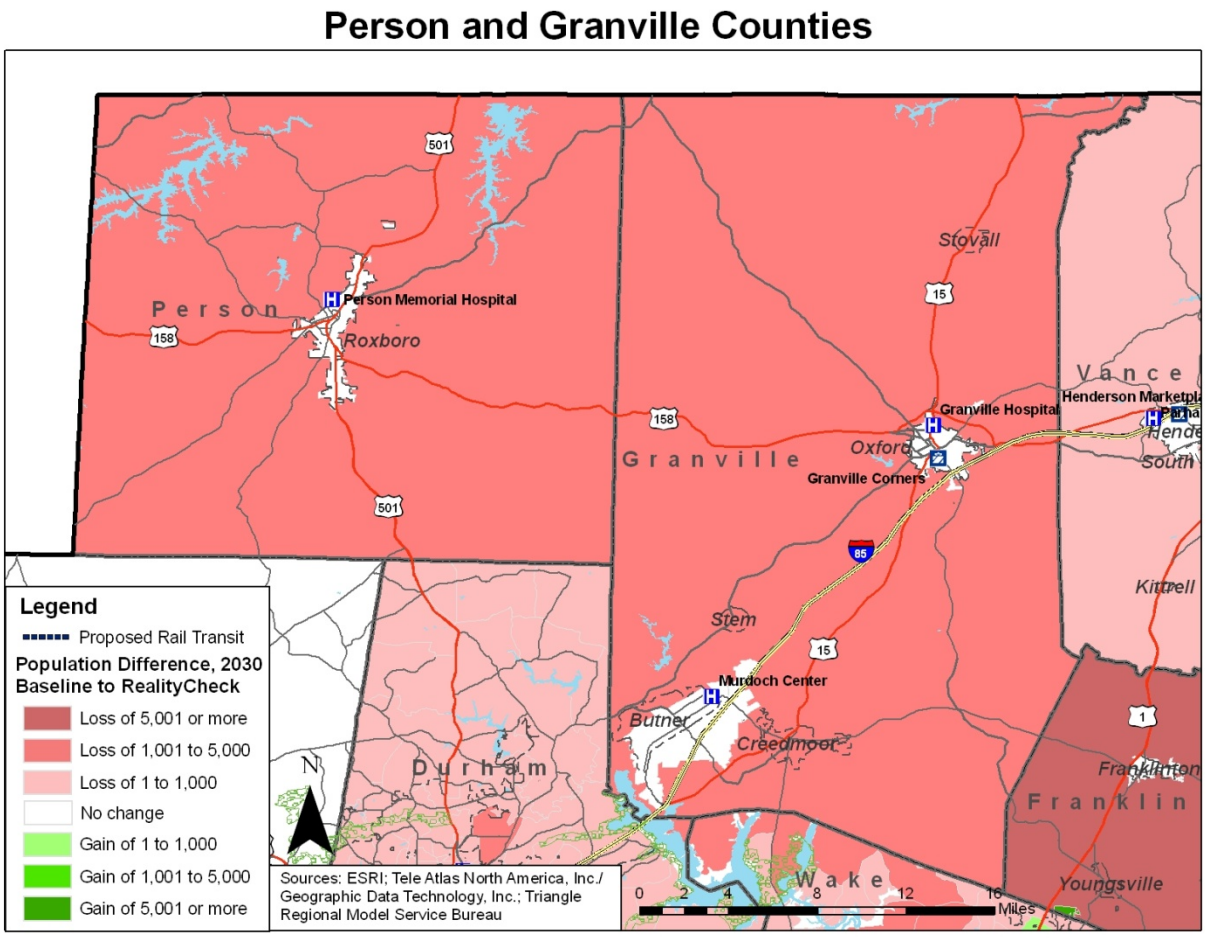
REALITY CHECK SCENARIO

Population –Reality Check Scenario			
	2007	**2030**	**Change**
Granville County	**55,667**	**69,252**	**+ 13,585**
Butner	6,648	13,928	+ 7,280
Oxford	8,641	12,141	+ 3,500
Unincorporated County	40,378	43,183	+ 2,805

Overall, Melissa felt that applying the Reality Check Principles would not have a great effect on growth. Due to the limiting factors on growth including the expense of sewer treatment expansion and citizens being reluctant to support high density or multifamily housing, development in Butner is expected to be very similar under both scenarios.

For the Reality Check scenario, Cheryl believes that Oxford could accommodate more housing under the suggested principles. Again, this number is 1500 homes, which would most likely house around 3,500 people. This is a significant increase compared to the Baseline scenario.

Figure 1.18: Granville County Population Difference 2030 Baseline to Reality Check



2030 EMPLOYMENT GROWTH

BASELINE SCENARIO

Employment–Baseline Scenario			
	2007	**2030**	**Change**
Granville County	**25,475**	**33,046**	**+ 7,571**
Butner	8,916	10,846	+ 1,930
Oxford	2,038	3,552	+ 1,514
Unincorporated County	14,521	18,648	+ 4,127

The same no growth principles will affect future employment growth in Granville County. It is expected that 80% of the employment growth in Granville will also locate between Butner and Creedmore, with roughly equal distribution to each. The range in terms of employment comes from the expectation that Creedmore may be able to handle more jobs than Butner.

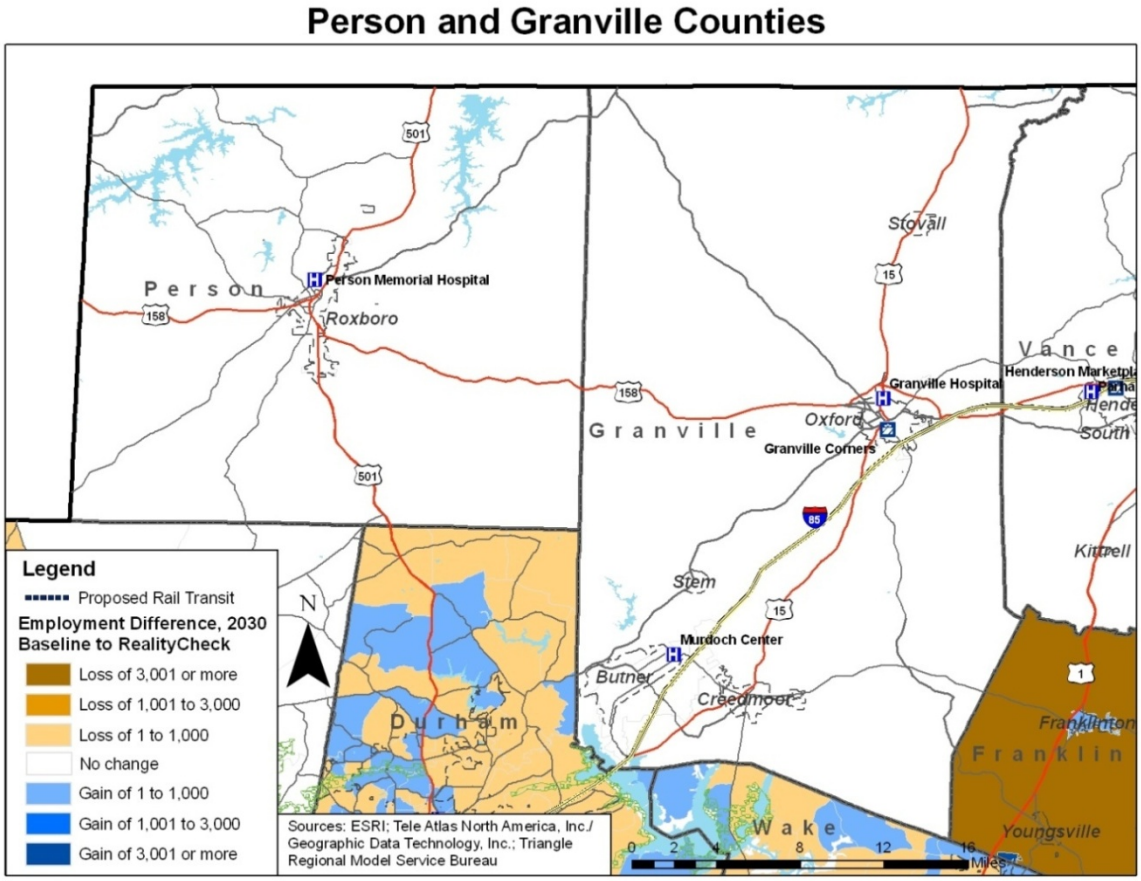
It is also expected that Oxford will receive 20% of the Granville total. Again, this is much less than is expected in Butner and Creedmore, but jobs are more likely to locate in Oxford than in other parts of the county.

REALITY CHECK SCENARIO

Employment–Reality Check Scenario			
	2007	**2030**	**Change**
Granville County	**25,475**	**33,046**	**+ 7,571**
Butner	8,916	10,846	+ 1,930
Oxford	2,038	3,552	+ 1,514
Unincorporated County	14,521	18,648	+ 4,127

For employment however, Cheryl and Melissa, both felt that the Reality Check principles would have little effect. Therefore, there is no change in the projection.

Figure 1.19: Granville County Employment Difference 2030 Baseline to Reality Check



HARNETT COUNTY, NC

The following information is based on interviews with Jay Sikes and Mark Locklear of the Harnett County Planning Department on February 19, 2010.

BACKGROUND

Harnett County, NC, is a predominantly rural and suburban county with a total area of 601 square miles. It includes the cities of Lillington, Angier, Erwin, and Dunn. The county's population as of the 2000 Census was 91,025, but has grown rapidly in recent years. The North Carolina State Office of Management and Budget estimated that Harnett County's population was 106,056 in 2007, a growth of 16.5%. The most rapid growth in the county is occurring in the northern portions proximate to the Wake County border and the southern areas near Fort Bragg and Fayetteville.

Recent growth and development has largely been characterized by the rapid infringement of moderately low-density subdivisions on previously rural land.

Harnett County has been subdivided into seven regions for this analysis. These sub-regions are aggregations of census block groups and/or Transportation Analysis Zones (TAZs) which comprised logical areas based on their recent histories and land use characteristics. The regions of analysis are as follows:

1. "Angier": TAZs in and around Angier
2. "North": TAZs in the northern portion of the county west of Angier
3. "Lillington": Block groups in and around Lillington
4. "Erwin/Dunn": Block groups in and around the cities of Erwin and Dunn
5. "Rural": Block groups west and east of Lillington
6. "Fort Bragg": the cluster of block groups closest to the Cumberland County line
7. "Southern": a belt of block groups between the Fort Bragg, Lillington, and rural areas

2030 POPULATION GROWTH

BASELINE SCENARIO

Population - Baseline Scenario			
	2007	**2030**	**Change**
Harnett County	**106,056**	**158,751**	**+ 52,695**
Angier	10,871	17,049	+ 6,178
Erwin/Dunn	20,132	24,734	+ 4,602
Fort Bragg	15,496	27,217	+ 11,721
Lillington	7,954	10,547	+ 2,593
Northern	6,821	10,697	+ 3,876
Rural	20,086	24,677	+ 4,591
Southern	24,697	43,279	+18,582

The Baseline scenario was calculated based on county-level population data provided by the US Census Bureau. The scenario assumes that future population growth will generally retain the patterns of development that have been observed in recent years by county planning staff. Population growth under this scenario will be diffuse, particularly in the northern and southern sections. This growth scenario is rooted in the application of recent estimated growth trends, calculated by the percentage of overall county growth occurring within particular regions.

Under this scenario, population will increase by 49.7% between 2007 and 2030, adding 52,695 new residents. The pattern of growth under this scenario reflects less regulated growth which would see the continued residential development of more rural regions, with these and other areas serving increasingly as "bedroom" communities for the Wake County and Fayetteville areas.

REALITY CHECK SCENARIO

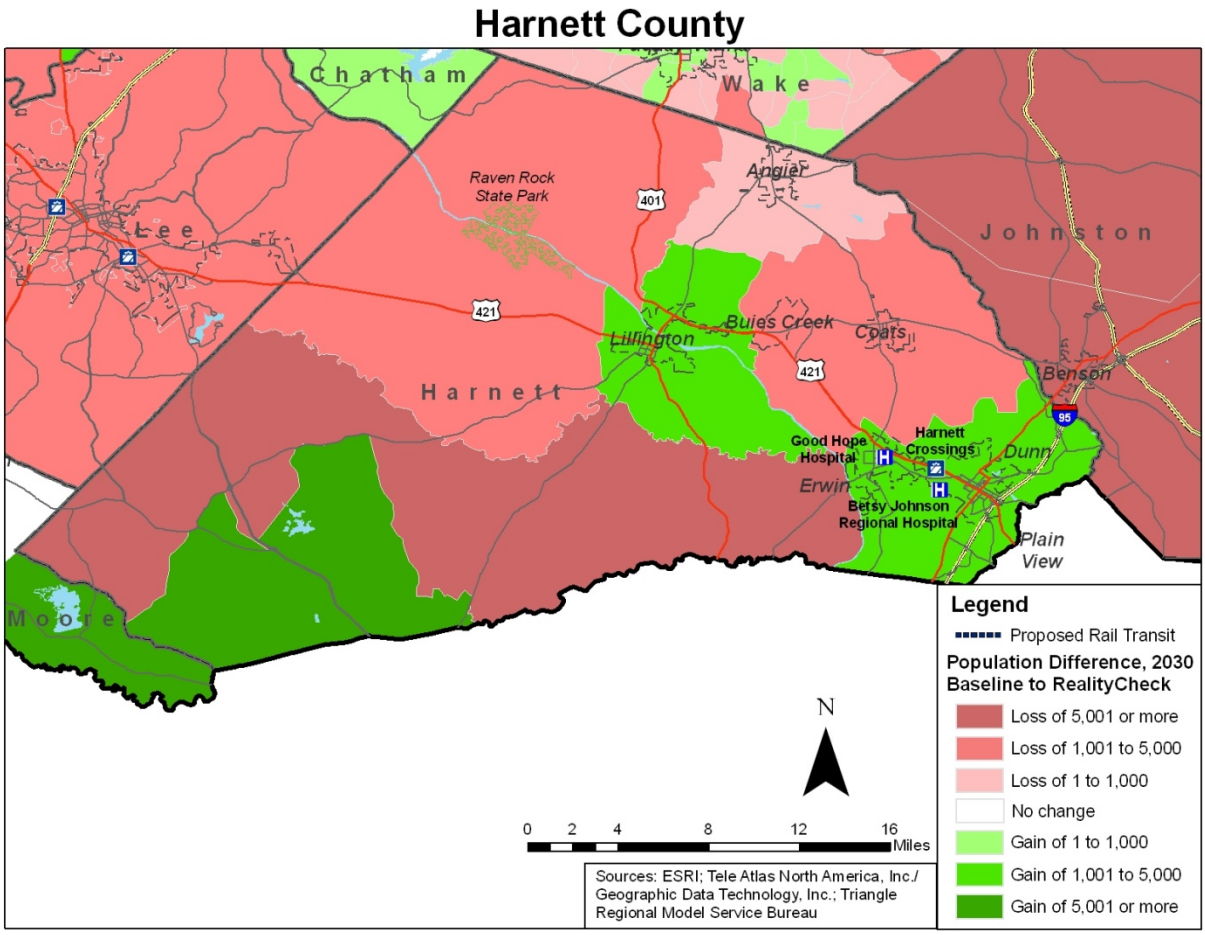
Population - Reality Check Scenario			
	2007	**2030**	**Change**
Harnett County	**106,056**	**155,298**	**+ 49,242**
Angier	10,871	16,682	+ 5,811
Erwin/Dunn	20,132	26,041	+ 5,909
Fort Bragg	15,496	40,118	+ 24,622
Lillington	7,954	12,879	+ 4,925
Northern	6,821	7,806	+ 985
Rural	20,086	23,040	+ 2,954
Southern	24,697	28,732	+ 4,035

The Reality Check scenario was calculated with the primary objective to direct population growth into the Fort Bragg, Angier, and Lillington regions, preserving the rural character of the "Rural," "Southern," and "Northern" regions while protecting the vitality of Erwin and Dunn. This type of development will require targeted investments in infrastructure to accommodate added density.

Very little, if any, of the future planned regional expansions of technologies and service in public transportation will include Harnett County. Most transportation-related investments planned for the county are the construction or expansion of roadways. Therefore, broader geographical areas have been selected in which to concentrate population and employment growth as part of the Reality Check scenario.

Under this scenario, the county will see a 46.4% increase in population with the addition of 49,242 new residents. This scenario considered a "vibrant centers" approach to accommodate additional population through policies which encourage higher density in already urbanized areas, more compact development in greenfield sites, and a reduction in auto-dependency.

Figure 1.20: Harnett County Population Difference 2030 Baseline to Reality Check



2030 EMPLOYMENT GROWTH

BASELINE SCENARIO

Employment - Baseline Scenario			
	2007	**2030**	**Change**
Harnett County	**42,381**	**60,950**	**+ 18,569**
Angier	2,147	5,059	+ 2,912
Erwin/Dunn	9,021	10,393	+ 1,371
Fort Bragg	6,943	11,436	+ 4,493
Lillington	3,564	4,432	+ 868
Northern	639	1,035	+ 396
Rural	9,000	10,369	+ 1,369
Southern	11,067	18,227	+ 7,160

The Baseline scenario assumes that future employment growth will generally retain the pattern that has been observed in recent years by county planning staff. Employment growth under this

scenario will be diffuse, particularly in the northern and southern sections. Algorithmically, this growth scenario is rooted in the application of recent estimated growth trends, calculated by the percentage of overall county growth occurring within particular regions. The employment growth was allocated assuming there would be a comparable ratio of jobs to population as seen in the current distribution.

Under this scenario, the county will see a 43.8% increase in employment. There will be 18,569 new jobs in Harnett County by 2030.

REALITY CHECK SCENARIO

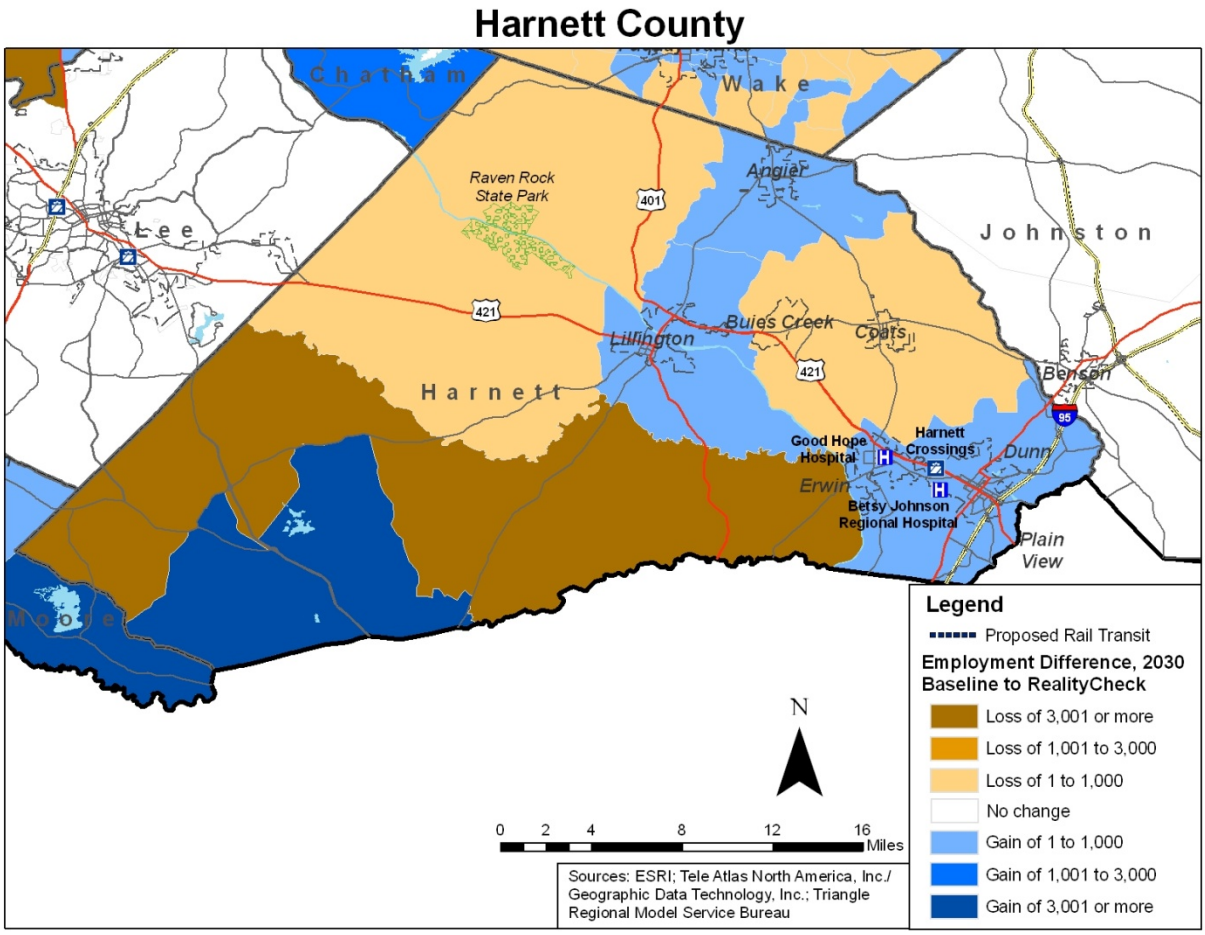
Employment - Reality Check Scenario			
	2007	**2030**	**Change**
Harnett County	**42,381**	**61,559**	**+ 19,178**
Angier	2,147	5,839	+ 3,692
Erwin/Dunn	9,021	10,942	+ 1,921
Fort Bragg	6,943	16,857	+ 9,914
Lillington	3,564	5,412	+ 1, 848
Northern	639	755	+ 116
Rural	9,000	9,681	+ 681
Southern	11,067	12,073	+ 1,006

The Reality Check Scenario was also calculated using a "vibrant centers" policy approach to growth management. This will result in increased densities, reduced automotive commutes, preserved ecologically valuable and sensitive areas, and promoted development in transit-friendly patterns.

Again, because very few of the planned regional expansions in technologies and service in public transportation will include Harnett County; broader geographical areas were selected in which to concentrate employment growth as part of this scenario.

Under this scenario, the county will see a 45.3% increase in employment. Employment centers are projected to be located in the same sub-regions of Angier, Fort Bragg, and Lillington to promote a more viable jobs-housing balance and reduce the number of residents who live in Harnett County but commute to neighboring counties for work.

Figure 1.21: Harnett County Employment Difference 2030 Baseline to Reality Check



JOHNSTON COUNTY, NC

The following information is based on interviews with Kevin Sigmond, Planner, Johnston County Planning and Zoning, February 11, 2010.

BACKGROUND

Johnston County has an area of 792 square miles, and is bordered by Wake, Harnett, Sampson, Wayne, Wilson and Nash Counties. A fairly rural county, Johnston's population was 157,296 in 2007. The major incorporated areas include Clayton, Smithfield, and Selma, at 12,908, 12,821, and 7,168 respectively. Clayton is the closest to Wake County and Raleigh. Johnston County is bisected by two highways that shape past and future growth patterns, I 95 from the NW to the SE, and Route 70 from the NE to the SW. The second major influence on future growth is the presence of the city of Raleigh to the NE.

2030 POPULATION GROWTH

BASELINE SCENARIO

Population - Baseline Scenario			
	2007	**2030**	**Change**
Johnston County	**157,296**	**283,401**	**+ 126,105**
TAZ's bordering Wake Co., including Clayton	81,468	168,130	+ 86,662
Smithfield	12,821	22,212	+ 9,391
Selma	7,168	11,864	+ 4,696
Remainder of the county	55,839	81,195	+ 25,356

The Baseline population growth was calculated by examining the data used in the Reality Check exercise and adapting it to local conditions based on planner's knowledge of the area.

The largest city, Clayton, is expected to grow at a faster rate than the county as a whole. Smithfield, on the other hand, will have growth at a slower rate than the rest of the county. Selma will grow quite slowly, due to political obstacles and ingrained perceptions that will be a challenge to overcome. Johnston County Planner Kevin Sigmond agreed that the rest of the county could be treated as one area with somewhat uniform growth, except for the northeastern county border with Raleigh, which should experience growth similar to Clayton.

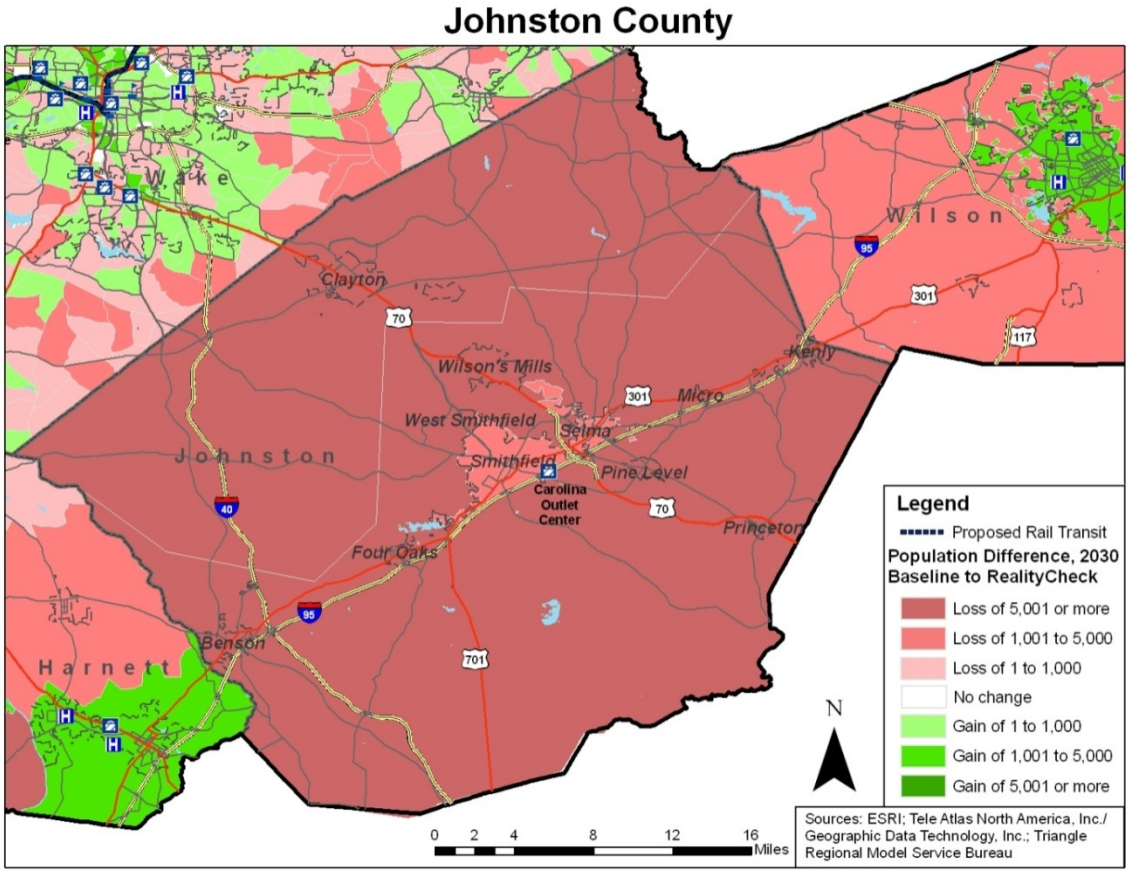
REALITY CHECK SCENARIO

Population - Reality Check Scenario			
	2007	**2030**	**Change**
Johnston County	**157,296**	**238,458**	**+ 81,162**
TAZ's bordering Wake Co., including Clayton	81,468	137,244	+ 55,776
Smithfield	12,821	18,865	+ 6,044
Selma	7,168	10,191	+ 3,023
Remainder of the county	55,839	72,158	+ 16,319

The Reality Check scenario for population growth was initially the same as the Baseline scenario. When asked about his views on a potential Reality Check scenario, Mr. Sigmond was familiar with the initiative. He sensed that growth in his county would not differ significantly from business as usual. As for the influence of transit, Mr. Sigmond's view was that any future growth would be in these areas, with or without the addition of commuter rail. Any bus systems in the county would probably not be viable before 2030, due to the low density in the county. He did not think that the county would lose population. Mr. Sigmond ascribes most of the growth in population to transplants, from areas such as New Jersey, Phoenix, and so forth, who are attracted to the relatively lower housing values and high quality of life, and this would be expected to continue regardless.

Reassessing the conditions of the area as envisioned with Reality Check principles, commuting patterns and commuting lengths led to a calculation that about 45,000 people would shift to Wake County that were expected to originally locate in Johnston County under the Baseline scenario. It is assumed that policies such as protection of farmland, incentives to locate closer to work, and an improved quality of life due to proactive planning in Wake County might promote the location of growth in its urban centers.

Figure 1.22: Johnston County Population Difference 2030 Baseline to Reality Check



2030 EMPLOYMENT GROWTH

BASELINE SCENARIO

Employment - Baseline Scenario			
	2007	**2030**	**Change**
Johnston County	**69,750**	**108,130**	**+ 38,248**
TAZ's bordering Wake Co., including Clayton	16,552	43,326	+ 26,774
Smithfield	8,995	11,727	+ 2,732
Selma	5,029	6,395	+ 1,366
Remainder of the county	39,174	46,551	+ 7,376

Employment projections in the Baseline scenario were created by Woods and Poole's 2008 "Complete Database," from the sub-file "Economic Database". The fact that the employment projections were much lower than the population projections was not surprising. Much of the job growth occurs in Raleigh and elsewhere in the region. At the same time, job growth is growing

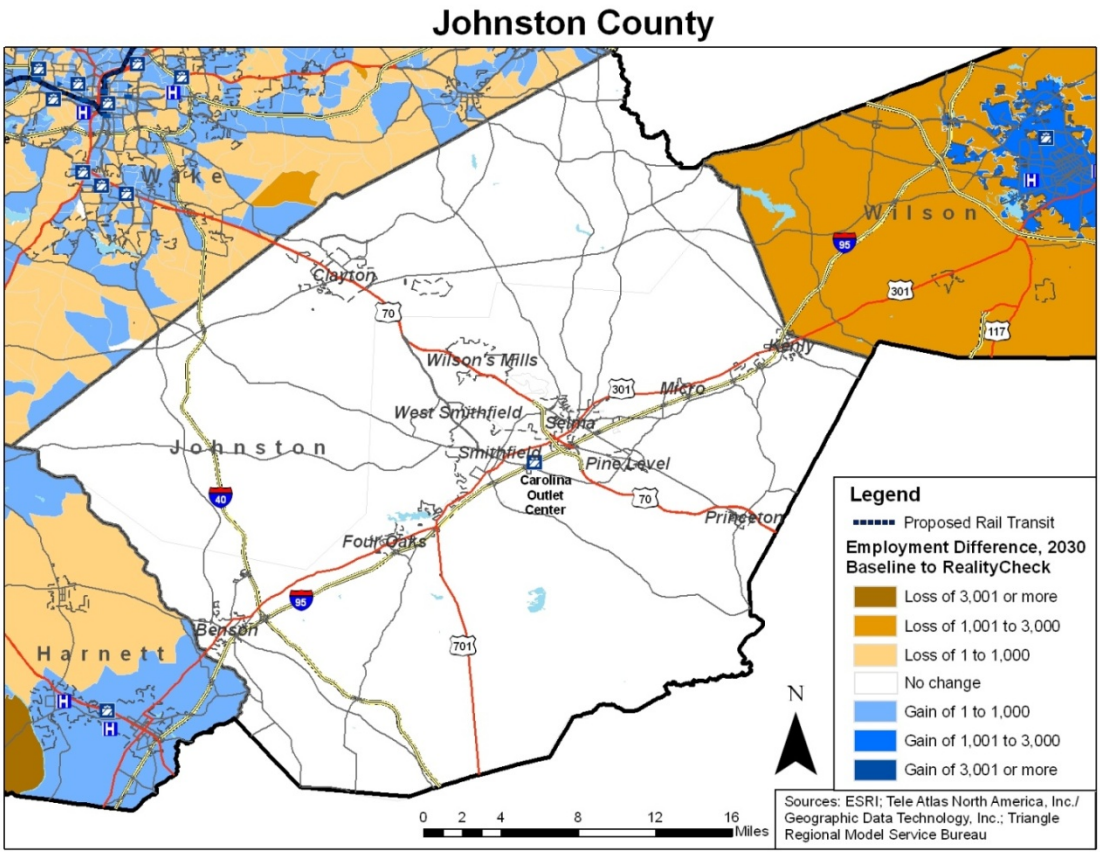
disproportionately faster than population, leading to some evening out of the jobs/housing imbalance. Job growth in the county would generally follow the population growth patterns, with the highest growth in Clayton, Smithfield, and along the MPO areas on the border with Wake County.

REALITY CHECK SCENARIO

Employment - Reality Check Scenario			
	2007	**2030**	**Change**
Johnston County	**69,750**	**108,130**	**+ 38,248**
TAZ's bordering Wake Co., including Clayton	16,552	43,326	+ 26,774
Smithfield	8,995	11,727	+ 2,732
Selma	5,029	6,395	+ 1,366
Remainder of the county	39,174	46,551	+ 7,376

Once again, according to Mr. Sigmond, job growth and the location of job growth were expected to remain the same under Baseline or Reality Check Scenarios.

Figure 1.23: Johnston County Employment Difference 2030 Baseline to Reality Check



LEE COUNTY, NC

Information and estimations below are based on interviews with Robert L. Bridwell, Director of the Planning and Community Development Department, which serves the City of Sanford, Town of Broadway and Lee County, and Don Kovasckitz, Lee County Strategic Services Director. As well as information from the Lee County Economic Development website and Reality Check documents and meetings.

BACKGROUND

Lee County encompasses 259 square miles. In 2007, Lee County had a population of 56,376, and 35,977 jobs. It lies in the southwest part of the Triangle. In 2007, Lee County had only 2.7% of the total population of the 15-county Triangle region.

The City of Sanford is the county seat and the largest populated area. The other notable populated area in Lee County is the Town of Broadway. There are three counties adjacent to Lee County: Chatham to the north, Harnett to the southeast, and Moore to the southwest. Chatham County separates Lee from the three major counties in the Reality Check region of Wake, Durham and Orange.

There are three major roads running through Lee County. US Highway 1 runs north-south through the county, connecting to Cary, Raleigh, Wake County, and Interstate 40 to the north and Southern Pines in Moore County to the south. US Highway 15-501 also crosses Lee County north to south (running concurrent with US 1 through Sanford), connecting to Pittsboro, Chapel Hill and Durham to the north and Moore County to the south. The east-west thoroughfare is US Highway 421, which travels west to Siler City in Chatham County, and east to Harnett County.

The growth scenarios were set up simply with two regions, the Town of Sanford and the rest of Lee County. This was mainly due to the lack of data attributed to smaller geographies such as TAZs, but also because smaller, manually-defined, regions in the county would have very minimal effects to discuss. Data provided by Don Kovasckitz from Lee County Strategic Services indicates areas capable of handling significant growth along the main highway corridors, particularly along US 1 from the northern edge of Sanford to the Chatham County line.

2030 POPULATION GROWTH

BASELINE SCENARIO

Population – Baseline Scenario			
	2007	**2030**	**Change**
Lee County	**56,376**	**81,419**	**+25,043**
City of Sanford	29,284	42,294	+13,010
Remainder of Lee County	27,092	39,125	+12,033

Some of the population data for the 2030 Baseline scenario was obtained from the Reality Check organizers and the US Census Bureau's American Community Survey. This data provided numbers for 2007 at both the county and Sanford levels, but the 2030 projection was only the total for the

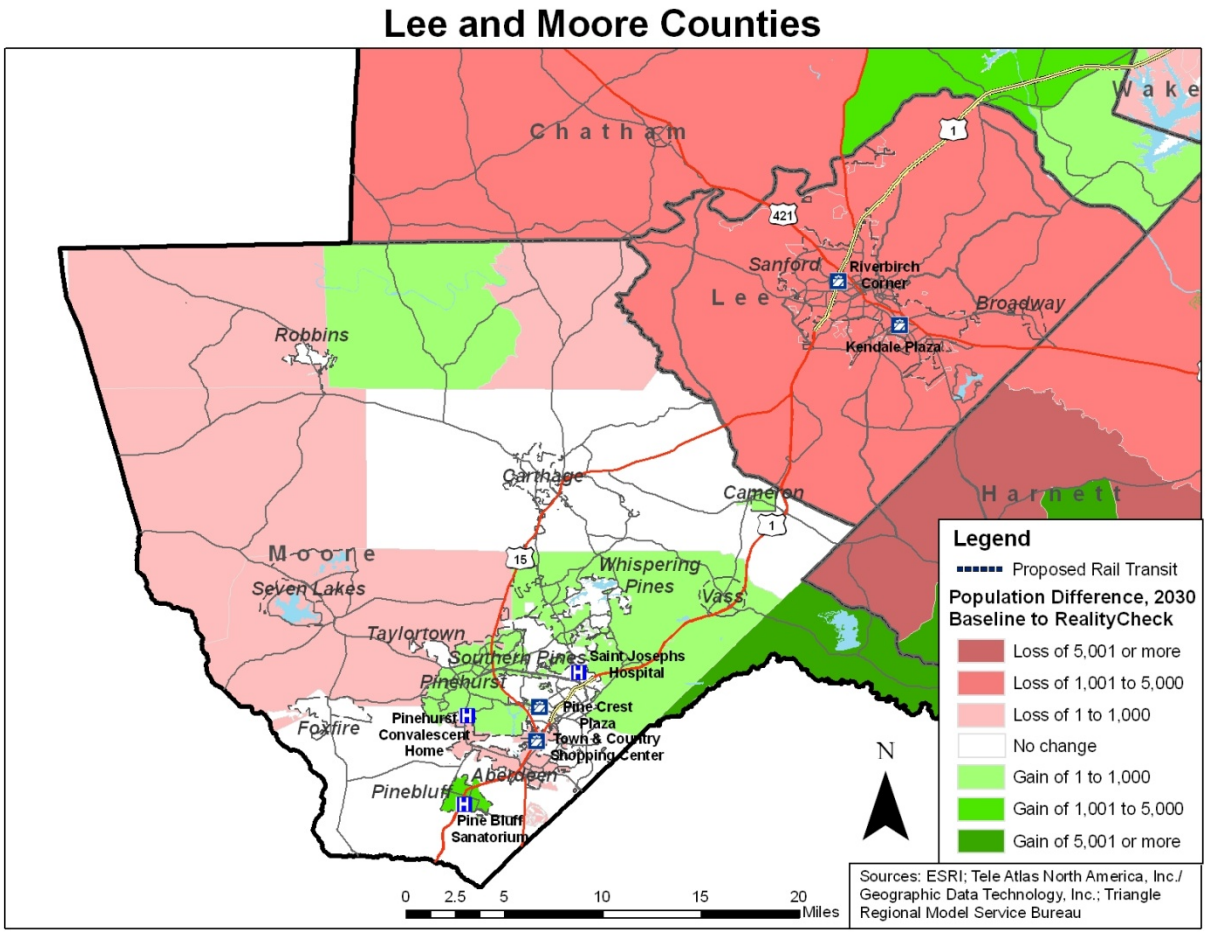
entire county. To estimate the population of Sanford from this projection, the proportion of total county residents that lived in the City of Sanford was applied to the total 2030 estimate. The ratio of Sanford residents to Lee County residents (the portion of the county less the City of Sanford) in 2007 was 1.081; this same ratio was used to determine the city's share of residents from the Total County residents provided.

REALITY CHECK SCENARIO

Population –Reality Check Scenario			
	2007	**2030**	**Change**
Lee County	**56,376**	**75,391**	**+19,015**
City of Sanford	29,284	40,179	+10,895
Remainder of Lee County	27,092	35,212	+8,120

Under the assumption of a growth scenario with the principles of Reality Check, a slight modification was made to the 2030 baseline population projection to create the 2030 Reality Check scenario. Ten percent and five percent reductions were taken from Lee County and Sanford respectively to indicate slight changes in population distribution in the Reality Check region. This assumption was made following Reality Check principles that some people who would reside in Lee County and Sanford under baseline circumstances would choose to live in the more urbanized Wake, Orange or Durham Counties. However, flight to the urban areas is small because people choosing to locate in Lee County do so primarily for its rural character.

Figure 1.24: Lee County Population Difference 2030 Baseline to Reality Check



2030 EMPLOYMENT GROWTH

BASELINE SCENARIO

Employment – Baseline Scenario			
	2007	**2030**	**Change**
Lee County	**35,977**	**50,524**	**+14,547**
City of Sanford	18,688	26,246	+7,558
Remainder of Lee County	17,289	24,278	+6,989

Employment data for 2007 and projections for 2030 were obtained from Woods & Poole Economics, and are the same numbers used by Reality Check. As with the population estimates, the employment data collected was for the total county. To approximate the distribution of employment in the two different geographies, the same ratio of Sanford/Lee County from the population data was used. There are not a significant number of Lee County residents commuting

to work in other counties in the Reality Check region, and this is not expected to change in the future.

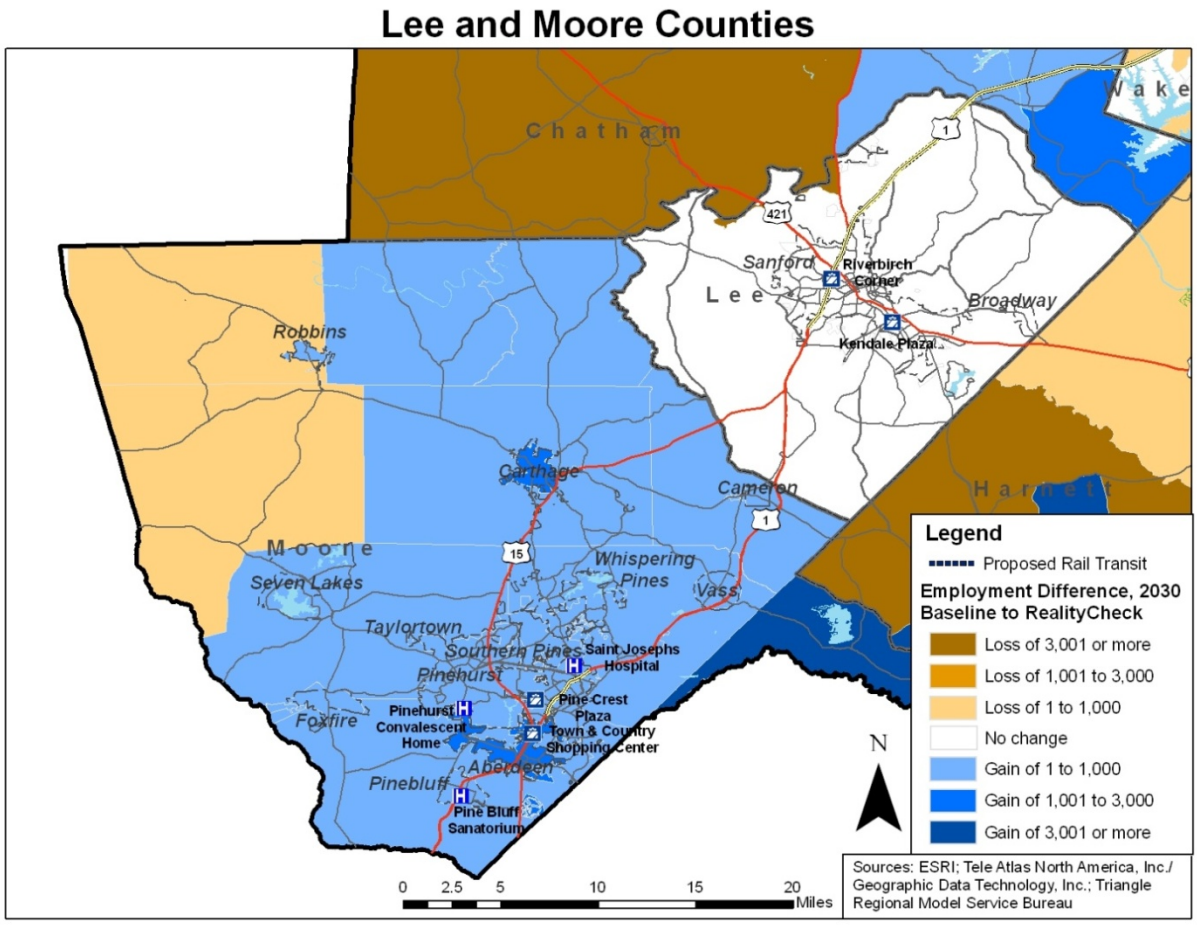
REALITY CHECK SCENARIO

Employment – Reality Check Scenario			
	2007	**2030**	**Change**
Lee County	**35,977**	**50,524**	**+14,547**
City of Sanford	18,688	26,246	+7,558
Remainder of Lee County	17,289	24,278	+6,989

It is expected that the implementation of Reality Check principles into the Triangle region will have very little effect on the distribution of employment throughout Lee County. This is because the largest employers in the county are all either local entities such as government and schools, or major employers located in the Lee County Industrial Park; these major employers seem stable and well-established.

Lee County and Sanford are willing and able to accommodate growth. There are many economic incentives for businesses to locate in the area and the industrial park is home to several big name companies such as Caterpillar and Pfizer. Even under the Reality Check scenario, it is expected that Lee County will retain these major employers and also the projected growth in employment.

Figure 1.25: Lee County Employment Difference 2030 Baseline to Reality Check



MOORE COUNTY, NC

This information is based on an interview with Jeremy Rust and Robert Farrell of the Moore County Planning Department on February 12, 2010.

BACKGROUND

Moore County is located at the southeastern edge of the Piedmont. As of 2005 its population was 83,332. It is located adjacent to Cumberland, Harnett, Lee, Chatham, Randolph, Montgomery, Richmond, Hoke, and Scotland Counties.

Moore County contains ten incorporated municipalities. Listed in order of highest to lowest population they are: Southern Pines, Pinehurst, Aberdeen, Whispering Pines, Carthage, Foxfire, Robbins, Pinebluff, Taylortown, Vass and Cameron. There are also a few small communities within the county that are not incorporated. Because our data did not include specific numbers for them, they have been included in the township in which they are located.

Moore County is roughly split into a northern agrarian section and a southern urbanizing area. This is primarily due to the soils in the county. To the north is dense clay soils of the Piedmont, and to the south are sandy soils of the Coastal region. The sandy soils are better for percolation and septic systems than the clay soils of the northern half. This has tended to encourage development in the south, while the northern half has stayed primarily agriculturally based. This trend is expected to continue into the foreseeable future.

According to the county's planning department, the possibility of denser development is limited. This is partly due to the prevalence of septic systems throughout the county as well as the desire to preserve the rural character of the county. The rapid development of the county is primarily driven by retirees wanting to move to the country, which will limit dense development. Also the county is well known for its large number of golf courses and equestrian facilities, which will reinforce the type of large lot rural development currently occurring. The Department of Environment and Natural Resources also places severe limitations on the amount of dense development possible in the county, further restricting this possibility.

2030 POPULATION GROWTH

BASELINE SCENARIO

Population Growth - Baseline Scenario			
	2005	**2030**	**Change**
Moore County	**83,332**	**156,426**	**+ 73,094**
Aberdeen	3,788	4,662	+ 874
Cameron	168	357	+ 189
Carthage	2,084	3,029	+ 945
Foxfire	1,748	3,533	+ 1,785
Pinebluff	1,235	1,521	+ 286
Pinehurst	10,814	37,906	+ 27,092
Robbins	1,331	1,299	-32
Southern Pines	12,165	16,531	+ 4,366
Taylortown	941	3,340	+ 2,399
Vass	835	1,154	+ 319
Whispering Pines Township	2,328	3,126	+ 888
Bensalem Township	3,795	4,798	+ 1,003
Carthage Township	5,010	7,272	+ 2,262
Deep River Township	364	348	-16
Greenwood Township	4,092	7,950	+ 3,858
Little River Township	3,664	14,490	+ 10,826
McNeill Township	3,529	8,159	+ 4,630
Mineral Springs Township	9,861	19,325	+ 9,464
Ritter Township	2,988	4,086	+ 1,098
Sand Hills Township	6,891	8,853	+ 1,962
Sheffield Township	5,701	4,597	-1,104

The Baseline scenario was calculated based on growth trends since 1970. The Triangle Area Regional Planning Organization (TARPO) used census data to determine these growth trends and created the projected growth rate by assuming that growth would remain constant over the next twenty years. Under this scenario, population will increase by 87.7% between 2007 and 2030, adding 73,094 new residents.

Development in the county is expected to occur primarily along three growth corridors: along US 1, Lobelia Road and US 211. These three corridors connect Moore County to Raleigh, Fayetteville and Charlotte respectively, and provide the major transit routes between these cities and Moore County.

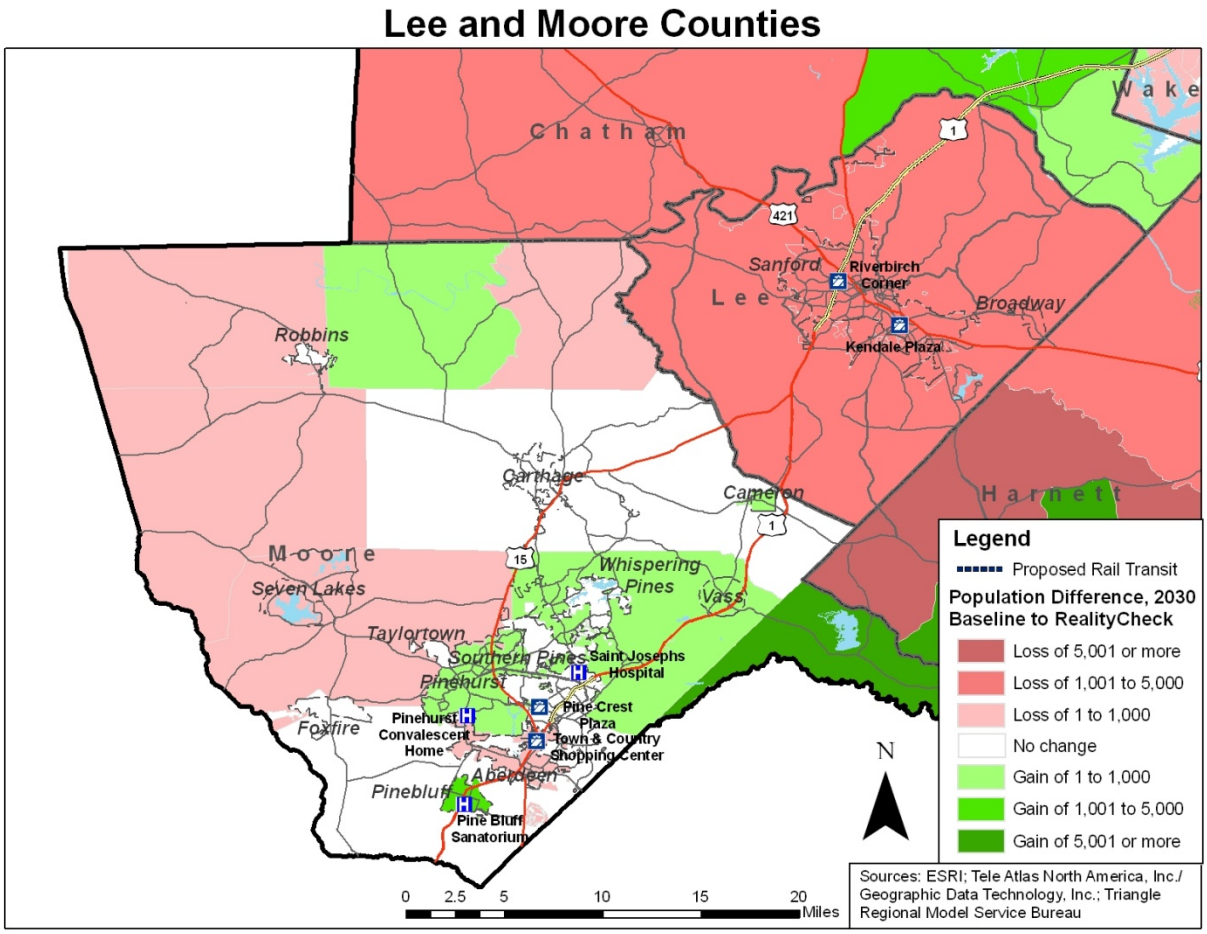
REALITY CHECK SCENARIO

Population - Reality Check Scenario			
	2005	**2030**	**Change**
Moore County	**83,332**	**169,129**	**+ 85,797**
Aberdeen	3,788	4,583	+ 795
Cameron	168	643	+ 475
Carthage	2,084	3,029	+ 945
Foxfire	1,748	3,533	+ 1,785
Pinebluff	1,235	2,730	+ 1,495
Pinehurst	10,814	38,012	+ 27,198
Robbins	1,331	1,299	-32
Southern Pines	12,165	16,531	+ 4,366
Taylortown	941	3,340	+ 2,399
Vass	835	1,236	+ 401
Whispering Pines Township	2,328	3,216	+ 888
Bensalem Township	3,795	4,682	+ 887
Carthage Township	5,010	7,272	+ 2,262
Deep River Township	364	343	-21
Greenwood Township	4,092	7,950	+ 3,858
Little River Township	3,664	25,369	+ 21,705
McNeill Township	3,529	8,263	+ 4,734
Mineral Springs Township	9,861	19,225	+ 9,364
Ritter Township	2,988	4,588	+ 1,600
Sand Hills Township	6,891	8,853	+ 1,962
Sheffield Township	5,701	4,432	-1,269

The Reality Check scenario was calculated using TARPO's projections for a growth scenario. These projections are based on growth changes since 1980. These changes were measured using Census data and a percent change was developed, which was then applied to the 2000 Census data to determine the projected growth through 2030. Under this scenario, the county will see a 103% increase in population.

For the denser Reality Check scenario, development was funneled along the three previously mentioned corridors when possible. The numbers used were primarily based on the desire to increase density while providing a viable scenario that took both the rural nature of the county and its geology into consideration. To this end, growth in several of the northern portions of the county decreased, while growth in the more southern portions increased.

Figure 1.26: Moore County Population Difference 2030 Baseline to Reality Check



2030 EMPLOYMENT GROWTH

BASELINE SCENARIO

Employment - Baseline Scenario			
	2005	**2030**	**Change**
Moore County	**43,390**	**78,775**	**+ 35,385**
Aberdeen	1,932	1,378	-554
Cameron	86	182	+ 96
Carthage	1,062	1,544	+ 482
Foxfire	892	1,802	+ 910
Pinebluff	629	775	+ 146
Pinehurst	5,515	19,332	+ 13,817
Robbins	678	663	-15
Southern Pines	6,204	8,431	+ 2,227
Taylortown	479	1,703	+ 1,224
Vass	425	588	+ 163
Whispering Pines Township	1,187	1,640	+ 453
Bensalem Township	1,935	2,447	+ 512
Carthage Township	2,555	3,709	+ 1,154
Deep River Township	185	177	-8
Greenwood Township	2,986	4,054	+ 1,068
Little River Township	1,868	7,390	+ 5,522
McNeill Township	1,799	4,161	+ 2,362
Mineral Springs Township	5,029	9,856	+ 4,827
Ritter Township	1,523	2,084	+ 561
Sand Hills Township	3,514	4,515	+ 1,001
Sheffield Township	2,907	2,344	-563

Employment projections were not included in the data received from TARPO so a proxy had to be created. In order to do this, the average number of per capita jobs in Wake County was used to multiply by the total population. This multiplier was determined to be .52. Under this scenario, the county will see an 82% increase in employment.

The largest increases in terms of percentage are projected to occur in Taylortown, Pinehurst, Little River Township, and McNeill Township. In absolute numbers, the largest increases will occur in Pinehurst, Southern Pines, McNeill Township, Mineral Springs Township and Little River Township.

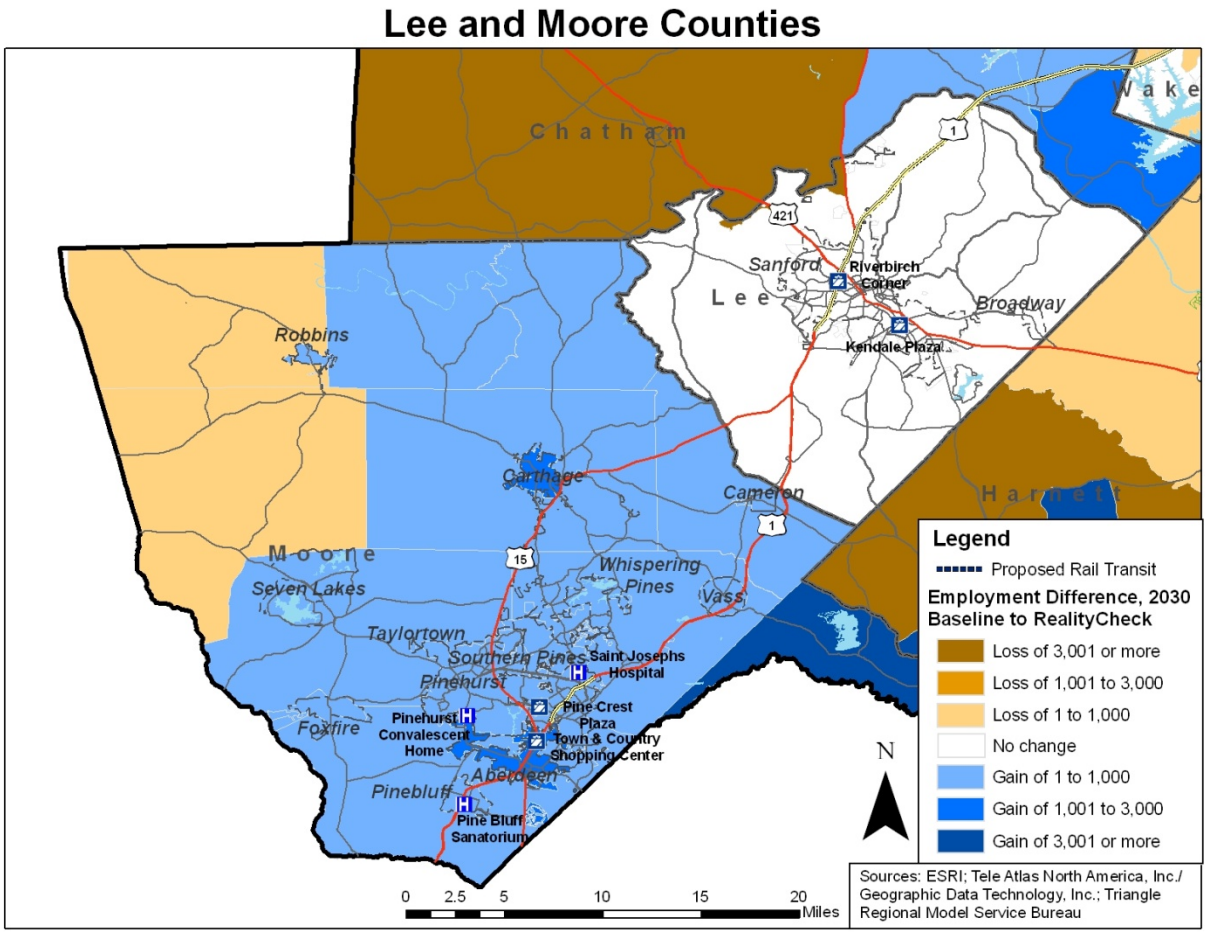
REALITY CHECK SCENARIO

Employment – Reality Check Scenario			
	2005	**2030**	**Change**
Moore County	**42,499**	**88,940**	**+ 46,441**
Aberdeen	1,932	2,382	+ 450
Cameron	86	334	+ 248
Carthage	1,063	2,575	+ 1,512
Foxfire	891	1,837	+ 946
Pinebluff	630	1,419	+ 789
Pinehurst	5,515	19,766	+ 14,251
Robbins	679	675	-4
Southern Pines	6,204	8,596	+ 2,392
Taylortown	480	1,736	+ 1,256
Vass	426	643	+ 217
Whispering Pines Township	1,187	1,672	+ 485
Bensalem Township	1,935	2,434	+ 499
Carthage Township	2,555	3,781	+ 1,226
Deep River Township	186	178	-8
Greenwood Township	2,087	4,134	+ 2,047
Little River Township	1,869	13,192	+ 11,323
McNeill Township	1,800	4,296	+ 2,496
Mineral Springs Township	5,029	9,997	+ 4,968
Ritter Township	1,524	2,386	+ 862
Sand Hills Township	3,514	4,603	+ 1,089
Sheffield Township	2,908	2,304	-604

Employment projections were not included in the data received from TARPO so a proxy had to be created. In order to do this, the average number of per capita jobs in Wake County was used to multiply by the total population. This multiplier was determined to be .52. The county jobs will increase by 109% in this scenario.

Largest increases in terms of percentage are projected to occur in Cameron, Pinehurst, Taylortown, and Little River Township. In absolute numbers, the largest increases will be in Pinehurst, Southern Pines, Greenwood Township, Little River Township, McNeill Township and Mineral Springs Township.

Figure 1.27: Moore County Employment Difference 2030 Baseline to Reality Check



PERSON COUNTY, NC

The following information is based on an interview held on March 2nd, 2010 with Julie Kelly, Roxboro Planner.

BACKGROUND

Person County is part of the Durham-Chapel Hill Metropolitan Area. The county seat is Roxboro. The county has a total area of 404 square miles.

2030 POPULATION GROWTH

BASELINE SCENARIO

Population - Baseline Scenario			
	2007	**2030**	**Change**
Person County	**37,640**	**43,782**	**+ 6,142**
Roxboro	8,672	9,286	+ 614
Unincorporated County	28,968	34,496	+ 5,528

In speaking with Julie, it appears that currently no population growth is expected in Roxboro. Julie called the growth in Roxboro "pathetic" In term of percentages, Roxboro's population is currently growing at less than 1% per year.

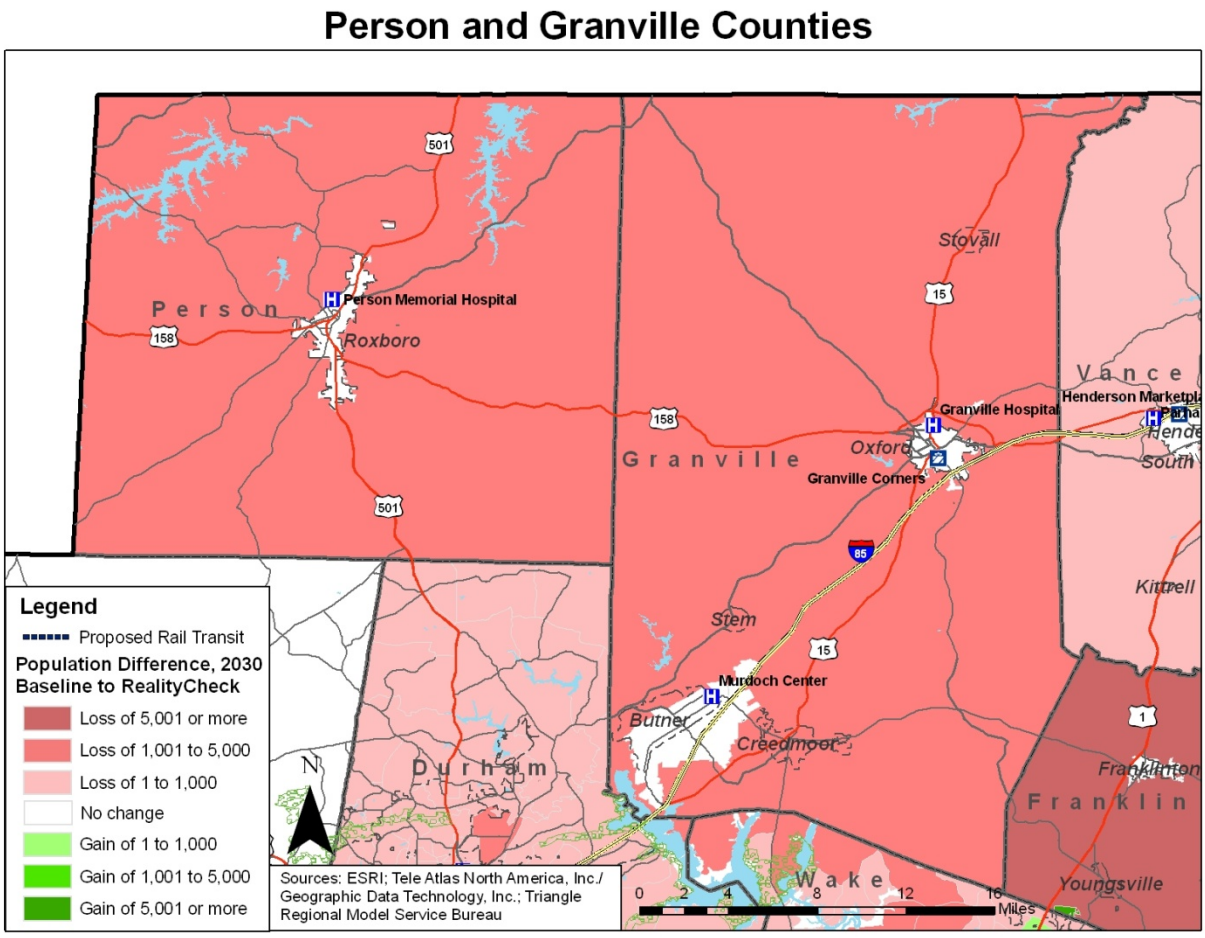
Due to the lack of growth, Julie was very pessimistic in her prediction for the 2030 population figure. Without really explaining her reasoning other than current trends, she predicts that Roxboro will only receive 614 of the predicted increase.

REALITY CHECK SCENARIO

Population –Reality Check Scenario			
	2007	**2030**	**Change**
Person County	**37,640**	**43,782**	**+ 6,142**
Roxboro	8,672	9,286	+ 614
Unincorporated County	28,968	32,576	+ 3,608

In terms of Reality Check, Roxboro has already adopted the guiding principles of vibrant centers, transit corridors, and open space preservation. Julie mentioned that the density provisions are currently being used and that mixed-use zoning is allowed. Furthermore, taxis and the Person Area Transit System are currently in operation. Green space has also been allocated in the Roxboro Land Use Plan. Due to these factors, the Baseline and Reality Check scenario are projected to have identical population growth.

Figure 1.28: Person County Population Difference 2030 Baseline to Reality Check



2030 EMPLOYMENT GROWTH

BASELINE SCENARIO

Employment– Baseline Scenario			
	2007	**2030**	**Change**
Person County	**15,696**	**20,371**	**+ 4,675**
Roxboro	6,035	8,101	+ 2,066
Unincorporated County	9,661	12,270	+ 2,609

Julie projected that there would also be no employment growth in Roxboro. She said that the lack of new jobs "is killing us." Julie refused to offer a prediction for employment. Instead the Person County Economic Development and Person County Chamber of Commerce were contacted. Ultimately, these parties also proved to be unhelpful and the employment growth was estimated as best as possible.

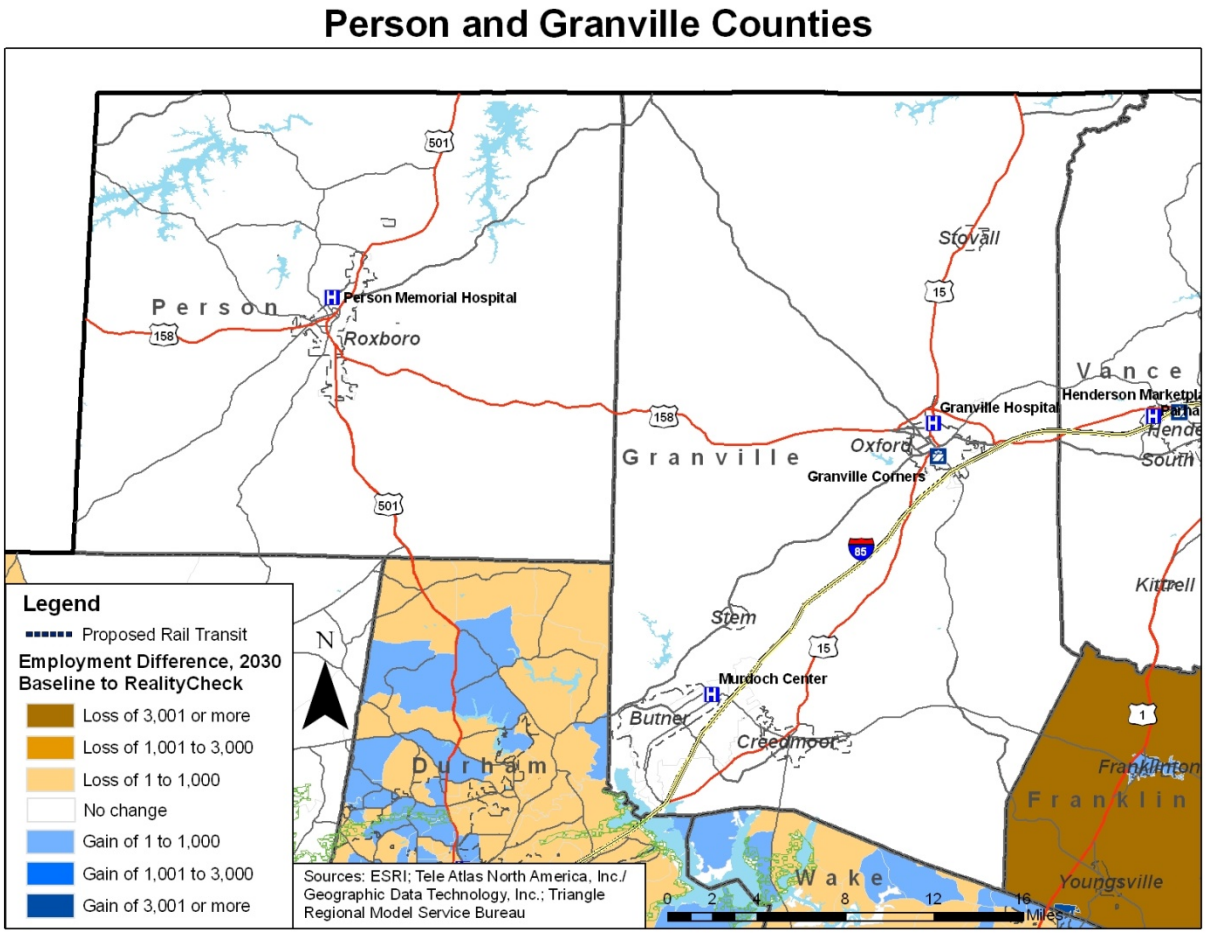
City-data.com was used as the information source for employment data. The total persons employed who work and live in Roxboro were used and these numbers were added to create the increase in daytime population to generate a number of 6,035 for the number of jobs in Roxboro.

REALITY CHECK SCENARIO

Employment– Baseline Scenario			
	2007	**2030**	**Change**
Person County	**15,696**	**20,371**	**+ 4,675**
Roxboro	6,035	8,101	+ 2,066
Unincorporated County	9,661	12,270	+ 2,609

For the Reality Check scenario, the 6,035 number was taken as a percentage of total jobs in Person County. That percentage of the total was maintained to project the growth in the year 2030. In other words, the percentage of total Person County employment located in Roxboro is the same now as it will be in 2030.

Figure 1.29: Person County Employment Difference 2030 Baseline to Reality Check



VANCE COUNTY, NC

This information is based on an interview with Jordan McMillen, Vance County Planning Services Manager on February 11, 2010 and City of Henderson's 2030 Comprehensive Plan Draft

BACKGROUND

Vance County's basic geographical and jurisdictional divide is between the City of Henderson and the remaining rural portion of the county. In 2007, roughly 37% of Vance County's 43,583 residents lived in Henderson. Henderson is the hub of economic and social activity for the county and occupies a place on key transportation routes in the region. Per the City of Henderson's 2030 Comprehensive Plan Draft:

> Henderson is located in the heart of Vance County, which is a rural county with incorporated places. With an estimated 16,315 residents in 2007, Henderson is the largest city in the county and the only one with a population over 5,000. Both Kittrell and Middleburg [the other incorporated areas] had populations less than 200 residents. Vance County is situated in the north-central part of North Carolina. It is bordered to the north by the Virginia state line and to the east by Warren County, the south by Franklin County, and the west by west by Granville County in North Carolina…
>
> Henderson's location along major transportation corridors makes the city accessible to many major urban centers in the region. Interstate 85 is the major east-west corridor that links Henderson to the cities of Durham approximately 41 miles to southwest and Richmond, Virginia approximately 100 miles northeast. US Highway 1 (Capital Boulevard) is a north-south corridor that connects Henderson to the state capital of Raleigh, the Research Triangle Park (RTP), and the Raleigh-Durham (RDU) International Airport 42 miles south…

While Henderson is the county's hub, its absolute primacy has slipped slightly as the rest of the county and the region has developed and textile jobs have left the city. In 1970, Henderson made up 42% of the county population. While still growing in population from 13,740 in 1970 to 16,315 in 2007, as noted earlier, Henderson made up 37% of the county's population in 2007. Areas growing in population and as a percentage of county total population include the area around Kerr Lake on the Virginia border and along the US Highway 1 corridor south of Henderson toward Raleigh.

2030 POPULATION GROWTH

BASELINE SCENARIO

Population - Baseline Scenario			
	2007	**2030**	**Change**
Vance County	**43,583**	**45,587**	**+ 2,004**
Henderson	16,126	17,227	+ 1,403
Rest of County	27,457	28,539	+ 601

This estimate of Henderson population was calculated by multiplying the Reality Check/InfoUSA Estimate by the City of Henderson's Comprehensive Plan's estimate of the proportion of the county population in Henderson. It will not match the population estimates given either in the City of Henderson Comprehensive Plan or the North Carolina Office of State Budget and Management (NC OSBM). The estimate of "Rest of the County" population was calculated by subtracting the estimated Henderson population above from the Reality Check/InfoUSA total county projection.

Various population estimates and projections are readily available for Vance County. NC OSBM projects a population growth of 694 between 2007 and 2030. It is not readily apparent what serves as the basis for this projection. The City of Henderson's 2030 Comprehensive Plan, based on historical growth trends and information provided by state agencies, projects a county population growth of 6,274 over the same time period. Mr. McMillen did not find this number to be very credible based on a decade of no or very little net-growth during the "boom times" of the 2000s. Furthermore, those historic trends were based on Henderson as a population-drawing textile mill town. As the mills have closed, that population pulling power has declined. Mr. McMillen found the middle-road growth projection provided by the Reality Check/InfoUSA as the most credible based on what he sees. For the purposes of this exercise, the Reality Check/InfoUSA projections have been adopted and other estimates or projections are provided purely as additional data points for subsequent researchers.

Mr. McMillen sees three major areas of the county growing. First, he sees the population of Henderson growing but at a rate less than the current Henderson-County split. He estimated that 30% of the county's population growth between 2007 and 2030 will occur in Henderson. Outside of Henderson, Mr. McMillen sees growth co-locating next to either recreational or transportation amenities. The most influential, according to Mr. McMillen, will be the US-1 route south of Henderson toward Raleigh. Based on current permits, county plans, and his knowledge of the area, he sees 40% of the county's projected growth occurring along that route. Additionally, based on current permits as well as projects in the development pipeline, Mr. McMillen sees the remaining 30% of the county's growth occurring on and around Kerr Lake in the northern part of the county. Kerr Lake is already one of the most popular recreational areas in the state, and Mr. McMillen is predicting that high-end development will locate near it.

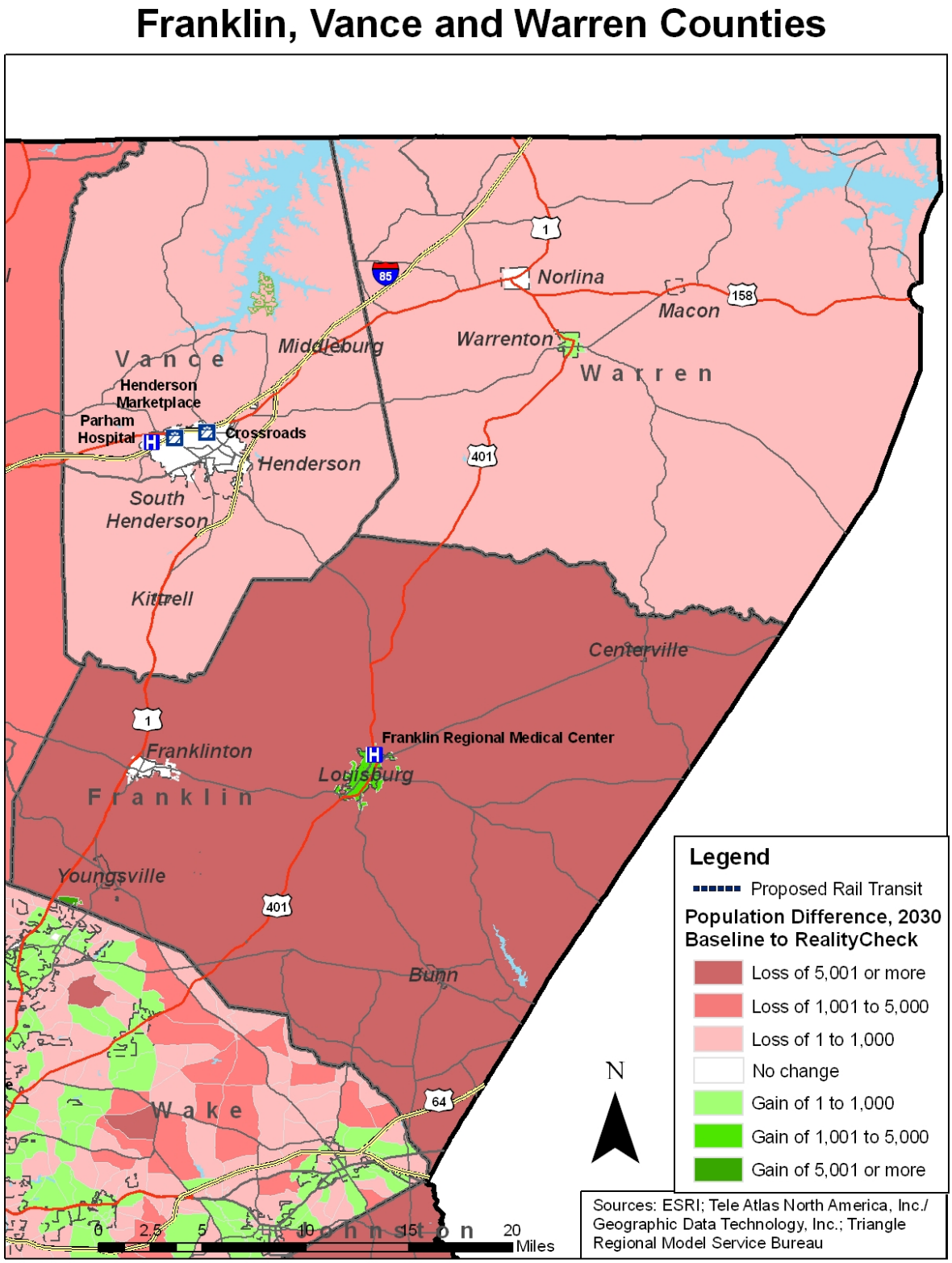
REALITY CHECK SCENARIO

Population - Reality Check Scenario			
	2007	**2030**	**Change**
Vance County	**43,583**	**45,766**	**+ 2,183**
Henderson	16,126[1]	17,227	+ 1,101
Rest of County	27,457[2]	28,539	+ 992

As a rural, slow-growing county, Mr. McMillen did not see "sustained green space" becoming a force shaping the location or intensity of growth before 2030 in even a marginal way. He does, however, see firm evidence that "transit" and "vibrant centers" working together in the form of a high-speed rail link becoming a development shaping force in Vance County. Currently, Henderson is slated to get a high-speed rail stop. This stop will connect Henderson to Raleigh and additional stops s south and north of Raleigh including Richmond. Historically, Henderson initially developed due to its historic rail connections to Raleigh. In the future, Mr. McMillen sees this connection as increasing

Vance County's, in particular Henderson's, growth potential, under the Reality Check scenario as Henderson could become more of a bedroom community to Raleigh. While a handful of "baseline" 2030 residents might shift from the US-1 corridor to Henderson to take advantage of the rail link, Mr. McMillen does not see this as the primary driver of a shift of population to Henderson. With the baseline 2030 US-1 population largely in place, Mr. McMillen sees the rail link as adding 500 new residents to Henderson. This increase is offset by a move of prospective long-commuting residents (341 people) to the Wake, Durham, and Orange counties using the aforementioned move-to-core methodology. With regards to growth around Kerr Lake, Mr. McMillen sees its placement, distribution, and number largely unaffected by the rail link because the development's location is anchored by the lake and recreation, not by its proximity to transportation.

Figure 1.30: Vance County Population Difference 2030 Baseline to Reality Check



2030 EMPLOYMENT GROWTH

BASELINE SCENARIO

Employment – Baseline Scenarios			
	2007	**2030**	**Change**
Vance County	**19,266**	**23,392**	**+ 4,126**
Henderson	15,413	17,016	+ 3,301
Rest of County	3,853	4,254	+ 825

These projections were based on the following statistics and methodology.

Total Employment	
Source: Woods and Poole (2008 Complete Data Base)	19,266
Source: NC Department of Commerce	17,809 (2008)
Source: U.S. Census Factfinder	16,673 (2006-8)

	2007	
	Employment of Residents[1]	Employment/Jobs in Geography[2]
Henderson	6,350	15,413
Rest of the County	12,916	3,853

(1) The U.S. Census and N.C. Employment Security Commission estimates Henderson's resident employment at 5,495 in 2009 and Vance County total resident employment at 16,673 on 2006-08. The numbers in this column represent the proportion of those numbers times the Wood and Poole 2008 Complete Data Base number to get an estimation of residents employed in 2007. While these numbers are helpful in getting a snapshot of employment and unemployment for residents within the jurisdiction, they do not give an idea of the geographic placement of jobs. However, it is very unlikely that the rural county has more jobs than the city of Henderson.

(2)The rough, baseline-split of city and county employment used in this study was 80-20. Based on business pattern numbers, Mr. McMillen saw a rough 60-40 split between the city and county. For purposes of this exercise and its mapping component, half of the county jobs have been included in the Henderson rough baseline number. This is because a large portion of those jobs are located outside of Henderson but within its extraterritorial jurisdiction and Henderson is likely to annex many of these areas over the next two decades.

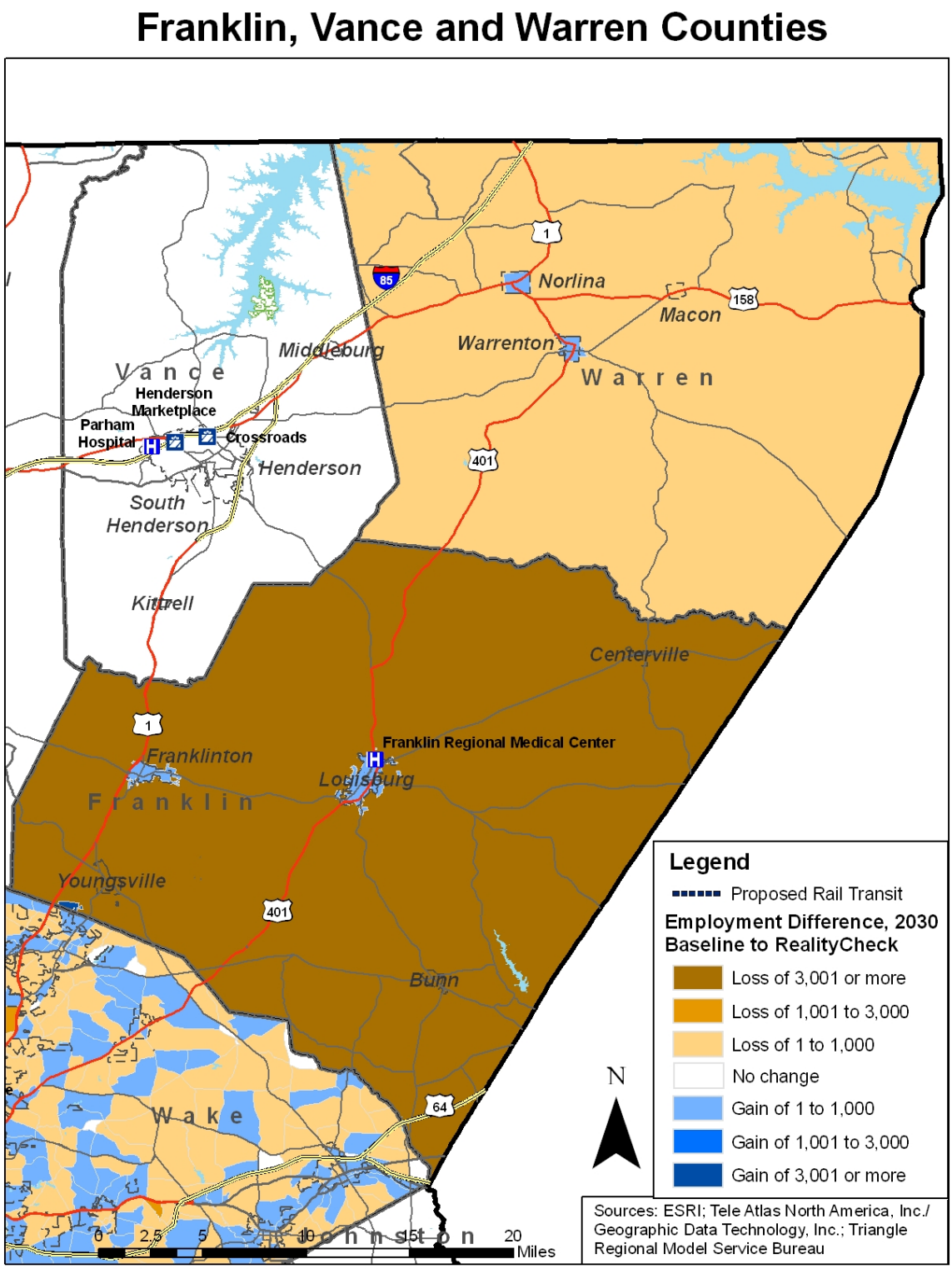
The Woods and Poole data gives the employment number for residents within the jurisdiction, not necessarily the number of jobs in the jurisdiction. While the employment of the jurisdiction's residents may have little or no relation to employment within the jurisdiction, the numbers in this column represent the proportions noted above (80% and 20%) multiplied by the Woods and Data 2008 Complete Data Base Total Employment number. In short, this study assumes that employed residents are employed within the county, or that the number commuting into and out of the county is the same.

REALITY CHECK SCENARIO

Employment –Reality Check Scenarios			
	2007	**2030**	**Change**
Vance County	**19,266**	**23,392**	**+ 4,126**
Henderson	15,413	17,016	+ 3,301
Rest of County	3,853	4,254	+ 825

Based on transportation links and existing infrastructure, Mr. McMillen sees Henderson taking the lion's share of any employment growth under either the Baseline or Reality Check scenarios. Based on the projections provided by Woods and Poole, Mr. McMillen sees roughly 80% of the job growth occurring within the current borders of Henderson in either scenario. In the Reality Check scenario, Mr. McMillen sees many of the new residents in Henderson, with the "vibrant center" consisting of commuters to Raleigh. This study assumes that their jobs would be located closer to the Raleigh-Durham "core" and would not affect job placement or growth in Vance County. The study further assumes that any greater good or service demand brought on by these commuters residing in Vance County would be picked up by the jobs already projected under the Baseline scenario with no new jobs being created.

Figure 1.31: Vance County Employment Difference 2030 Baseline to Reality Check



WARREN COUNTY, NC

The following information is based on interviews and emails with Ken Krulik, Warren County Planner/Zoning Administrator; Blaine Reese, Norlina Public Works; John Freeman, Warrenton City Administrator; and Fred Papa, Warren County Director of Economic Development.

BACKGROUND

Warren County is comprised of 443 sq. miles located in the north/northeast area of North Carolina at the border with Virginia. In 2007, Warren County had a population of 19,919. It is one of five counties that are members of the Kerr-Tar Regional Council of Governments (Region-K). In 2008, Warren County had only 1% of the total population of the 15-county triangle region.

Warren County consists of twelve townships and three incorporated towns. Most of the population in Warren County lives in unincorporated areas. The three incorporated towns' combined populations only comprise 6.1% of the total county population. Warrenton, the county seat, has a population of 815, Norlina, the largest incorporated area, has a population of 1107, and Macon has a population of 152.

2030 POPULATION GROWTH

BASELINE SCENARIO

Population - Baseline Scenario			
	2007	**2030**	**Change**
Warren County	**19,919**	**19,545**	**-374**
Warrenton	815	701	-114
Norlina	1,107	1,229	+ 122
Unincorporated County	17,997	17,590	-382

Warren County is expected to decrease in population from 19, 919 to 19, 545 between 2007 and 2030. This is a decrease of 374 people, or 1.9%. Most of the decrease in population is expected to occur in unincorporated areas, as that is where the majority of the current population resides. If the municipal populations follow growth trends of the past 20 years: Warrenton can expect to shrink by 14%, or 114 people, to a population of 701; Norlina can expect to grow by 11%, or 122 people, to a population of 1,229; while the unincorporated county can expect to shrink by about 2% and account for the remainder of the expected population decline in Warren County.

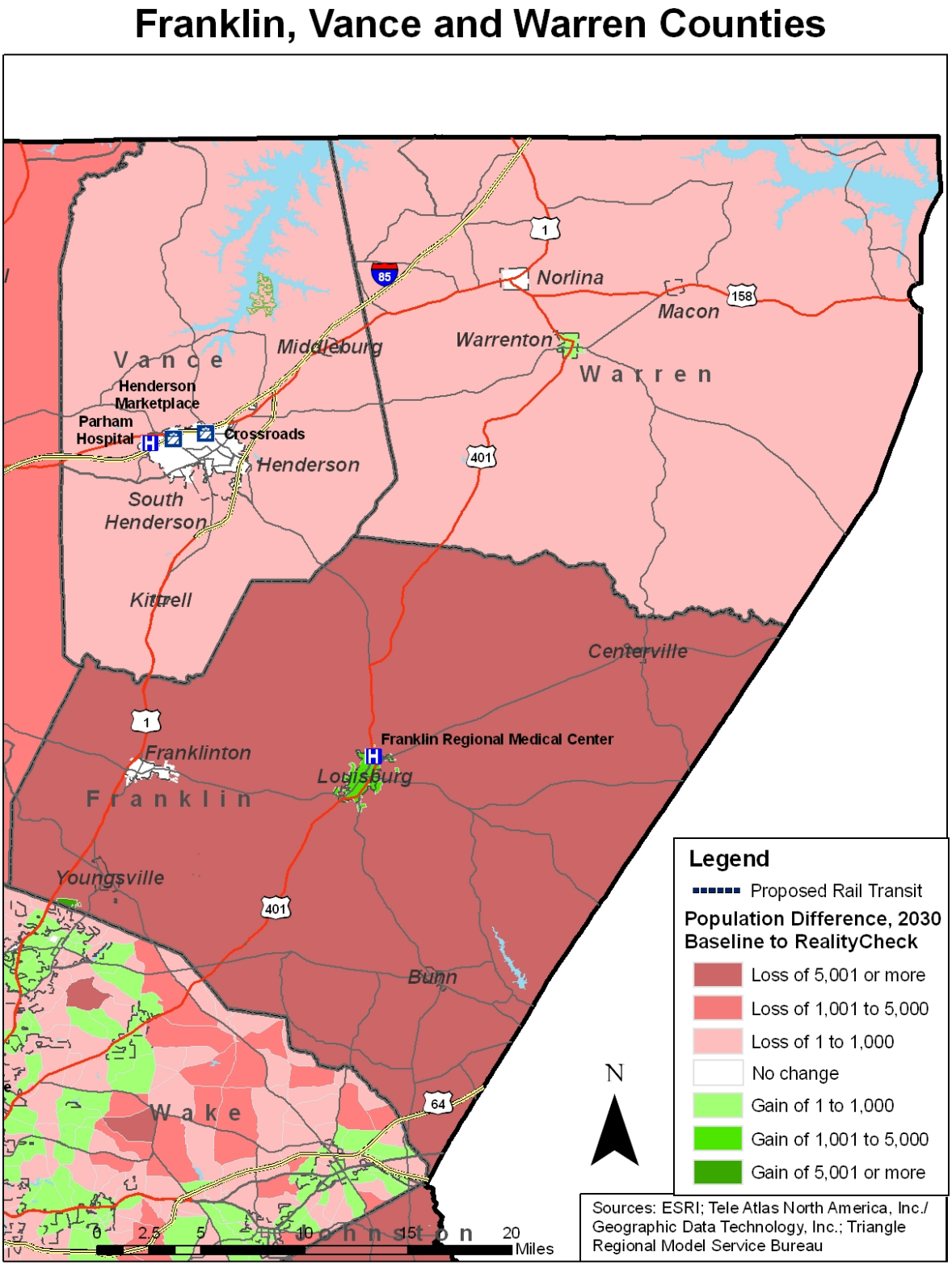
REALITY CHECK SCENARIO

Population - Reality Check Scenario			
	2007	**2030**	**Change**
Warren County	**19,919**	**19,545**	**-374**
Warrenton	815	815	0
Norlina	1,107	1,229	+ 122
Unincorporated County	17,997	17,501	-496

Despite a predicted population decline, County and Town Planners in Warren County hope to see the county grow. According to Warren County Planning Administrator Ken Krulik, the county could handle up to 25,000 people. He pointed out that Warren County has twice the landmass of Vance County but half the population. Warren County has countywide water (but not sewer), so in terms of infrastructure the county could handle more people. Krulik would like to see Norlina grow as anticipated and Warrenton hold steady, resisting the downward population trend.

If growth occurs, it will likely be divided between Lake Gaston at the northern part of the county, around 401 in the southeastern part of the county, and even around US 1 north of Norlina. Another area of potential growth is along US 158 between Norlina and Vance County by the Carr/Tarr hub site. Lake Gaston is a big draw for second homes and retirement homes, as is Kerr Lake, but to a lesser extent because a major portion of Kerr Lake is in Vance County. All of the above mentioned areas of potential growth are in unincorporated Warren County.

Figure 1.32: Warren County Population Difference 2030 Baseline to Reality Check



2030 EMPLOYMENT GROWTH

BASELINE SCENARIO

Employment - Baseline Scenario			
	2007	**2030**	**Change**
Warren County	**5,775**	**7,110**	**+ 1,335**
Warrenton	311	383	+ 72
Norlina	477	587	+ 110
Unincorporated County	4,987	6,140	+ 1,153

Employment data at the municipal level for Franklin County was unavailable. The North Carolina Employment Security Commission Labor Market Information Division stated that employment data is not calculated for municipalities with populations below 5,000. As such, employment estimates at the municipal level represent the best guess of Warren County planning staff.

Despite the drop in population, Warren County Director of Economic Development Fred Papa feels that the assumed employment growth for Warren County is correct. He thinks there will be a gradual increase in jobs in Warren County due to its varied, diversified base and its approach to business expansion and recruitment. Warren County has a certified 860 acre business park with adequate infrastructure serving the park as well as many other areas of the County. Interstate 85 passes through the County and has four interchanges that in essence serve as the "Gateway to North Carolina" from Virginia. This is a valuable resource as traffic heading to the internationally recognized Research Triangle Park pass through Warren County. Warren County also has a Tier 1 Tax status that offers a $12,000 tax credit for each job created, which is the highest in the State.

Under the Baseline scenario, much of the employment growth in Warren County will occur in and near the I-85 corridor, the Lake Gaston area and the area surrounding the corridors leading to and from Warrenton.

REALITY CHECK SCENARIO

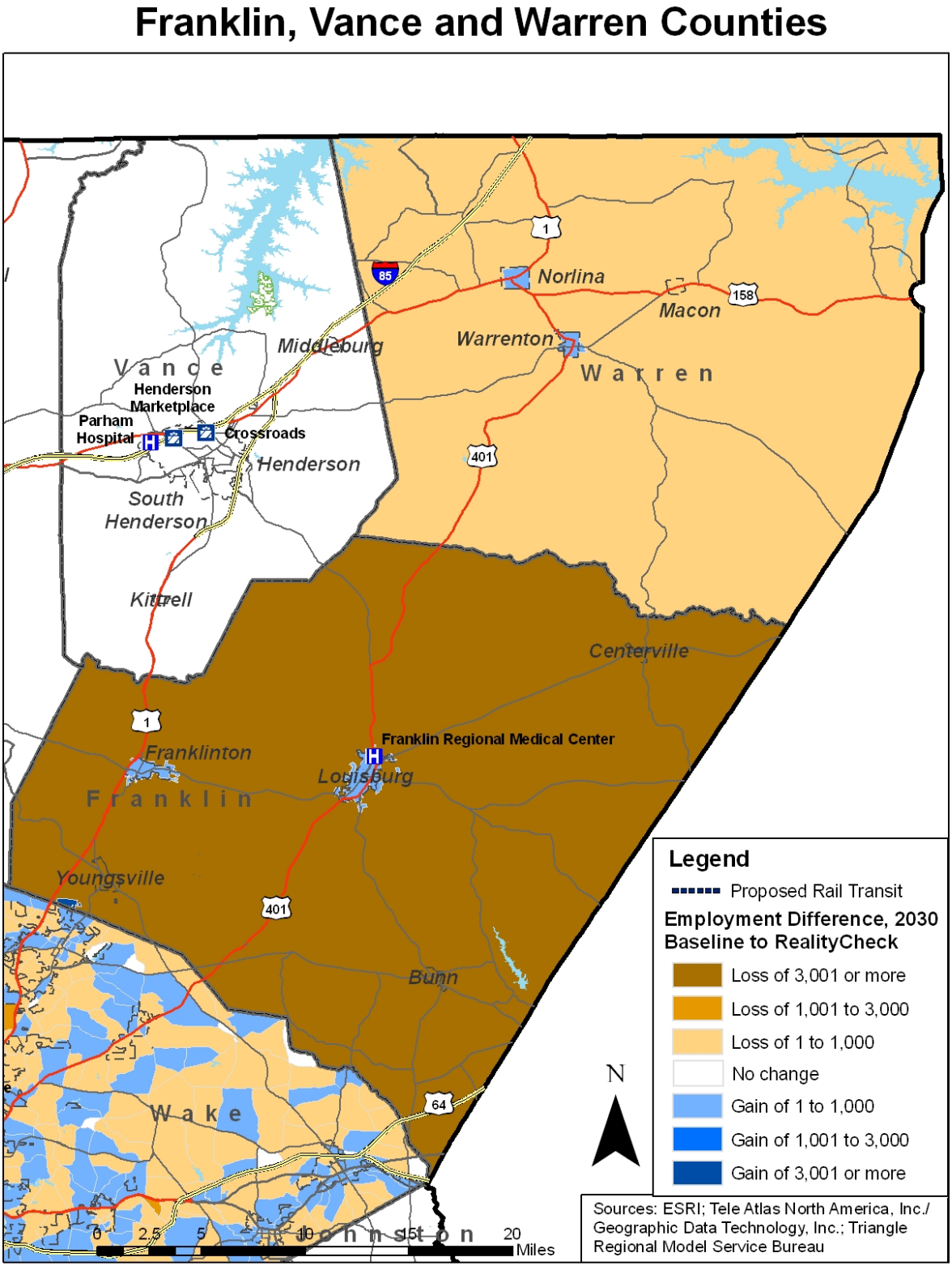
Employment - Reality Check Scenario			
	2007	**2030**	**Change**
Warren County	**5,775**	**7,110**	**+ 1,335**
Warrenton	**311**	**454**	**+ 143**
Norlina	**477**	**696**	**+ 219**
Unincorporated County	**4,987**	**5,960**	**+ 973**

With careful planning, Warren County could double the predicted growth in employment by 2030. Countywide zoning would encourage industrial and commercial development. Although Warren County has land that is available for industrial development, there are no designated parks or property “zoned” for industrial and commercial development. Zoning is only present around the lake areas and in the incorporated towns of Warrenton and Norlina. The greatest potential for industrial and commercial growth lies along the transportation corridors of I-85, US- 1, US-158, and US-401.

A potential industrial area of 400 acres is available between the communities of Ridgeway and Manson. This tract of land has access to water and sewer infrastructure, rail service, natural gas, and is located within 2.5 miles of I-85.

It is estimated that one of the best potential areas for retail development is along the NC-401 corridor, between Norlina and Warrenton, with some additional growth potential in the antique trade along the US-158 corridor. In addition, Manson Road in northwest Warren County, feeds into US-158 and offers one of the best locations for a concentration of retail-commercial development.

Figure 1.33: Warren County Employment Difference 2030 Baseline to Reality Check



WILSON COUNTY, NC

This summary is based on interviews with Rodger Lentz, Planning Director for the City of Wilson, and Jennifer Lantz from the Wilson County Economic Development Council, on February 18, 2010, as well as information from the Long Range Transportation Plan for the Triangle, and Wilson County's Comprehensive Plan.

BACKGROUND

Wilson County is positioned on the eastern edge of the Triangle. The majority of Wilson County's residents live in the incorporated City of Wilson, with about 1/3 of residents residing in other small towns and rural areas. While the population distribution is easy to capture, the employment picture is more complex. Wilson is a net source for jobs in the region (see commuting table below from Wilson's comprehensive plan). It appears that the connection to the Wake County economy is more about business, and is not about serving as a bedroom community for Wake County employees, in contrast to Johnston County and others. (That being said, depending on policies enacted, Wilson's position being a 45 minute less-congested drive to Raleigh may see a trend towards more commuters residing here, according to Mr. Lentz. This would lead to more costly commuting and inefficient land use, and would be a departure from current trends and policies.)

The county hosts strong pharmaceutical manufacturing and BB&T banking offices. Retail development has captured the local demand, and has even drawn other consumers from nearby counties. One of the main attractions for people and employers to locate in or near the City of Wilson is that the city has water and sewer service, whereas the county does not provide it. This has been an important determinant of location for firms to locate near the city rather than elsewhere. Due to the infrastructure capacity available, it is estimated that Wilson could absorb 30,000 more in population. Currently, some of Wilson's large economic parks are located just outside of the city, and are not incorporated, but still receive sewer and water utilities.

Although wage rates are high in comparison with nearby counties unemployment in Wilson is also high. According to Mr. Lentz, this is likely due to issues involved with entrenched poverty that the county has struggled to bring into the workforce. Retention is another challenge: many local graduates who are successful in their careers move elsewhere.

Incoming Commuters to Wilson County from:			Outgoing Commuters to:		
County	Number		County	Number	
	1990	2000		1990	2000
Wilson	25,580	26,255	Wilson	25,580	26,255
Nash	2,060	3,216	Nash	2,031	2,457
Wayne	1,203	1,342	Wake	721	1,143
Edgecombe	850	1,121	Johnston	637	749
Johnston	953	1,051	Edgecombe	458	576
Greene	516	639	Pitt	339	493
Wake	283	622	Wayne	274	352
Pitt	212	561	Halifax	49	110

(Wilson County commuting levels. Source: US Census, cited in Wilson County Comprehensive Plan, 2008.)

2030 POPULATION GROWTH

BASELINE SCENARIO

Population - Baseline Scenario			
	2007	**2030**	**Change**
Wilson County	**77,970**	**90,960**	**+ 12,990**
City of Wilson and surrounding econ. parks	49,947	58,261	+ 8,314
Rest of county	28,023	32,699	+ 4,676

The Baseline population scenario is based on current trends in Wilson County, with about 2/3 of the growth occurring in and near the City of Wilson.

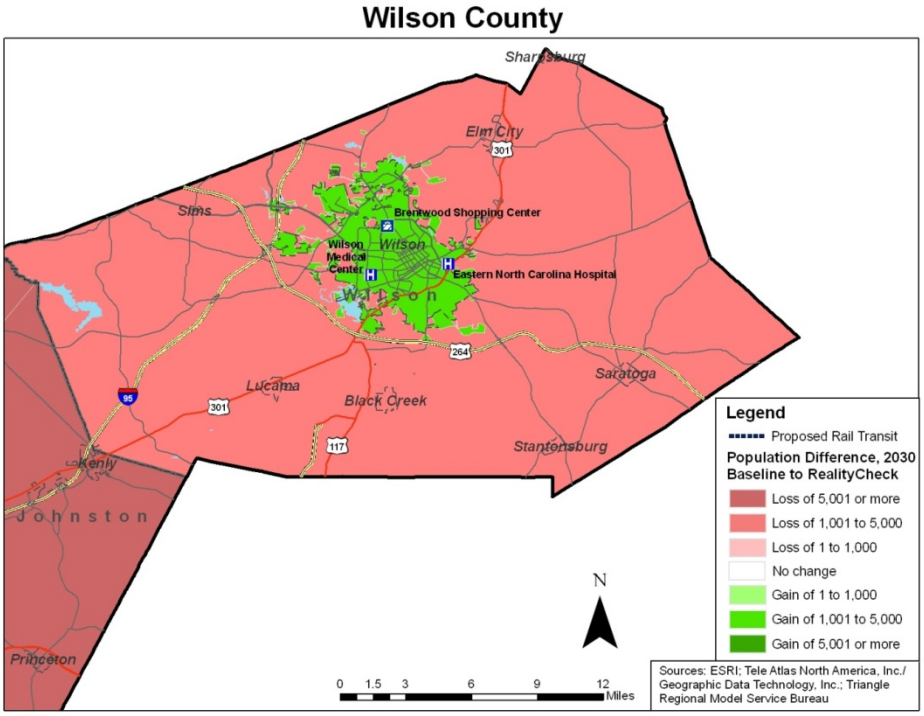
REALITY CHECK SCENARIO

Population - Reality Check Scenario			
	2007	**2030**	**Change**
Wilson County	**77,970**	**90,658**	**+ 12,688**
City of Wilson and surrounding economic development parks	49,947	61,638	+ 11,691
Rest of county	28,023	29,020	+ 997

The City of Wilson is already focusing on infill, historic preservation, and redevelopment, and is currently aligned with the goals of Reality Check. Transit would have minimal affect on the county, population or employment growth, so Mr. Lentz's prediction is that growth in jobs and housing would be nearly the same under the Baseline and Reality Check scenarios. However, since the City of Wilson is primed to handle population growth, the city could absorb about 90% of the county's growth.

Ms. Lantz echoed many of Mr. Lentz's assertions that the city of Wilson would grow faster than the rest of the county at the same proportions that Mr. Lentz mentioned. She added that the city would probably expand slightly to the west toward Raleigh, and also to the east in the direction of Greenville.

Figure 1.34: Wilson County Population Difference 2030 Baseline to Reality Check



2030 EMPLOYMENT GROWTH

BASELINE SCENARIO

Employment - Baseline Scenario			
	2007	**2030**	**Change**
Wilson County	**47,821**	**61,546**	**+ 13,725**
Wilson City and surrounding econ. parks	30,634	41,359	+ 10,725
Rest of county	17,187	20,187	+ 3,000

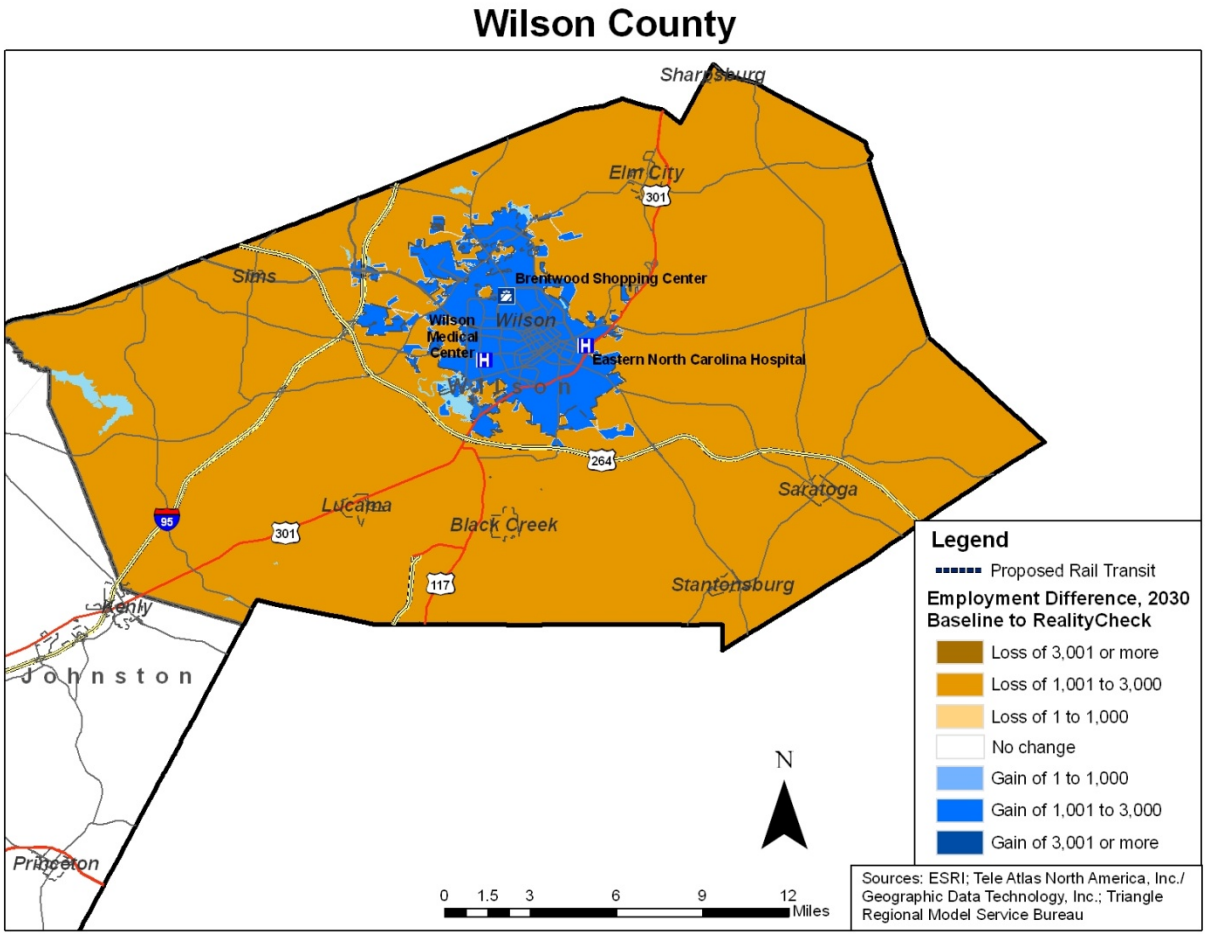
Wilson's Baseline scenario for jobs is based on interviewee's perspectives and on the past increases of jobs at a faster rate in the city verses the rest of the county. About 78% of the employment growth is expected to occur in the City of Wilson.

REALITY CHECK SCENARIO

Employment - Reality Check Scenario			
	2007	**2030**	**Change**
Wilson County	**47,821**	**61,546**	**+ 13,725**
Wilson City and surrounding econ. parks	30,634	43,673	+ 13,039
Rest of county	17,187	17,873	+ 686

Under the Reality Check principles of vibrant centers and protection of greenspace, 95% of jobs could be located within the City of Wilson.

Figure 1.35: Wilson County Employment Difference 2030 Baseline to Reality Check



RESULTS

Overall, the Baseline scenario forecasts what development will look like in 2030 if growth patterns continue in a similar fashion to what is occurring today. Under this scenario, future population and employment growth is occurring at low densities in a sprawling manner. Conversely, the Reality Check scenario produced more dense and transit-oriented development. The figures below show the population and employment differences in a Reality Check scenario versus a Baseline scenario. The Reality Check patterns of growth were largely based on the following guiding principles:

(1) Transit

Goal - Improve regional transit, matching land use decisions with transit investments

(2) Vibrant Centers

Goal - Reinvest in city and town centers, promote compact development, density and mixed use, including a balance of jobs and housing

(3) Sustained Green Space

Goal - Define appropriate growth and preservation areas to protect open space, agricultural land and resources, especially water supply and quality

Figure 1.36: Population Difference between 2030 Scenarios

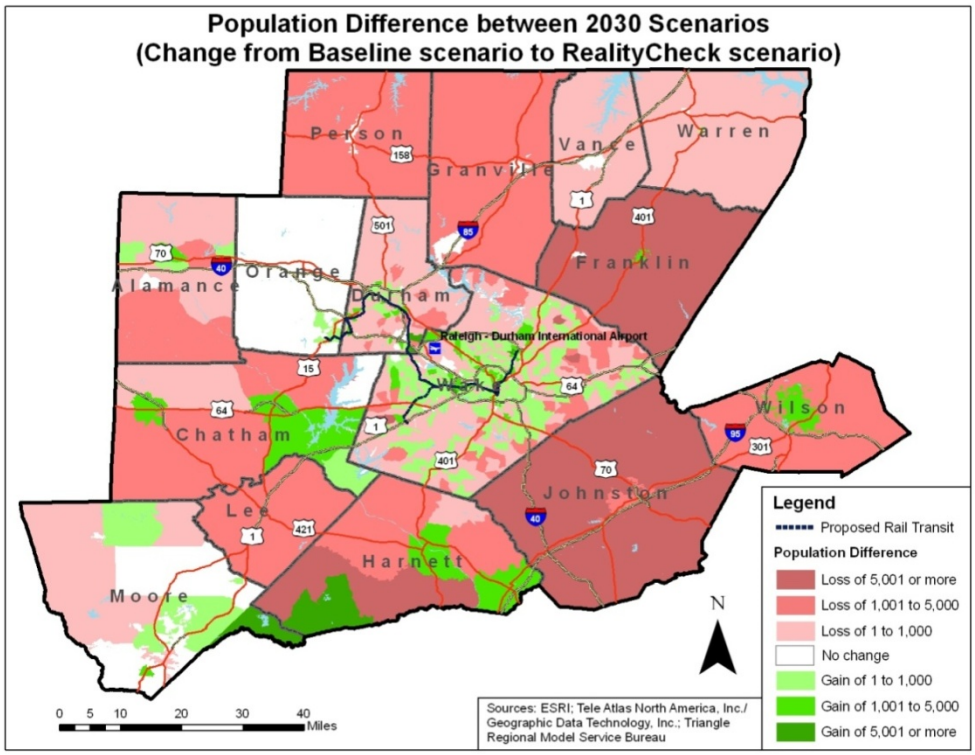
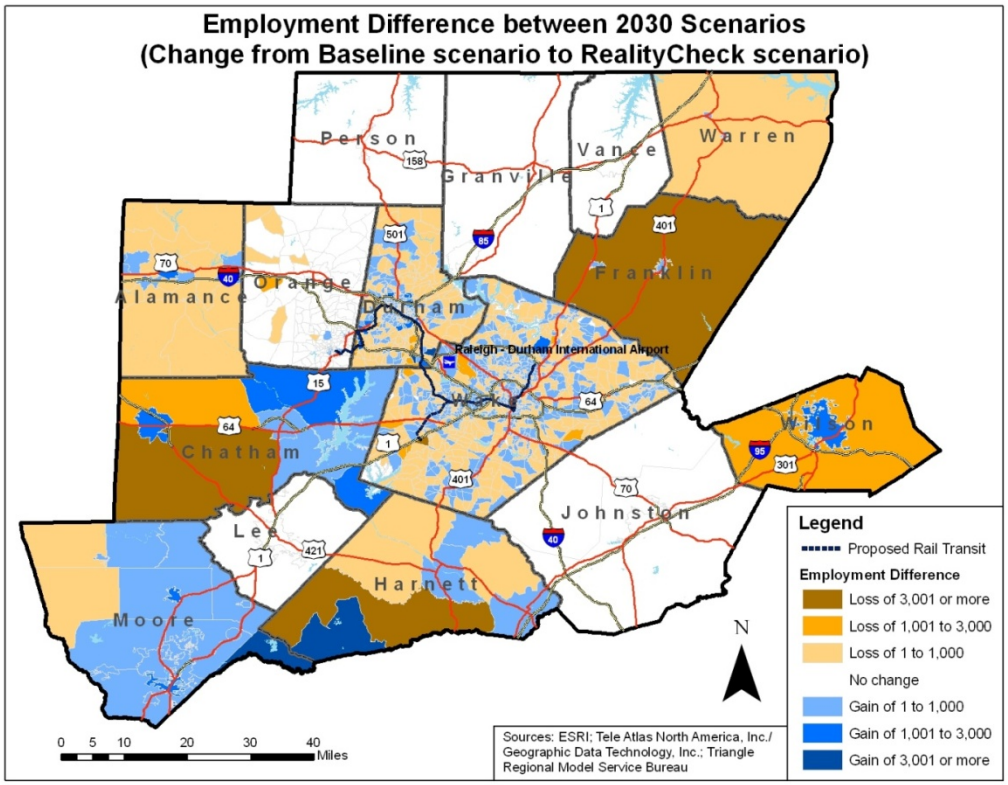
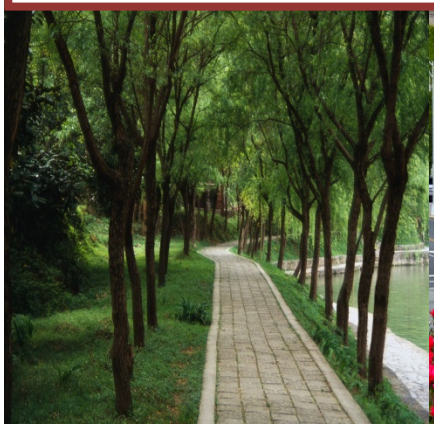


Figure 1.37: Employment Difference between 2030 Scenarios



PART II: COMPARATIVE IMPACT ASSESSMENT

ENVIRONMENTAL
TRANSPORTATION
FISCAL



ENVIRONMENTAL EFFECTS
REALITY CHECK VS BASELINE SCENARIO

INTRODUCTION

The Triangle region is likely to grow differently under a business-as-usual scenario than it would under a scenario based on Reality Check principles. The differences in the character of the growth expected in the area will likely have very different impacts on the region's environment.

In this section, the environmental impacts of our two future scenarios are estimated using two different methods. Section 1, 2, and 3, estimate some of the effects on climate change and energy consumption, human health, and the viability of ecosystems with a brief qualitative literature review approach. For these first three sections, for the sake of comparison, a non-Reality Check scenario is roughly equated to sprawl as it is typically defined.

Sections 4, 5 and 6 assess the impacts on water and sewer infrastructure costs, impervious surface area, and urbanized area versus green space. This section uses a method of matched pairs of communities, following the model used in Berke et al., 2003, and Berke, Song and Stevens, 2009. Six pairs of places were identified, two rural, two suburban, and two urban, that each shared some characteristics. The neighborhoods in each pair contained a comparable population, and were built within the same jurisdiction and therefore under similar regulations. Each pair contained two different development types, however. One of each pair exhibited characteristics of the Reality Check principles, and its traditional counterpart exhibited the opposite characteristics. The characteristics are listed in the table below. Many of the Reality Check neighborhood characteristics are drawn from Smart Growth, New Urbanism and neo-traditional development ideas. The two urban neighborhoods that were compared are: the Capital Boulevard neighborhood and University Park neighborhood, both in Raleigh (see Figure 2.0). The two rural neighborhoods chosen were Briar Chapel and Windfall subdivisions in Chatham County (see Figure 2.1 and 2.2) and the two suburban neighborhoods were Stadium Heights and Tuscaloosa-Lakewood in Durham (see Figure 2.3).

Neighborhood Characteristics:

Vibrant Urban, Suburban, or Rural Centers	Traditional Urban, Suburban, or Rural Development
• Exhibit compact development, density • Mixed use • Diversity of housing types and uses (income, age), • Contain balance of jobs and housing • Include public gathering spaces • Safely walkable, bikable • Human-scale design • 24/7 use (Urban only), variety of amenities • Match land use decisions with transit and transportation investments	• Sprawling low density development • Separation of land uses (Euclidean zoning) • Lack of housing diversity resulting in separation by income, age, etc. • Jobs and housing in separate places • Few public gathering spaces • Not walkable, oriented towards vehicles • Safety of bicyclists, pedestrians not adequately considered • Little night life or variety of amenities • Transportation and land use poorly linked

Comparing the existing matched pair developments allowed the authors to assess differences and extrapolate the differences in environmental impacts of a future Reality Check or Baseline outcome.

Figure 2.0: Urban Neighborhoods

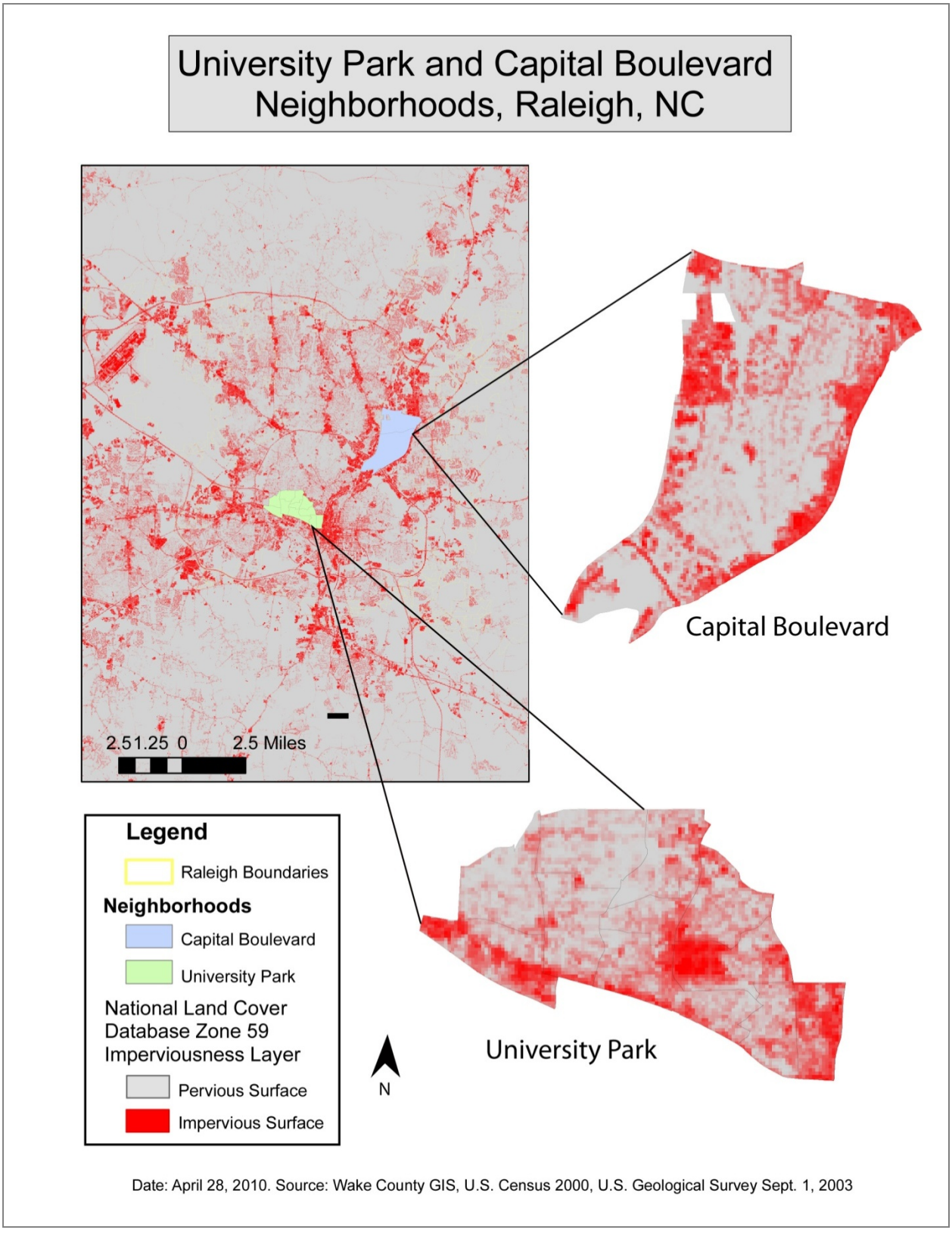


Figure 2.1: Rural Neighborhood Briar Chapel, Chatham County

Figure 2.2: Rural Neighborhood Windfall, Chatham County

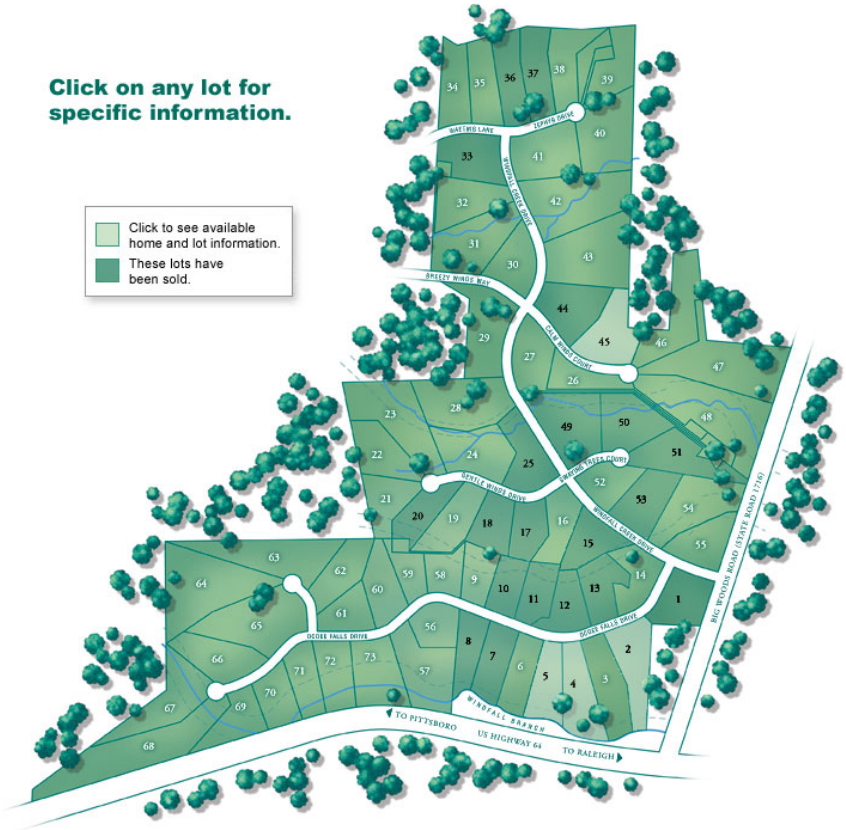
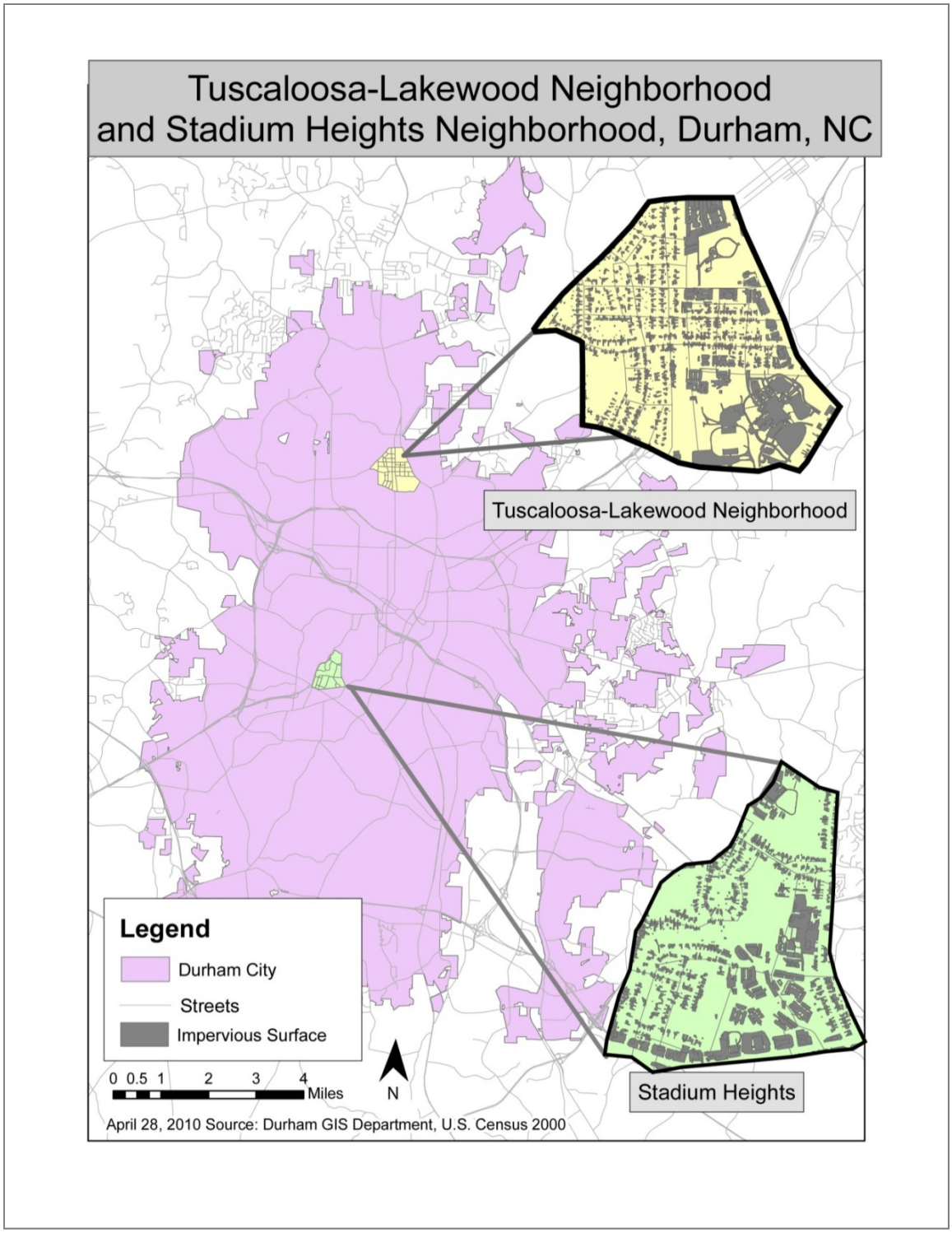


Figure 2.3: Suburban Neighborhoods



1. CLIMATE CHANGE AND ENERGY CONSUMPTION

It is widely accepted among scientists that a major cause of observed global warming is increased atmospheric levels of anthropogenic greenhouse gases. These gases include carbon dioxide, nitrous oxide, methane, chlorofluorocarbons, and ozone (Houghton, 2006). North Carolina greenhouse gas emissions increased by 57% from 1990 to 2005 and they are projected to continue to increase 106% from 1990 levels by 2020 (ULI Reality Check, 2009). If nothing is done to curb these emissions on a global, national, and regional scale; there will be drastic consequences including increasing rates of melting glacial ice, rising sea levels, new precipitation patterns, as well as additional negative effects on human health, biodiversity, and agriculture (Houghton, 2006).

Urban sprawl and climate change are inextricably linked because sprawling development requires more energy and resources, as more infrastructure, roads, pipes, wires, concrete, and other materials are necessary to connect lower density, sprawling development (Orr, 2008). Also, more disperse development patterns result in higher energy use from transportation because a greater number of people and goods are forced to travel longer distances (Bart, 2008). This results in the use of more fossil fuels, combined with the loss of carbon sinks, such as forests and soils, which work to drive climate change (Orr, 2008).

A study conducted in the European Union by Istvan Bart (2010) supports this idea by examining the relationship between transport emissions and urban land use. Sprawl, measured in the increase of areas covered by buildings and roads, was shown to have a stronger correlation with increased transport emissions than other possible causes such as growth of per capita gross domestic product (GDP) or population growth. The study found that the growth of transportation emissions is a result of specific urban planning and land use policies. Therefore, reducing sprawl will limit the increase of artificial land, and as a result, stop or limit the increase in carbon dioxide emissions (Bart, 2010).

Another study conducted by Roshan et al. (2010) in Tehran, has examined the relationship between urban sprawl and changes in local climate variables. The variables used in the study include climatic elements such as rainfall, temperature, percent of relative humidity, and percent of calm wind. Urban sprawl components studied included the city area, private cars per capita, population density, and urban population. The study found that the oscillations in temperature, percent of relative humidity, and percent of calm wind seem to have a significant relation to components of urban sprawl. The most important factor in the increasing temperature is the number of cars; the most important factor in the increasing percent of relative humidity is the expansion of the city area; and the increase in the percent of calm wind may be attributed to the increase of population (Roshan et al., 2010).

In conclusion, the Baseline, or business-as-usual, scenario for the Triangle region in North Carolina projects higher levels of urban sprawl. This pattern of development is predicated on high energy use and greenhouse gas production, which threatens to amplify anthropogenic climate change. Conversely, growth under the Reality Check scenario is projected to be denser and will likely create fewer negative impacts on the environment because it will require the use of less energy and fossil fuels, which will reduce greenhouse gas emissions and the potential for climate change.

2. IMPACT ON HUMAN HEALTH

In the second half of the twentieth century there was a rapid expansion of metropolitan areas into widely dispersed, low-density developments of urban sprawl. During this same period, the proportion of overweight Americans rose from 24% to 64% of adults and the percentage of gross domestic product spent on health care rose from 5.1% to 14%. Asthma, which previously affected a very small portion of society, now affects 10% of Americans (Frumkin, 2002). Planning and public health literature has increasingly linked the environmental conditions associated with urban sprawl with rising levels of obesity, asthma and other lung conditions, and automobile and pedestrian fatalities. As humans are a component of the natural environment, it is no surprise that human health is affected by environmental conditions. The US Department of Health and Human Services recognizes this link in their definition of environmental health: "those aspects of human health, disease, and injury that are determined or influenced by factors in the environment" (US Dept. Health and Human Services, 2001).

Anti-sprawl proponents point to the reliance on cars seen in low-density areas as the cause of the most pressing adverse human and environmental health effects (Jackson, 2003). There is a well-established close relationship between lower density development and automobile travel. For example, in Atlanta, which exemplifies a sprawling urban area, the average person travels 34.1 miles in a car per day. This number is much lower for more compact urban areas such as Philadelphia (16.9), Chicago (19.9) and San Francisco (21.2) (Frumkin, 2002). Vehicle travel contributes to human health problems such as lung disease, motor vehicle crashes, and pedestrian injuries and fatalities. Cars and trucks pollute the atmosphere with ground-level ozone and particulate matter, which leads to higher incidence and severity of respiratory symptoms, more emergency room visits and hospitalization and more absenteeism from work and school (Frumkin, 2002). Because residents of low-density areas spend more time in their car, they have greater exposure dangers on the road and a higher probability of being in a traffic accident. In addition, the most dangerous stretches of road for pedestrians are those built in ways that typify sprawl, with multiple lanes, high speeds, no sidewalks and long distances between intersections and crosswalks. Because of these factors, denser cities with more extensive public transportation systems have lower automobile and pedestrian fatality rates.

Sustainable communities, based on principles described in the Smart Growth movement, have been advocated as a solution to the detrimental effects of sprawl on human health by providing reduced levels of air pollution, more opportunities for physical activity, and fewer motor vehicle crashes (Frumkin, 2002). Environmental guidelines have recommended mitigation strategies such as: vertical and cluster development to preserve open space, porous paving materials to allow infiltration, and vegetated stream buffers to filter runoff (Srinivasan, 2003). Infill and redevelopment of existing urban areas, such as those proposed under the Reality Check scenario, are more likely to achieve reductions in automobile trips and miles traveled than neighborhoods in areas isolated from urban services (Jackson, 2003).

Human health concerns were the original impetus in the 19th century for the profession of city planning (Jackson, 2003). While human health concerns no longer drive urban design, it is important to consider the potential adverse effects on human and environmental health when planning for future growth. The Baseline scenario projects high levels of urban sprawl whereas the Reality Check scenario moves the region toward higher density. The Reality Check scenario would therefore be less detrimental to the environmental health of the residents of the triangle region.

3. VIABILITY OF ECOSYSTEMS

The threats to the viability of ecosystems, such as the loss of environmentally fragile land, open space and farmland, fragmentation of ecosystems, and reduced diversity of species, are worsened by sprawling urban and suburban development. Since the mid-1990s, there has been growing public concern about the impacts of sprawling development patterns. Environmental concerns have made up the most prominent public concerns regarding sprawl, with the loss of open space especially increasing as a share of all sprawl concerns (Bengston et al., 2005).

Urbanization can endanger plant and animal species by depleting natural habitat and resources and replacing them with urban or suburban development. Urbanization is second only to agriculture as the biggest endangerment to ecosystems and species. The construction of roads as a part of urbanization can increase habitat fragmentation and alter species' distribution by creating habitat edges, while roadside mowing can also destroy natural flora habitat (Czech et al., 2000).

The loss of open space and habitat often leads to the loss of biodiversity, which is a concern of planners because humans derive many benefits from biodiversity: food, pharmaceutical medicines, energy, and materials for consumer goods. Biodiversity also enables the completion of several vital biological processes, including nutrient recycling, waste decomposition, and oxygen generation. Finally, loss of biodiversity may also affect aesthetics, harming an area's appeal for tourists or residents (Ortiz, 2002).

In addition to loss of open space, the loss of farmlands is a growing concern. Because it tends to be flat and historically near human settlements, the land most suitable for growing crops is also usually most suitable for "growing" development. Therefore a disproportionate amount of prime farmland is lost to urbanization. This loss of a region's farmland has three negative impacts (Ewing, 1994):

1. Urban externalities that make nearby farming less profitable, causing farmers to disinvest.
2. The "impermanence syndrome" that causes farmers to abandon operations prematurely in anticipation of urban development.
3. Misjudgment of the value of farmland to future generations, often leading to more expensive farmland.

Poorly planned and rapid urban and suburban development can reduce the viability of ecosystems, including loss of open space, farmland, and sensitive habitats. These will be key issues for the Triangle and the Reality Check region moving forward. Indeed, a study done by the US Department of Agriculture (Wear & Greis, 2009) identified the I-85 corridor from Raleigh to Atlanta as a key "hotspot" where "changes in land use and forest conditions portend important negative impacts on the services provided by forests." As the region grows by more than 1 million residents by 2030 (ULI Reality Check, 2009), the stresses placed on the area's farmland, open space, and ecosystems must be considered and adequately planned for. By planning for growth based on the Reality Check principles, the region can hope to curb these detrimental effects of sprawling development on its current natural ecosystems and farmlands.

A 1999 study found that farmland preservation was much more successful in states with growth management plans, compared to the national average and comparable states without growth

management, due to regulations to curb sprawling development patterns (Nelson, 1999). Because the Baseline scenario projects higher levels of urban sprawl, the development ideas from Reality Check should be implemented across the region to preserve habitat, biodiversity, farmlands, and open space as best as possible given the amount of anticipated growth.

4. WATER AND SEWER INFRASTRUCTURE

It is important to consider the effects that different patterns of development may have on infrastructure, in terms of cost, resource and energy efficiency. Does compact, higher density development require less water and sewer infrastructure, in terms of both feet of pipe and costs per dwelling unit, than more traditional, large lot development, as it seems at first glance? If this is the case, then both developers and taxpayers can expect a reduction of cost under the Reality Check principles of Vibrant Centers and Open Space.

METHODOLOGY

This part of the study takes a look at the relationship between growth patterns and cost of water and sewer infrastructure. After the research is completed, the findings of the study are applied to the pairs of neighborhoods with differing growth patterns to identify differences in water and sewer infrastructure.

Research conducted by Speir and Stephenson (2002) concluded that indeed, lot size, tract dispersion, and distance to water and sewer provision centers have an effect on the provision of water and sewer infrastructure. The findings on tract dispersion were not as pronounced, demonstrating that the other variables have a stronger relationship with cost. However, all scenarios demonstrated that lot size has a significant effect on the cost of providing water and sewer services, with smaller lots being less expensive to serve than larger lots (when the other two variables are held constant). The study also found that increased distances away from water and sewer service centers can increase costs significantly. Thus, the Reality Check principles promoting the conservation of open space and compact development can be successful in reducing the amount and cost of water and sewer infrastructure.

URBAN NEIGHBORHOODS

In Raleigh, the Capital Boulevard neighborhood and University Park neighborhood serve as an excellent comparison of these findings. University Park represents the principles proposed by Reality Check, while Capital Boulevard would represent a business as usual scenario. Again, we can utilize Speir and Stephenson's research on lot size and water and sewer infrastructure cost to estimate which neighborhood is more cost effective. Capital Boulevard is comprised of 2,415 acres and 1,727 lots, equaling an average lot size of 1.4 acres. University Park, however, consists of 1,557 acres and 2,807 lots, for an average lot size of 0.55 acres – roughly half the size of lots on Capital Boulevard. Again, we see that the neighborhood incorporating the Reality Check principles has a smaller average lot size than more traditional development. Based on the research conducted by Speir and Stephenson, we can assume that University Park has a more cost efficient water and sewer network than Capital Boulevard.

RURAL NEIGHBORHOODS

Two current subdivisions are examined to provide further support for the Reality Check principles, the Briar Chapel and Windfall subdivisions. Both subdivisions are located in Chatham County and were approved in the mid 2000s. Briar Chapel incorporates the principles of Reality Check as it includes a mix of uses, green space and trails, and compact development. Windfall, on the other hand, is strictly residential. Due to the rural nature of these subdivisions, sewer is provided on site, though residents rely on county water. To illuminate the difference in the provision of water and sewer between the two developments we must examine their size. Briar Chapel has been permitted to include 323 lots on 152 acres of land, 0.47 acres per lot, while Windfall has been permitted to include 55 lots on 289 acres of land, 5.25 acres per lot. Looking at lot size, the most critical determinant of water and sewer infrastructure cost, it can be interpreted that Windfall would be much more costly than Briar Chapel. In this respect, the development that adheres to the principles proposed by Reality Check appears more efficient in terms of water infrastructure.

SUBURBAN NEIGHBORHOODS

Unfortunately, we were unable to obtain data to compare our suburban neighborhoods, Stadium Heights and Tuscaloosa-Lakewood.

CONCLUSION

Based on the findings from our rural and urban comparisons, we feel it is safe to assume that communities that apply the Reality Check principles will generally have lower water and sewer infrastructure costs. Fewer and shorter lines of pipes in the ground also means lower energy costs from pump stations, fewer resources used, and less environmental disturbance in construction.

5. OPEN SPACE/ GREEN SPACE

In this section, we attempt to measure the differences in open space or green space in parcels of land representing our two scenarios, looking to see if denser, more compact development results in a higher percentage of open space per site.

It is important that we define what is meant by open space or green space. Two possible meanings have been used in the following sections according to available data. The first pertains to all space not occupied by an impervious surface or building of some kind. This would include personal yard space, stands of trees, local parks, etc. The second meaning is very similar to the first with the additional criteria that it must be publicly accessible.

METHODOLOGY

2001 Landsat data from the US Geological Survey was used to compare the amount of green space for the urban and suburban pairs. This data is formatted as rasters with each cell representing 30 meters. This is the highest resolution freely available; if a more detailed look is desired, higher resolution imaging is available for purchase.

We compared the land cover of each identified neighborhood to determine which contained the greatest amount of green space as a percentage of the total area. This was done by dividing the number of raster cells in each category by the total number of cells in each neighborhood. This

provided the percent of the area made up by each land cover type, which allows the results to be comparable to one another despite their different sizes. The categories used in the data coding with their definitions follow and were taken from the website of the Multi-Resolution Land Characteristics Consortium (MRLC):

- **11. Open Water** - All areas of open water, generally with less than 25% cover of vegetation or soil.
- **21. Developed, Open Space** - Includes areas with a mixture of some constructed materials, but mostly vegetation in the form of lawn grasses. Impervious surfaces account for less than 20 percent of total cover. These areas most commonly include large-lot single-family housing units, parks, golf courses, and vegetation planted in developed settings for recreation, erosion control, or aesthetic purposes
- **22. Developed, Low Intensity** - Includes areas with a mixture of constructed materials and vegetation. Impervious surfaces account for 20-49 percent of total cover. These areas most commonly include single-family housing units.
- **23. Developed, Medium Intensity** - Includes areas with a mixture of constructed materials and vegetation. Impervious surfaces account for 50-79 percent of the total cover. These areas most commonly include single-family housing units.
- **24. Developed, High Intensity** - Includes highly developed areas where people reside or work in high numbers. Examples include apartment complexes, row houses and commercial/industrial. Impervious surfaces account for 80 to100 percent of the total cover.
- **41. Deciduous Forest** - Areas dominated by trees generally greater than 5 meters tall, and greater than 20% of total vegetation cover. More than 75 percent of the tree species shed foliage simultaneously in response to seasonal change.
- **42. Evergreen Forest** - Areas dominated by trees generally greater than 5 meters tall, and greater than 20% of total vegetation cover. More than 75 percent of the tree species maintain their leaves all year. Canopy is never without green foliage.
- **43. Mixed Forest** - Areas dominated by trees generally greater than 5 meters tall, and greater than 20% of total vegetation cover. Neither deciduous nor evergreen species are greater than 75 percent of total tree cover.
- **71. Grassland/Herbaceous** - Areas dominated by grammanoid or herbaceous vegetation, generally greater than 80% of total vegetation. These areas are not subject to intensive management such as tilling, but can be utilized for grazing.
- **81. Pasture/Hay** - Areas of grasses, legumes, or grass-legume mixtures planted for livestock grazing or the production of seed or hay crops, typically on a perennial cycle. Pasture/hay vegetation accounts for greater than 20 percent of total vegetation.
- **90. Woody Wetlands** - Areas where forest or shrubland vegetation accounts for greater than 20 percent of vegetative cover and the soil or substrate is periodically saturated with or covered with water.

Of these categories 23: Developed, Medium Intensity and 24: Developed, High Intensity were subtracted from the totals to determine the amount of available green space, because each of these categories had 50% or more of its space taken up by development and impervious surfaces.

Unfortunately, because the rural pair has not been completely built out, it was not possible to analyze them in the same way. Instead the site plans of each development were used to visually analyze the amount of green space in the plans. Another challenge to this portion of the analysis was that the available site plans were not of comparable quality or detail.

RESULTS

URBAN NEIGHBORHOODS

In the urban neighborhoods, the level of green space is fairly close. Approximately 78.18% of the Capital Boulevard neighborhood was taken up by land uses where vegetation constituted more than 50% of the total surface space. University Park was very similar with about 73.1% of its land covered with at least 50% vegetation.

Because these numbers are so close, it must be considered possible that development under the Reality Check scenario may not increase the amount of available green space. On the other hand, it may also mean that the amount of green space will not decrease as a result of shifting to this development mode. Indeed, it may be that a shift to denser development would mean that more of this green space would be accessible to the public. This is not something that could be determined using the data available, but could warrant further study.

SUBURBAN NEIGHBORHOODS

This pair was similar to the urban set mentioned above since the difference in green space was very low. In Stadium Heights, the less dense neighborhood, about 81.84% of land was covered by at least 50% vegetation. In Tuscaloosa-Lakewood about 85.04% was covered in a minimum of 50% vegetation. The latter is also about twice as dense as the former. Looking at these numbers, it is again evident that we will not be able to determine whether denser development leads to more or less green space. All that can be determined is that the two development schemes have about the same level of greenery. Again, it is possible to infer that while increased density may not increase green space, neither would it decrease it. And again there is the potential for that available space to be more accessible to the public, thus playing a larger role in the life of the community.

RURAL NEIGHBORHOODS

After examining the site plans for both Briar Chapel and Windfall, it is evident that the designers of the former were more concerned with the preservation of publicly accessible open space. This is evidenced by the clustered development style and the inclusion of numerous pocket parks, internal walking trails and even a cemetery. In contrast, Windfall seems to make no attempt to provide set aside green space outside of personal yard space. Indeed it is a very standard style subdivision plan with large lots that take up all of the available land. After examining the two site plans, it is not possible to determine which would have a higher percentage of overall green space. This is because it is highly likely that the large lots in Windfall would have only a small portion of the available land taken up by buildings and other development. When examining Briar Chapel, it is evident that much more public open space has been provided, but it is difficult to determine whether the pod style development will result in more or less overall green space.

One caveat must be made on the evaluation of these two site plans. Because the detailed site plan for Briar Chapel was available publicly, it was much easier to estimate the exact placement of lots and planned green spaces. Unfortunately we did not have access to the detailed site plan for Windfall and a lower-quality version was used.

6. IMPERVIOUS SURFACE

Impervious surfaces are surfaces such as pavement or rooftops that prevent the infiltration of water. High levels of impervious surface can contribute to degraded water quality and increased flood risks by increasing runoff and reducing the opportunity for natural absorption and filtration of water. According to some researchers, as little as 10% impervious surface can lead to impairment of a watershed (Schueler, 1994). A 2006 study by the US Environmental Protection Agency demonstrated that compact development could effectively protect resources by preserving "large, continuous areas of open space," preserving areas critical to watershed ecology, and reducing land disturbance and impervious surface. This study demonstrated that while high-density development might have more impervious surface and thus a greater impact on watersheds per square mile, it exhibits decreased impacts and impervious surface per dwelling unit (Richards, 2006). However, our analysis of local neighborhoods showed an even greater reduction in neighborhoods that embodied Reality Check principles: not only did these neighborhoods have lower per capita and per dwelling unit impacts; they also had a lower impervious surface level per square mile of land. These findings suggest that Reality Check principles could greatly reduce burdens on the region's water resources.

METHODOLOGY

Different methodology and data sources were used to calculate impervious surfaces for the three pairs of neighborhoods based on the availability and quality of data. Because the purpose of this part of the study was to compare impervious surface cover between neighborhoods that resembled what would be built under the Baseline scenario or the Reality Check scenario, rather than to draw comparisons between urban, suburban, and rural neighborhoods, the different methodologies should not be a concern.

URBAN NEIGHBORHOODS

National Land Cover Database Zone 59 Imperviousness Layer data from the U.S. Geological Survey was used to calculate the amount of pervious and impervious surface in each neighborhood in square feet.

SUBURBAN NEIGHBORHOODS

The two suburban neighborhoods, Tuscaloosa-Lakewood and Stadium Heights, showed no impervious surface according to the National Land Cover Database Impervious Layer. Since this is not possible, a likely explanation is that because the data was created through remote sensing, tree cover might have disguised impervious surfaces in this area. Therefore, the impervious surface data came from a polygon shapefile from Durham's GIS department showing impervious surfaces in Durham. This shapefile includes both building footprints and paved surfaces.

RURAL NEIGHBORHOODS

The results of the two rural neighborhoods, Briar Chapel and Windfall, was unable to be compared as data on building footprints and road widths were not yet available. The USGS National Land Cover Database layer was also not applicable because it dated from 2006; these two neighborhoods were not yet completed at that date.

RESULTS

For each neighborhood the following was calculated: the total impervious surface in feet, the impervious surface per capita, and the impervious surface per dwelling unit. The results confirmed that neighborhoods designed in a way that corresponds with Reality Check principles—such as compact development, density, and mixed use—produced far less impervious surface per capita and per dwelling unit than neighborhoods that more closely resembled sprawling, low density land uses with low street connectivity, separated uses, and orientation toward autos). The tables below illustrate these findings:

Percent impervious surface		
	Baseline	**Reality Check**
Urban	**Capital Boulevard**	**University Park**
Impervious surface	58.01%	24.48%
Permeable surface	41.99%	75.52%
Suburban	**Stadium Heights**	**Tuscaloosa-Lakewood**
Impervious surface	23.50%	21.82%
Permeable surface	76.50%	78.18%

Not only was the percent impervious surface dramatically lower for the entire neighborhood, but also the square footage of impervious surface was lower per capita and per dwelling unit in the neighborhoods that fit the Reality Check scenario.

Impervious surface per capita and per dwelling unit		
	Baseline	Reality Check
Urban	Capital Boulevard	University Park
Total Population	9069	9112
Square feet of impervious surface per capita	5068.77	1449.69
Total housing units	3942	4568
Square feet of impervious surface per housing unit	11661.25	2891.77
Suburban	Stadium Heights	Tuscaloosa-Lakewood
Total Population	1306	1383
Square feet of impervious surface per capita	3045.53	1551.06
Total housing units	475	667
Square feet of impervious surface per housing unit	8373.60	3216.07

In fact, impervious surface per capita and per dwelling unit in the Reality Check scenario neighborhoods was a small portion of what it was in the Baseline scenario. The table below illustrates this large difference by showing the amount of impervious surface in the Reality Check neighborhoods expressed as a percentage of the impervious surface in their matched Baseline neighborhoods.

Impervious surface in Reality Check scenario as a percentage of impervious surface in Baseline scenario		
	University Park	Tuscaloosa-Lakewood
Square feet of impervious surface per capita	28.60%	50.93%
Square feet of impervious surface per housing unit	24.80%	38.41%

The comparison of these two sets of neighborhoods demonstrates that development along the lines encouraged by the Reality Check principles has the potential to dramatically reduce impervious surface in the region, perhaps by as much as 50-75%.

SUMMARY

This first section of the environmental assessment shows that a future Triangle region that grows and develops based on the principles outlined in Reality Check will have different environmental outcomes than a business-as-usual or sprawl framework.

Climate Change and Energy Consumption

Sprawling development…

- Requires more energy and resources to construct
- Result in higher energy use for transportation
- Reduces land available for carbon sinks, such as forests

Impact on Human Health

- During the second half of the 20th century, sprawl became more widespread. Also during this time…
  - The proportion of overweight Americans rose from 24% to 64% of adults and
  - The percentage of gross domestic product spent on health care rose from 5.1% to 14%.
  - Asthma, which used to affect a very small portion of society, now affects 10% of Americans
- Denser cities with more extensive public transportation systems have lower automobile and pedestrian fatality rates

Viability of Ecosystems

- One USDA study identified the I-85 corridor from Raleigh to Atlanta as a key "hotspot" where "changes in land use and forest conditions portend important negative impacts on the services provided by forests."
- Sprawl means more pavement, and more pavement means less land for wildlife habitat, farmland, and open space
- Natural amenities are a key tourism draw in the Triangle region

Water/Sewer Infrastructure

According to our findings, the neighborhoods with Reality Check adopted principles will have lower water and sewer impacts and costs than comparable business-as-usual developments.

Open Space/Green Space

Our findings suggest that more study is needed to determine the exact character and amount of open space/green space per person in the comparison neighborhoods.

Impervious Surface

According to available data, the urban and suburban neighborhoods that were designed along the lines of the Reality Check principles exhibited significantly less impervious surface overall and per person and dwelling unit.

TRANSPORTATION IMPACTS: REALITY CHECK VS BASELINE

INTRODUCTION

The Baseline and Reality Check scenarios developed during Phase I of this workshop highlight the differences in a regional vision for future growth and development. Perhaps no issue is more central to these different visions than transportation. The ability of residents to travel to various destinations in the region conveniently and expeditiously—to their places of employment, to recreation, to commerce, etc.—is a critical component of economic vitality and quality of life.

Likewise, the effects of transportation patterns, investments, and infrastructure have significant cost implications for individuals, for whom transportation is typically a large percentage of household budgets, and for the regional leaders, who must weigh complex and difficult decisions about economic, fiscal, environmental, opportunity, and social costs. These costs are difficult to measure and even more so to forecast. However, this section will present—in very general terms—the cost savings resulting from transportation patterns in the Reality Check scenario versus the Baseline scenario.

Based on examinations of regional estimates generated in various scenarios developed by local Metropolitan Planning Organizations (CAMPO and DCHC), the DCRP transportation study group devised a method for estimating the number of vehicles miles traveled (VMT) daily and annually under the two different scenarios.[4] Our final estimates concluded that the VMT reductions under the Reality Check scenario would result in savings of approximately $512,060,435 annually.

Predictably, a development scenario in which population density increases generates fewer VMT than one in which growth perpetuates greater degrees of low-density sprawl, since the distances between households and destinations is shortened. We then compared these annual reductions in VMT to cost savings based on previous research about various costs per VMT. A summary of the cost savings of the Reality Check scenario over the Baseline scenario is presented below:

Costs per VMT	Best Estimate of Savings
Environmental Costs (2010 Dollars)	$16,645,854
Social Costs (2010 Dollars)	$343,356,850
Vehicle Operating Costs (2009 Dollars)	$152,057,730
Total VMT Cost Saving	**$512,060,435**

VMT METHODOLOGY AND FINDINGS

Because of the availability of consistent small-area level data, this study focuses exclusively on the core regional counties of Orange, Durham, and Wake. The analysis was based on regional models

[4] In both charts and text, "MPO" represents the model developed by CAMPO and DCHC, and "DCRP" refers to our model.

developed by CAMPO and DCHC for the Triangle Regional Model long-term transportation plan for the period of 2005-2035. The model generated VMT projections for each direction of travel during weekday morning peak periods, evening peak periods, and off-peak periods; we summed these projections for each segment to obtain VMT calculations for a "typical" future weekday. These VMT estimates are calculated for each roadway segment in the model's network, and we aggregated these estimates to develop a single VMT count for the three-county area. These aggregated estimates from CAMPO/DCHC formed the basis of an algorithmic comparison of our own growth scenarios to those developed during the long-term transportation planning process.

Basing our VMT estimates on established regional scenarios introduced both limitations and advantages. For instance, this methodology did not allow us to fully explore larger regional transportation changes, particularly in areas of outlying counties included in the development of our Baseline and Reality Check scenarios. Likewise, it did not allow us to compare areas within the three core counties in which our scenarios envisioned population and employment changes that differed somewhat from those delineated by the regional model. Additionally, it required making comparisons between our model—which projects population and employment through the year 2030—to the regional model, which establishes estimates for the year 2035. Finally, it required us to assume that the proportional relationship between increases in population density and VMT reduction in our scenarios would be identical to those established by DCHC and CAMPO.

However, the methodology posed considerable practical and analytical advantages. First, a full-scale modeling of the Baseline and Reality Check scenarios was simply beyond our capacity given the time and resources available to us. Secondly, basing our VMT calculations on those established by the regional MPOs allowed us to utilize the expertise inherent in their models, which include very similar assumptions about transit and road investments, increases in population density, and established regional conditions such as demographics, travel patterns, and the like.

Our estimation of VMTs for both our Baseline and Reality Check scenarios occurred in three steps. First, we analyzed the relationship between increases in population density and decreases in VMT in the "Baseline" and "Transit Notes" scenarios developed by the MPOs in their regional model. Based on their scenario forecasts for 2035, we calculated that for every 0.99% increase in population density, there was a corresponding -0.3% decrease in total daily VMT.

Regional Model 2035 Forecasts	
MPO Population per sq. mi. (Baseline)	1,372
MPO Population per sq. mi. (Transit Node)	1,385
Increase in Population Density	***0.99%***
MPO Daily VMT (Baseline)	67,024,585
MPO Daily VMT (Transit Node)	66,822,168
Decrease in Daily VMT	***-0.30%***

Secondly, we compared CAMPO's and our Baseline scenarios to determine our estimate for VMT in our model based on proportions. We determined that the VMT in our Baseline scenario could be calculated as follows, solving for the portion of the equation in red.

$$\frac{\text{Changes in Pop Density (MPO)}}{\text{Changes in VMT (MPO)}} = \frac{\text{Difference between Pop Densities (MPO - DCRP)}}{\text{Changes in VMT (MPO - DCRP)}}$$

The resulting value was 0.43%, meaning that the daily VMT in our Baseline scenario would be 0.43% higher than in the MPO "Baseline" scenario. Accordingly, our final estimate was that under our Baseline scenario, the daily number of VMT in the region would be 67,310,081.

MPO Daily VMT (Baseline)	67,024,585
Proportional Factor	0.43%
DCRP Daily VMT (Baseline)	**67,310,081**

Our calculation of VMT estimates for the Reality Check proceeded along similar lines. We assumed the same relationship between population increases and VMT decreases; namely, that for every 0.99% increase in population density, there would be a corresponding -0.3% decrease in daily VMT. Again, solving for the portion in red, our equation to determine the difference in VMT (in percentage terms) between our Baseline and Reality Check scenarios is as follows:

$$\frac{\text{\% change between population densities in MPO Baseline and Transit Node scenarios}}{\text{\% change between VMT in MPO Baseline and Transit Node scenarios}} = \frac{\text{\% change between population densities in DCRP Baseline and Reality Check scenarios}}{\text{\% change between VMT in DCRP Baseline and Reality Check scenarios}}$$

The resulting value was -1.23%, meaning that VMT estimates in our Reality Check scenario would be 1.23% lower than in our Baseline scenario. Accordingly, our final estimate was that under our Reality Check scenario, the daily number of VMT in the three counties would be 66,482,781.

DCRP Daily VMT (Baseline)	67,310,081
Proportional Factor	-1.23%
DCRP Daily VMT (Reality Check)	**66,482,871**

Under DCRP's Reality Check scenario, we have calculated that drivers in Wake, Orange, and Durham Counties would drive 215,074,583 fewer miles annually by the year 2030. We regard this number as a conservative estimate which, if anything, understates the impact of realigning development into transit-accessible, vibrant centers. For example, the regional models on which these estimates are based do not include outlying counties studied in the Reality Check process. The anticipation is that if greater numbers of localities adopted a vibrant centers model, VMT reductions would occur on a larger scale throughout the region. Likewise, regional models do not account for trips made by bicycle, walking, or other non-motorized modes. Encouraging development which allows residents to regularly commute or otherwise travel by these modes would further reduce VMT. Below is a summary of the calculations and savings.

Summary of VMT Estimates by Scenario

Daily VMT Estimates (Baseline)	67,310,081
Daily VMT Estimates (Reality Check)	66,482,871
Daily VMT Savings	***827,210***
Annual VMT Estimates (Baseline)	17,500,621,062
Annual VMT Estimates (Reality Check)	17,285,546,479
Annual VMT Savings	***215,074,583***

** Note: Annual estimates based on multiplying daily estimates by 260*

A final note on this methodology concerns the relationship between transit use and VMT. While the full scale and structure of rail and bus transit expansions in the area remains undetermined, it is clear that the "Transit Node" scenario developed by the MPOs and the Reality Check scenario developed by DCRP hinge on substantial investments in these areas.

Multiple studies of areas with high levels of public transit utilization suggest that as transit use increases, VMT decreases at an even higher rate; the relationship, in other words, is not linear but exponential.[5] These findings suggest that a successful suite of transit expansions which attracts high levels of ridership and shapes development patterns even modestly may yield greater reductions in regional VMT than is demonstrated in this report.

COST SAVINGS METHODOLOGY AND FINDINGS

The possibility of decreasing 215,074,583 VMTs annually under our Reality Check scenario could create significant cost savings for the Triangle. For every vehicle mile decreased, there is a decrease in the costs of external variables associated with driving. For our analysis, we looked at VMT savings in regards to environmental costs, social costs, and vehicle owner operating costs. Once these costs per mile were calculated, we were able to provide a best estimate of savings in regard to the reduction of VMTs associated with our Reality Check scenario.

ENVIRONMENTAL COSTS

FACTORS

Environmental costs are considered external costs normally borne by society as a whole rather than individuals. The environmental costs of transportation include those associated with noise pollution, air pollution, water pollution, and climate change. Environmental costs are usually measured in the aggregate for the nation as a whole, but when these costs are translated to a per mile basis, they total several cents per mile.

Air pollution costs comprise the largest portion of environmental costs since they have been extensively documented as a source of health problems and property damage. They are one of the most obvious external costs associated with the use of motor vehicles. Since air pollution from motor vehicles tends to be most heavily concentrated in urban areas, the health impacts of air pollution will be more greatly felt with the growth of the Triangle.

[5] A summary of these findings can be found on p. 47 of American Public Transit Association, "Recommended Practice for Quantifying Greenhouse Gas Emissions from Transit."

Water pollution costs are attributed to a variety of sources including leaking underground fuel tanks, large oil spills, contaminated urban runoff, and nitrogen deposition (nitrogen oxide). All of these factors can be attributed to automobile usage. In addition, urban growth has been acknowledged as a factor in reducing water quality. By reducing water quality, more costs and resources have to be devoted to cleaning contaminated water.

Noise pollution costs are somewhat harder to quantify than other environmental costs. In addition, noise impacts are quite localized, with urban areas' highest levels of vehicle noise pollution normally found on heavily traveled arterial streets and freeways. Higher-speed traffic also generates more noise than does lower-speed traffic. With a reduction of VMTs, the reduced costs of curtailing vehicle noises could bring about nominal savings.

Climate change has been at the forefront of many environmentally based efforts. Climate change costs are associated with increases in the concentration of greenhouse gases and motor vehicle travel. It is estimated that these produce as much as 30% of the United States' total production of carbon dioxide. Estimates of vehicle climate change costs consider variables such as fuel economy and quality, emission factors for vehicles, energy use at refineries, and other similar factors. A reduction in VMTs will create a related reduction in the variables associated with vehicle climate change.

ESTIMATES

The Transportation Research Board (TRB) "Costs of Sprawl" 2000 Report provides a set of environmental cost estimates per VMT, originally created by Delucchi. These estimates range from "low" to "high" to "best" for costs of air pollution, water pollution, noise pollution, and climate change. The estimates were originally in 1995 dollars but have been adjusted to 2010 dollars using the annual inflation figures provided by the Consumer Price Index. See table below.

Costs Per VMT (2010 USD)	Low Estimate	High Estimate	Best Estimate
Air Pollution	0.003	0.381	0.065
Water Pollution	0.000	0.001	0.001
Noise Pollution	0.000	0.011	0.001
Climate Change	0.003	0.028	0.010
Total	**0.005**	**0.422**	**0.077**

Since our transportation model has provided an annual savings of 215,074,583 VMTs, a simple savings estimate could be applied using the previous table. Using the inflated 2010 Delucchi figures, we see that the reduction of VMTs under the Reality Check scenario could result in savings of anywhere from $1.1 million to $90.7 million annually. As previously mentioned, most of the costs associated with environmental factors are associated with air pollution, reductions of which could provide annual savings of between $500,000 and $82 million alone. Using the best estimate figure, we can expect an annual environmental cost savings of over $16.6 million. See table below.

Total VMT Costs (2010 USD)	Low Savings	High Savings	Best Estimate of Savings
Air Pollution	$544,773	$82,018,663	$13,921,987
Water Pollution	$0	$302,652	$302,652
Noise Pollution	$0	$2,421,215	$302,652
Climate Change	$605,304	$6,053,038	$2,118,563
Total	**$1,150,077**	**$90,795,568**	**$16,645,854**

SOCIAL COSTS

FACTORS

Determining the social costs associated with VMTs is an important, but difficult part of calculating VMT costs. An array of social factors could be included in any analysis, but for our purposes, we will focus on nonmonetary and monetary externalities, government infrastructure and services, privately bundled and provided goods and services, and personal nonmarket costs.

For this study, other nonmonetary external costs include factors indirectly associated with motor vehicle ownership. These include factors like pain and suffering in motor vehicle accidents, nonmarket costs of travel delay, and nonmonetary costs of crimes and fire related to using or having motor vehicle goods, services, or infrastructure. Monetary externalities include the direct social factors associated with car ownership. This includes factors like monetary costs of accidents and travel delay and energy security costs of using oil.

Government infrastructure costs include the physical maintenance of roads along with services related to motor vehicles. Thus, government costs range from highway and road repair to highway patrol and other essential services.

There is also a private sector cost associated with VMT. Goods and services can be split between ones that are "bundled" and others that are "provided" in the public sector. Bundled costs include factors like free parking, while provided costs include factors like vehicle fuel.

Lastly, there is personal nonmarket costs associated with VMTs. These are costs that affect individuals based on societal actions. These factors include costs like personal risk in accidents and travel time when not subject to delay.

ESTIMATES

The Transportation Research Board (TRB) "Costs of Sprawl" 2000 Report provides a set of social cost estimates originally created by Delucchi. These estimates include both "low" and "high" estimates for nonmonetary and monetary externalities, government infrastructure and services, privately bundled and provided goods and services, and personal nonmarket costs. A "best" estimate cost was creating by taking the average of the low and high estimates. These estimates were originally in 1991 dollars but have been adjusted to 2010 dollars using the annual inflation figures provided by the Consumer Price Index. See table below.

Costs Per VMT (2010 USD)	Low Estimate	High Estimate	Best Estimate
Other nonmonetary external costs	0.029	0.154	0.092
Monetary externalities	0.033	0.071	0.052
Govt. infrastructure and service related to motor vehicle use	0.095	0.178	0.137
Goods and services bundled in the private sector	0.054	0.202	0.128
Goods and services provided in the private sector	0.594	0.701	0.648
Personal nonmarket costs	0.382	0.700	0.541
Total	**1.187**	**2.006**	**1.596**

Since our transportation model has provided an annual savings of 215,074,583 VMTs, a simple savings estimate could be applied using the previous table. Using the inflated 2010 Delucchi figures, we see that the reduction of VMTs under the Reality Check scenario could be anywhere from $255 million to $431 million annually. The biggest factor associated with social costs is goods and services provided in the private sector, which could provide annual savings between $127 million and $150 million. Using the best estimate figure, we can expect an annual social cost savings of over $343 million. See table below.

Total VMT Costs (2010 USD)	Low Estimate	High Estimate	Best Estimate
Other nonmonetary external costs	$6,339,922	$33,034,333	$19,687,127
Monetary externalities	$7,007,283	$15,349,286	$11,178,284
Govt. infrastructure and service related to motor vehicle use	$20,354,488	$38,373,215	$29,363,851
Goods and services bundled in the private sector	$11,678,804	$43,378,416	$27,528,610
Goods and services provided in the private sector	$127,799,488	$150,823,417	$139,311,453
Personal nonmarket costs	$82,085,311	$150,489,737	$116,287,524
Total	**$255,265,297**	**$431,448,404**	**$343,356,850**

VEHICLE OWNER OPERATING COSTS

FACTORS

Vehicle owner operating costs or user costs are those paid directly by the driver, such as the cost of fuel, maintenance, and tires. These costs also include fixed indirect costs, such as insurance, license, registration, taxes, depreciation, and finance. A vehicle owner incurs fixed costs independently from the number of miles driven annually, and the fixed cost per vehicle-mile traveled can vary substantially.

For this analysis, we used figures provided by the 2009 "Your Driving Costs" Report from the American Automobile Association (AAA). This report covered all of the operating and fixed indirect

costs previously mention. Several factors were considered when determining theses costs and are outlined below.

In regard to operating costs, the price of fuel was based on $2.30 per gallon, which was the late-2008 U.S. price from AAA's Fuel Gauge Report. Obviously, fuel is perhaps the most volatile factor in estimating automobile costs. AAA used this standard cost despite the fact that fuel costs have risen and will continue to rise over the course of our analysis. Maintenance costs included parts and labor for routine maintenance and the price of a comprehensive extended warranty with one warranty claim deductible of $100. In addition, other wear-and-tear items are expected to require service during five years of operation. Tires costs are based on the price of one set of replacement tires and include mounting, balancing and sales tax.

In regard to fixed indirect costs, AAA based its insurance costs on a full-coverage policy for a married male with a good driving record, living in a small city with an average commute. The policy includes $100,000/$300,000 coverage with a $500 deductible for collision and a $100 deductible for comprehensive coverage. License, registration, and taxes include all governmental taxes and fees payable at time of purchase, as well as annual fees. Depreciation is based on the difference between vehicle purchase price and trade-in value after five years. Finance costs are based on a five-year loan at 6% interest with a 10% down payment. The loan amount includes taxes and the first year's license fees.

ESTIMATES

Once all of these factors were complied, AAA was able to determine an average cost per mile based on the composite average driving costs of the fifteen top selling sedans for 2008. This estimate included costs for operating at 10,000, 15,000, and 20,000 miles per year. For this analysis, we used the low end operating estimate of 10,000 miles per year. In 2009, the average cost per mile was $0.707 per VMT, assuming 10,000 miles of driving per year.

Based on the estimate of $0.707 per VMT, a simple savings estimate could be applied using the annual savings of 215,074,583 VMTs from our Reality Check scenario. By multiplying these two factors, we see a potential savings of over $152 million annually in regard to vehicle owner operating costs.

TOTAL ANNUAL SAVINGS

By combining all of the cost estimates created above, we could see a substantial savings under our Reality Check scenario. These estimates include the best estimate environmental and social savings determined from the TRB report and the vehicle owner operating savings from the AAA report. In total, the Reality Check scenario could create an annual savings of over $512 million from the reduction of VMTs alone.

Costs Per VMT	Best Estimate of Savings
Environmental Costs (2010 Dollars)	$16,645,854
Social Costs (2010 Dollars)	$343,356,850
Vehicle Owner Operating Costs (2009 Dollars)	$152,057,730
Total VMT Cost Savings	**$512,060,435**

MONEY MATTERS: COMPARING THE REVENUES AND COSTS

INTRODUCTION

The purpose of a traditional fiscal impact analysis is to compare the costs incurred by local governments to the revenue that is generated in a fiscal year to determine the net gains or losses caused by development. Due to the limitations and regional scale of this study, the goal of this analysis is to consider the magnitude the two scenarios will create in terms of revenue and costs and compare the two scenarios. The 2030 Baseline Scenario, as previously discussed, is a sprawling development pattern based on future projections for the 15-county geographical region surrounding the Triangle. The Baseline scenario will be compared to the 2030 Reality Check scenario to determine if a more compact, controlled-growth development pattern is a more cost effective alternative in terms of delivering quality public services to both residents and employees.

The following sections are a discussion of the methods and results of determining the revenues and costs of the Baseline and Reality Check scenarios. The Reality Check scenario produces higher regional tax revenue and lower average costs per county than the Baseline scenario. Although this analysis only identifies additional revenue from property taxes and not total county revenue, it is anticipated that the Reality Check scenario will shift people and jobs into areas that will generate enough revenue to provide for the costs of public services. Under the Baseline scenario, uncontrolled growth into rural and undeveloped counties will lead to higher costs than revenues as rural counties invest in new public service infrastructure for their growing populations, a cost that is much lower in developed counties because they are already equipped with county-wide public service infrastructure networks.

REVENUES

The population shifts between the Baseline and Reality Check scenarios- shifting growth to the core counties (Orange, Durham, and Wake) and to existing developed municipalities within all of the counties- resulted in a shift of growth into municipal tax bases, resulting in *higher regional tax revenues*. Local governments depend on these property tax revenues to fund capital improvement projects and provide public services such as water, sewer, emergency services, government administration, and education. While some counties will lose new potential tax bases under the Reality Check scenario, they will also not bear the costs associated with the new development.

In order to project the expected revenue for each of the scenarios, many assumptions were made and kept consistent across the two scenarios in order to make a valid comparison. Comparing the Baseline scenario to the Reality Check scenario, tax revenue generated from additional household units under the Reality Check scenario increased by 13.65% more than the Baseline scenario with only a 0.51% increase in number of households. Tax revenue from employment centers increased 4.84% with only a 0.51% increase in the total employment. See tables below for expected revenue under the Baseline scenario and Reality Check scenario by county and major municipality.

Household Revenue:

COUNTY	SELECTED MAJOR MUNICIPALITIES	Pop2007	Pop2030S1	Pop2030S2	Average HH Size (US Census)	Total HH in 2007	Total HH in 2030S1	Total HH is 2030S2	Median Value of Owner-Occupied Housing (US Census)	Current Tax Rate (per $100) (County Data)	Taxes per HH	Revenue Attributable to Growth in S1	Revenue Attributable to Growth in S2	Percent Change
Alamance	County	143,155	187,946	180,877	2.42	59,155	77,664	74,742	$ 134,300	0.52	$ 698.36	$ 12,925,720.15	$ 10,885,617.85	-15.78%
Chatham	County	63,134	91,492	91,500	2.66	23,734	34,395	34,398	$ 180,700	0.60	$ 1,084.20	$ 11,558,716.85	$ 11,561,784.68	0.03%
	Pittsboro	4,689	6,155	8,354	2.34	2,004	2,630	3,570	$ 120,500	0.30	$ 363.91	$ 227,988.06	$ 569,970.15	150.00%
	Siler City	10,279	14,232	17,196	2.86	3,594	4,976	6,013	$ 85,600	0.45	$ 385.20	$ 532,411.05	$ 931,618.32	74.98%
Durham	County	254,740	353,630	370,826	2.36	107,941	149,843	157,130	$ 173,900	0.71	$ 1,234.69	$ 51,736,650.03	$ 60,733,241.91	17.39%
Franklin	County	56,456	86,842	71,930	2.66	21,224	32,647	27,041	$ 115,400	0.87	$ 1,003.98	$ 11,468,773.04	$ 5,840,315.16	-49.08%
	Franklinton	1,745	5,057	5,057	2.41	724	2,098	2,098	$ 75,600	0.68	$ 514.08	$ 706,486.71	$ 706,486.71	0.00%
	Louisburg	3,111	4,417	6,222	2.24	1,389	1,972	2,778	$ 92,500	0.54	$ 494.88	$ 288,529.80	$ 687,301.84	138.21%
	Wake Forest	638	15,132	22,379	2.79	229	5,424	8,021	$ 228,800	0.51	$ 1,166.88	$ 6,061,920.69	$ 9,092,881.03	50.00%
Granville	County	55,667	73,865	69,252	2.63	21,166	28,086	26,332	$ 127,600	0.83	$ 1,052.70	$ 7,284,043.57	$ 5,437,615.78	-25.35%
	Butner	6,648	13,928	13,928	2.53	2,628	5,505	5,505	$ 98,500	0.25	$ 246.25	$ 708,577.08	$ 708,577.08	0.00%
	Oxford	8,641	9,964	12,141	2.45	3,527	4,067	4,956	$ 96,500	0.60	$ 579.00	$ 312,660.00	$ 827,142.86	164.55%
Harnett	County	106,056	158,301	155,298	2.69	39,426	58,848	57,732	$ 117,600	0.73	$ 852.60	$ 16,559,140.15	$ 15,607,306.38	-5.75%
	Angier	10,871	17,049	16,682	2.46	4,419	6,930	6,781	$ 96,100	0.53	$ 509.33	$ 1,279,122.25	$ 1,203,136.84	-5.94%
	Lillington	7,954	10,547	12,879	2.26	3,519	4,667	5,699	$ 91,000	0.52	$ 473.20	$ 542,923.72	$ 1,031,199.12	89.93%
Johnston	County	157,256	283,401	238,458	2.78	56,567	101,943	85,776	$ 131,800	0.78	$ 1,028.04	$ 46,648,239.50	$ 30,028,477.48	-35.63%
	Selma	7,168	11,864	10,191	2.61	2,746	4,546	3,905	$ 71,000	0.53	$ 376.30	$ 677,051.65	$ 435,844.79	-35.63%
	Smithfield	12,821	22,212	18,865	2.30	5,574	9,657	8,202	$ 100,500	0.57	$ 572.85	$ 2,338,971.46	$ 1,505,350.17	-35.64%
	Johnston TAZ/Clayton	81,468	168,130	137,244	2.52	32,329	66,718	54,462	$ 108,800	0.54	$ 587.52	$ 20,204,626.29	$ 13,003,776.00	-35.64%
Lee	County	56,376	81,419	75,391	2.71	20,803	30,044	27,820	$ 129,800	0.75	$ 973.50	$ 8,996,073.99	$ 6,830,665.13	-24.07%
	Sanford	29,284	42,294	40,179	2.68	10,927	15,781	14,992	$ 128,300	0.54	$ 692.82	$ 3,363,279.18	$ 2,816,520.11	-16.26%
Moore	County	83,332	156,426	169,129	2.75	30,303	56,882	61,501	$ 171,000	0.47	$ 795.15	$ 21,134,797.85	$ 24,807,812.56	17.38%
Orange	County	127,344	156,958	179,334	2.34	54,421	67,076	76,639	$ 250,600	0.86	$ 2,150.15	$ 27,211,317.46	$ 47,772,196.11	75.56%
	Town of Chapel Hill	50,440	63,986	86,362	2.22	22,721	28,823	38,902	$ 353,200	0.49	$ 1,744.81	$ 10,646,472.60	$ 28,232,879.72	165.19%
	Carrboro	17,264	18,569	18,569	2.20	7,847	8,440	8,440	$ 172,800	0.59	$ 1,018.48	$ 604,145.72	$ 604,145.72	0.00%
	Hillsborough	10,687	16,991	16,991	2.48	4,309	6,851	6,851	$ 117,100	0.67	$ 788.79	$ 2,005,042.11	$ 2,005,042.11	0.00%
Person	County	37,640	43,782	41,862	2.43	15,490	18,017	17,227	$ 116,200	0.65	$ 755.30	$ 1,909,075.14	$ 1,312,445.62	-31.25%
	City of Roxboro	8,672	9,286	9,286	2.30	3,770	4,037	4,037	$ 72,900	0.61	$ 447.61	$ 119,491.34	$ 119,491.34	0.00%
Vance	County	43,583	46,087	45,766	2.68	16,262	17,197	17,077	$ 95,700	0.78	$ 748.37	$ 699,227.05	$ 609,568.30	-12.82%
	City of Henderson	16,126	16,727	17,227	2.47	6,529	6,772	6,974	$ 75,100	0.59	$ 439.34	$ 106,898.92	$ 195,833.13	83.19%
Wake	County	832,590	1,560,026	1,603,537	2.59	321,463	602,327	619,126	$ 217,700	0.53	$ 1,162.52	$ 326,508,665.59	$ 346,038,519.13	5.98%
	City of Raleigh	331,139	461,285	604,568	2.30	143,973	200,559	262,856	$ 200,900	0.37	$ 750.36	$ 42,459,368.60	$ 89,204,606.34	110.09%
	Town of Cary	103,928	135,160	151,435	2.69	38,635	50,245	56,296	$ 274,900	0.33	$ 907.17	$ 10,532,614.66	$ 16,021,161.78	52.11%
Warren	County	19,919	19,520	19,545	2.48	8,032	7,871	7,881	$ 80,500	0.60	$ 483.00	$ (77,708.47)	$ (72,839.52)	-6.27%
Wilson	County	77,970	90,960	90,658	2.51	31,064	36,239	36,119	$ 86,400	0.73	$ 630.72	$ 3,264,164.46	$ 3,188,343.65	-2.32%
Total			3,390,655	3,403,363	0.37%		1,319,079	1,326,541	0.57%		$ -	$651,545,478	$740,484,035	13.65%

Commercial Revenue:

COUNTY	SELECTED MAJOR MUNICIPALITIES	Emp2008	Emp2030S1	Emp2030S2	Employment Growth in S1	Employment Growth in S2	Est. Sq.Ft per Worker	Est. Value per Sq.Ft.	Current Tax Rate (per $100) (County Data)	Revenue Attributable to Growth in S1	Revenue Attributable to Growth in S2	Percent Change
Alamance	County	81,969	102,622	101,141	20,653	19,172	485	$ 100	0.52	$ 520,868,660	$ 483,518,816.92	-7.17%
Chatham	County	40,810	62,726	62,721	21,916	21,912	485	$ 100	0.60	$ 637,767,009	$ 637,632,027.69	-0.02%
	Pittsboro	3,030	3,977	4,972	947	1,942	485	$ 100	0.30	$ 13,870,709	$ 28,444,474.00	105.07%
	Siler City	6,642	9,197	10,474	2,555	3,832	485	$ 100	0.45	$ 55,762,875	$ 83,633,400.00	49.98%
Durham	County	228,771	322,704	322,704	93,933	93,933	485	$ 100	0.71	$ 3,234,582,855	$ 3,234,573,943.74	0.00%
Franklin	County	21,944	31,847	31,847	9,903	9,903	485	$ 100	0.87	$ 417,857,085	$ 417,857,085.00	0.00%
	Franklinton	741	1,074	1,482	333	741	485	$ 100	0.68	$ 10,982,340	$ 24,438,180.00	122.52%
	Louisburg	1,197	1,736	2,394	539	1,197	485	$ 100	0.54	$ 13,985,703	$ 31,059,157.50	122.08%
	Wake Forest	8,220	11,919	16,440	3,699	8,220	485	$ 100	0.51	$ 91,494,765	$ 203,321,700.00	122.22%
Granville	County	25,475	33,046	33,046	7,571	7,571	485	$ 100	0.83	$ 302,934,638	$ 302,934,637.50	0.00%
	Butner	8,916	10,846	10,846	1,930	1,930	485	$ 100	0.25	$ 23,401,250	$ 23,401,250.00	0.00%
	Oxford	2,038	3,552	3,552	1,514	1,514	485	$ 100	0.60	$ 44,057,400	$ 44,057,400.00	0.00%
Harnett	County	42,381	60,950	61,559	18,569	19,178	485	$ 100	0.73	$ 652,947,374	$ 674,346,425.00	3.28%
	Angier	2,147	5,059	5,839	2,912	3,692	485	$ 100	0.53	$ 74,852,960	$ 94,902,860.00	26.79%
	Lillington	3,564	4,432	5,412	868	1,848	485	$ 100	0.52	$ 21,890,960	$ 46,606,560.00	112.90%
Johnston	County	69,750	107,999	107,999	38,249	38,249	485	$ 100	0.78	$ 1,446,959,670	$ 1,446,959,670.00	0.00%
	Selma	5,029	6,395	6,395	1,366	1,366	485	$ 100	0.53	$ 35,113,030	$ 35,113,030.00	0.00%
	Smithfield	8,995	11,727	11,727	2,732	2,732	485	$ 100	0.57	$ 75,526,140	$ 75,526,140.00	0.00%
	Johnston TAZ/Clayton	16,552	43,326	43,326	26,774	26,774	485	$ 100	0.54	$ 701,211,060	$ 701,211,060.00	0.00%
Lee	County	35,977	50,524	50,524	14,547	14,547	485	$ 100	0.75	$ 529,147,125	$ 529,147,125.00	0.00%
	Sanford	18,688	26,246	26,246	7,558	7,558	485	$ 100	0.54	$ 197,944,020	$ 197,944,020.00	0.00%
Moore	County	43,390	78,775	88,940	35,385	45,550	485	$ 100	0.47	$ 798,020,213	$ 1,027,266,375.00	28.73%
Orange	County	79,883	117,893	117,893	38,010	38,010	485	$ 100	0.86	$ 1,581,710,130	$ 1,581,710,130.33	0.00%
	Town of Chapel Hill	55,557	84,925	87,152	29,368	31,595	485	$ 100	0.49	$ 703,627,912	$ 756,984,605.00	7.58%
	Carrboro	6,343	7,019	7,019	676	676	485	$ 100	0.59	$ 19,324,068	$ 19,324,068.40	0.00%
	Hillsborough	9,484	16,828	16,828	7,344	7,344	485	$ 100	0.67	$ 239,925,542	$ 239,925,542.40	0.00%
Person	County	15,696	20,371	20,371	4,675	4,675	485	$ 100	0.65	$ 147,379,375	$ 147,379,375.00	0.00%
	City of Roxboro	6,035	8,101	8,101	2,066	2,066	485	$ 100	0.61	$ 61,523,414	$ 61,523,414.00	0.00%
Vance	County	19,266	21,270	21,270	2,004	2,004	485	$ 100	0.78	$ 76,005,708	$ 76,005,708.00	0.00%
	City of Henderson	3,853	4,254	4,254	401	401	485	$ 100	0.59	$ 11,377,373	$ 11,377,372.50	0.00%
Wake	County	560,244	816,927	818,414	256,683	258,170	485	$ 100	0.53	$ 6,647,833,017	$ 6,686,344,829.82	0.58%
	City of Raleigh	312,827	362,906	388,405	50,079	75,578	485	$ 100	0.37	$ 907,168,565	$ 1,369,076,575.50	50.92%
	Town of Cary	77,071	105,313	107,377	28,242	30,306	485	$ 100	0.33	$ 452,013,210	$ 485,047,530.00	7.31%
Warren	County	5,775	7,110	7,110	1,335	1,335	485	$ 100	0.60	$ 38,848,500	$ 38,848,500.00	0.00%
Wilson	County	47,821	61,546	61,546	13,725	13,725	485	$ 100	0.73	$ 485,933,625	$ 485,933,625.00	0.00%
Total			1,896,310	1,907,085	0.57%					$ 21,273,848,279	$ 22,303,376,613.31	4.84%

When reviewing these results, it is important to keep in mind that these conclusions are based on a set of broad assumptions. These assumptions are: no inflation, constant municipal borders, and all new worker space and new households will be new to tax rolls. Housing revenues are calculated by determining the new additional households from the new additional population in each scenario and then multiplying those averages by the property tax rate per county and average 2009 housing price. Average household size is estimated from US Census Data for each county. Average housing prices per county are based on the US Census median value of owner-occupied housing units. The employment revenues are determined in a similar fashion following several assumptions. Non-residential space is held constant at an assumed 485 square feet per employee. The average working place value is assumed to be $100 per square foot. These assumptions were held constant in analyzing both scenarios with only the location of new residents and employment varied. While any of the assumptions may be attacked on its merits, holding them constant in analyzing both scenarios, allows for a comparison of how the change in jurisdictional location of residents and employment will affect revenues on a percentage basis.

COSTS

Population and employment growth will result in fiscal impacts that could positively or negatively influence a county's ability to provide services to its residents. This section of the analysis begins to identify whether implementing a compact development pattern that emphasizes controlled growth is less expensive to provide services in the long-term than the current sprawling development pattern.

For this analysis, it is assumed that all local services are delivered at the county level. Expected expenses include the administrative costs of providing public services such as emergency services, public works, recreation, and education as well as major capital improvement projects. On average, the majority of county level spending is allocated to providing a public education for residents under 18. Therefore a more detailed description of the impacts of school siting is included in the following section of the analysis. The costs determined for each scenario are based on the estimated additional public service costs each county is expected to incur with the allocated increase in residents and employees.

Future costs for each county in the region are determined using the Rutgers Fiscal Impact Analysis Model used within the Transit Cooperative Research Program's report Cost of Sprawl—2000 (2002). The public service cost to each county is calculated on a per capita and per employee basis. Residents and employees both benefit from local services and governmental funds are appropriated to provide services for both groups; however, it is assumed that non-residential induced costs (employee costs) would exclude the cost of education. As a result, costs are much higher per resident than per employee and residents make up a larger percentage of the total costs generated.

The expected costs of additional residents associated with future growth are calculated by multiplying the per capita cost by the future population. The additional employment growth is multiplied by a per worker cost. The TCRP report (2002) estimates a national average overall per capita expenditure of $2,267 for an uncontrolled growth scenario and $2,203 for a controlled growth scenario. The average national per work expenditure for an uncontrolled growth scenario is $120 and $117 for a controlled growth scenario. Due to the uncertain fluctuation in both residential

and nonresidential property value in future decades, as well as the pending 2010 Census data, national average costs per resident and employee are applied to both the Baseline scenario and the Reality Check scenario as a constant for all counties. See tables below for a summary of the total additional costs to each county under the Baseline and Reality Check scenarios.

County	Projected Population Growth	Additional Residential Cost	Projected Employment Growth	Additional Employment Cost	Total Additional Cost to County
Alamance	44,791	$101,541,197	20,653	$2,478,360	$104,019,557
Chatham	28,358	$64,288,513	21,916	$2,629,967	$66,918,480
Durham	98,890	$224,183,630	93,933	$11,271,960	$235,455,590
Franklin	30,386	$68,885,062	9,903	$1,188,360	$70,073,422
Granville	18,198	$41,254,866	7,571	$908,520	$42,163,386
Harnett	52,245	$118,439,415	18,569	$2,228,331	$120,667,746
Johnston	126,145	$285,970,715	38,249	$4,589,880	$290,560,595
Lee	25,043	$56,772,481	14,547	$1,745,640	$58,518,121
Moore	73,094	$165,704,098	35,385	$4,246,200	$169,950,298
Orange	29,614	$67,134,938	38,010	$4,561,200	$71,696,138
Person	6,142	$13,923,914	4,675	$561,000	$14,484,914
Vance	2,504	$5,676,568	2,004	$240,480	$5,917,048
Wake	727,436	$1,649,097,412	256,683	$30,801,960	$1,679,899,372
Warren	-399	-$904,533	1,335	$160,200	-$744,333
Wilson	12,990	$29,448,330	13,725	$1,647,000	$31,095,330

County	Projected Population Growth	Additional Residential Cost	Projected Employment Growth	Additional Employment Cost	Total Additional Cost to County
Alamance	37,722	$83,100,491	19,172	$2,243,129	$85,343,620

Chatham	28,366	$62,490,156	21,912	$2,563,675	$65,053,831
Durham	116,086	$255,737,864	93,933	$10,990,131	$266,727,995
Franklin	15,474	$34,088,458	9,903	$1,158,651	$35,247,109
Granville	13,585	$29,927,755	7,571	$885,807	$30,813,562
Harnett	49,242	$108,479,932	19,178	$2,243,826	$110,723,758
Johnston	81,202	$178,888,570	38,249	$4,475,133	$183,363,703
Lee	19,015	$41,890,045	14,547	$1,701,999	$43,592,044
Moore	85,797	$189,010,791	45,550	$5,329,350	$194,340,141
Orange	51,990	$114,534,733	38,010	$4,447,170	$118,981,903
Person	4,222	$9,302,134	4,675	$546,975	$9,849,109
Vance	2,183	$4,808,980	2,004	$234,468	$5,043,448
Wake	770,947	$1,698,396,241	258,170	$30,205,890	$1,728,602,131
Warren	-374	-$823,922	1,335	$156,195	-$667,727
Wilson	12,688	$27,952,248	13,725	$1,605,825	$29,558,073

Comparing the Baseline scenario and the Reality Check scenario, there is apparent cost savings found in a denser, controlled-growth development pattern. Ten counties out of the 15-county region will see a reduction in total public service costs if a controlled growth pattern is implemented as opposed to the baseline projection. In total, the Reality Check scenario will reduce costs over $54 million compared to the total cost of the Baseline scenario (see table below).

County	2030 Baseline Scenario	2030 Reality Check Scenario	Difference
Alamance	$104,019,557	$85,343,620	-$18,675,937
Chatham	$66,918,480	$65,053,831	-$1,864,649
Durham	$235,455,590	$266,727,995	$31,272,405
Franklin	$70,073,422	$35,247,109	-$34,826,313
Granville	$42,163,386	$30,813,562	-$11,349,824
Harnett	$120,667,746	$110,723,758	-$9,943,988
Johnston	$290,560,595	$183,363,703	-$107,196,892
Lee	$58,518,121	$43,592,044	-$14,926,077
Moore	$169,950,298	$194,340,141	$24,389,843
Orange	$71,696,138	$118,981,903	$47,285,765
Person	$14,484,914	$9,849,109	-$4,635,805
Vance	$5,917,048	$5,043,448	-$873,600
Wake	$1,679,899,372	$1,728,602,131	$48,702,759
Warren	-$744,333	-$667,727	$76,606
Wilson	$31,095,330	$29,558,073	-$1,537,257
Total	**$2,960,675,664**	**$2,906,572,700**	**-$54,102,964**

Under the Baseline scenario, the average county expenditure will be $197,378,378--$3.6 million higher than the average cost under the Reality Check scenario of $193,773,513. In addition to the total county savings, a Reality Check scenario will reduce the spending in rural, undeveloped counties and target those developed central counties that are more able to absorb a higher rate of growth. The table below shows the distribution of costs by percentage of the total costs. In the Reality Check scenario, those rural and undeveloped county areas will hold a smaller percentage of the overall costs as expensive public service provision pressures are alleviated and growth is absorbed by more developed central counties.

Naturally, those counties projected to increase in population and employment at a faster rate relative to others (Wake, Durham, Orange) are estimated to have an increase in total county cost. In a denser, more compact development pattern, residential and employment growth will be directed to these already developed urban areas in an effort to create a job-housing balance and to support transit. In doing so, total county costs are higher than the Baseline scenario. However, it is expected

that with the additional growth in population and employment there will be an increase in tax-base revenue that will offset the majority, if not all of these costs.

County	Percentage of Total Costs—Baseline	Percentage of Total Costs—Reality Check
Alamance	3.5%	2.9%
Chatham	2.3%	2.2%
Durham	8.0%	9.2%
Franklin	2.4%	1.2%
Granville	1.4%	1.1%
Harnett	4.1%	3.8%
Johnston	9.8%	6.3%
Lee	2.0%	1.5%
Moore	5.7%	6.7%
Orange	2.4%	4.1%
Person	0.5%	0.3%
Vance	0.2%	0.2%
Wake	56.7%	59.5%
Warren	0.0%	0.0%
Wilson	1.1%	1.0%

IMPACTS OF SCHOOL SITING

As mentioned previously, providing public education services represents a significant expenditure to localities within the region. According to the Wake County Annual Operating and Capital Budget for 2000-2001, over $289 million was spent on education - roughly 51% of the county's budget (Renkow, 2001). Based on a study done for Cabarrus County, the average cost of school construction per student following minimum statewide standards is $19,839 for an elementary school, $21,067 for a middle school, and $26,278 for a high school (TischlerBise, 2006). Following this trend and estimating an increase in the region's student population of 318,860 students by 2030, would result in the capital investment of over $6.8 billion[6]. The location of these new schools

[6] This was calculated by subtracting the 2030 baseline population projection from the 2007 Population (1,275,437=3,390,655-2,115,218) then estimating that every fourth person was a school-age child (approximately 25% of Wake County's population is under 18)(318860=1,275,437/4). The cost of school construction was

will have a great impact on the expense of providing educational services (including land cost, construction cost, support facilities, bus services), student performance and health, as well as development patterns.

The national trend of constructing larger schools on the edge of town, known as "school sprawl" or "school giantism," has been shaped by two main school siting policies and has led to a wide variety of negative impacts (Passmore, 2002). Minimum size standards accepted by the state that call for 10 acres for an elementary school, 15 acres for a middle school, and 30 acres for a high school (plus an additional acre for every 100 students), force localities to construct larger schools away from urban centers where large parcels of land are available and less expensive (SRTSNP,2007). Funding formulas that favor new construction over rehabilitation (such as the 60% rule that limits state funding to rehabilitation projects that are less than 60% of the cost to replace the school) has also led to the abandonment of older neighborhood schools (Passmore, 2002).

In a paper compiled for the Funders' Network for Smart Growth and Livable Communities, Sam Passmore compared the success rates of two school types- a small neighborhood school (less than 300 students) and a larger (1,000 or more students) school. He found that smaller schools have lower drop-out rates, better standardized test scores, greater participation rates in extracurricular activities, fewer violent crimes, higher teacher satisfaction, and an increased level of parental and community involvement (Passmore, 2002). Because of lower drop-out rates, the cost per graduate for the smaller schools were actually less than the larger school counterparts, negating the theory that large economies of scale are necessary to provide adequate educational services (Passmore, 2002).

As childhood obesity and asthma rates have increased rapidly over the last 30 years (according to a 2008 report by the Centers for Disease Control, childhood obesity has more than tripled), ways to increase physical activity levels of students and decrease ozone levels are needed. The ability of students to walk to school, determined by the distance to the school and the pedestrian environment along the route, has greatly decreased as neighborhood schools close and new schools are built on the outskirts of town. In 1969, 48% of students walked or biked to school, but by 2001 less than 15% biked or walked (EPA, 2003). Because of the increased auto-dependency, communities around schools experience a 30% increase in traffic during morning school hours (EPA, 2003).The U.S. Environmental Protection Agency estimated that making schools more walkable could result in a 15% reduction in harmful emissions that lead to ozone and respiratory diseases such as asthma (2003). Five million children suffer from asthma resulting in 14 million lost school days per year (EPA, 2003). Siting schools within existing neighborhoods would help improve the physical and respiratory health of the children they are meant to serve.

School siting has greater implications on a locality's overall growth pattern. Like other infrastructure improvements, schools on the edge of town can attract additional development to the surrounding area and increase residential property values (Passmore, 2002). Under performing schools in inner cities can cause families to leave for higher performing school districts in the suburbs, reducing property values. Schools constructed as part of infill development and preserved older neighborhood schools can also better serve joint purposes (shared playing fields,

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calculated assuming that of the population growth, for every six children- 3 would be in elementary school ($3,162,924,330=159,429*$19,839), 2 would be in middle school ($2,239,135,939=106,286*$21,067) and 1 would be in high school (1,396,497,228=53,143*$26,278) for a total of $6,798,557,498 in construction costs for new schools rounded to $6.8 billion.

parks, libraries, and assembly locations) within population centers of the community (Passmore, 2002).

Although a quantitative comparison between the cost of constructing a new school on the outskirts of town and rehabilitating an existing neighborhood school or constructing a new school on an infill site has not been done, the qualitative advantages- more walkable schools, better student performance, and the reinvestment in a central community assets-make a persuasive case for returning to smaller, neighborhood schools.

CONCLUSION

Overall, this cost analysis shows that residential growth can have a large impact on county expenditure, especially in counties not currently equipped to supply adequate public services. In a denser, more compact scenario, growth will be targeted to areas that are developed and are already prepared with sophisticated public services. In doing so, developed areas will be able to absorb demand in a way that minimizes the costs to the county and maximizes revenue expenditure in making relatively small adjustments to adapt. Under the expected projected growth numbers of the Baseline scenario, rural and less developed counties will incur elevated public service costs as they try to meet the demand with new staff, infrastructure, and service boundary expansion. In the Reality Check scenario, the directed growth into developed areas has the potential to reduce costs that may have otherwise been incurred by rural and less developed counties and allow for developed counties to utilize existing surplus capacity to meet additional public service demands.

This report provides a set of growth scenarios and cost implications based on the degree to which various counties and municipalities in the region adopt a “vibrant centers” approach to growth management, infrastructure investment, and public service allocation. As population in the area increases dramatically over the next twenty years, policies regulating land use, transportation, open space, fiscal activity, and the like have far-reaching implications for quality of life, environmental protection, regional efficiency, economic growth, and public amenities. The purpose of this study has been to demonstrate the relative benefits of envisioning and implementing sustainable, carefully planned, and high-quality growth patterns which maximize the current and projected capacity of certain areas.

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