Chapter 3 - Existing Conditions

A number of factors have contributed to changing travel patterns and transportation system performance in the SR 316/University Parkway corridor. They include: residential and commercial growth in metro Atlanta, improved accessibility made possible by SR 316 itself, extensions of sewer and water service, rising school enrollments, facilities expansions at the University of Georgia, as well as a strong economy. In combination, these developments have changed travel patterns and place new demands on the corridor's entire transportation network. This chapter profiles the study's findings on growth and development in the corridor, a description of the existing road system, an analysis of safety conditions, and a description of traffic patterns.

3.1 Demographics

Current demographic information, growth trends, and horizon year projections are important in describing the environment or background in which transportation infrastructure decisions are made. This section presents historical trends of population and employment within the study area over the past 30 years. These data sets were vital to projecting population and total employment numbers for the horizon year. In addition, the study collected data on households by categories including low income, race, and ethnicity. This information was crucial in identifying concentrations of low income or minority households within the study area so that a preliminary identification of potential environmental justice issues could be addressed.

3.1.1 Population

The following population numbers were obtained from U.S. Census Bureau.

Gwinnett County. As one of the fastest growing counties in the United States during the last 30 years, its population figures show that between 1970 and 2000, the number of persons rose from 73,644 in 1970 to 588,488 in 2000, a seven-fold increase. On average, Gwinnett added more than 171,000 persons every ten years. The average annual growth rate was 7% per year. This information is reflected in Figure 3-1.

Barrow County. It experienced modest, but steady growth during the last 30 years. The number of persons almost tripled between 1970 and 2000, climbing from 16,986 to 46,144. Population grew by only 4,491 people from 1970 to 1980.

More recently, however, 16,090 were added between 1990 and 2000. The average annual growth rate exceeded 3% per year. The population numbers are presented in Figure 3-2.

Figure 3-1
Gwinnett County Population Trends

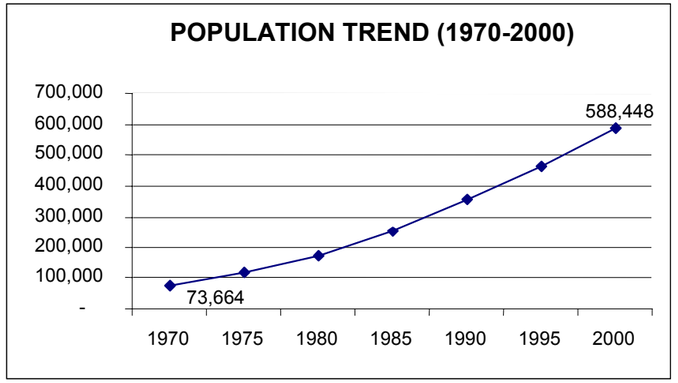
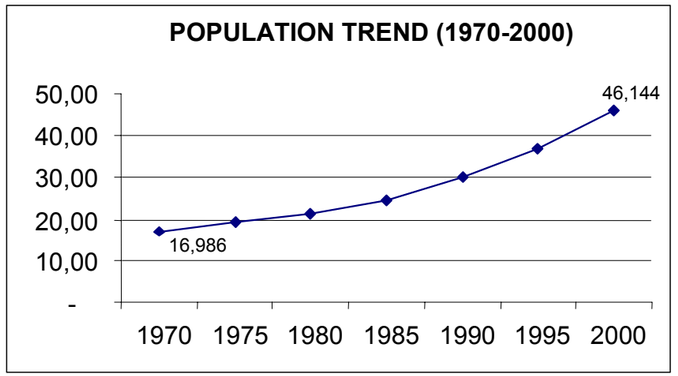
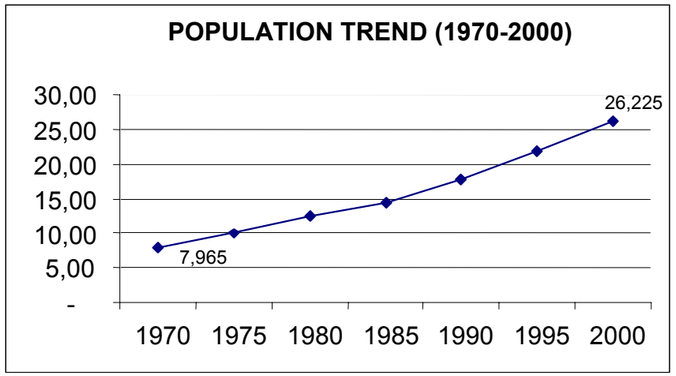


Figure 3-2
Barrow County Population Trends



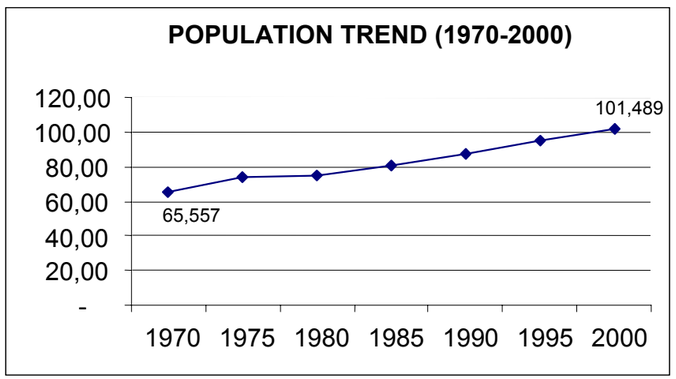
Oconee County. This county experienced modest, but steady growth during the last 30 years. The study area did not include all of Oconee County, so portions of the County south and east of Watkinsville are not reflected in the study's analysis. Oconee's population more than tripled from 1970 to 2000, climbing from 7,965 to 26,225. From 1970 to 1980 population grew by only 4,561 people. During the last decade, however, 8,428 persons were added. The average annual growth rate was 4% per year. Population numbers for the portion of the county within the study area are presented in Figure 3-3.

Figure 3-3
Oconee County Population Trends



Athens-Clarke County. It experienced extremely steady growth during the last 30 years. For the purposes of this study, portions of Clarke County were not included in the demographic figures -- areas northeast, east and southeast of Athens are not reflected. Athens-Clarke's population grew slightly more than 50% from 1970 to 2000, rising from 65,557 to 101,489. From 1970 to 1980 population grew by only 9,466 people. Unlike the other counties, Athens-Clarke's growth rate from 1990-2000 was similar to its change between 1970 and 1980. During the last decade, population grew by 13,666 persons. The average annual growth rate was 1.5% per year. Population numbers are presented in Figure 3-4.

Figure 3-4
Athens-Clarke County Population Trends

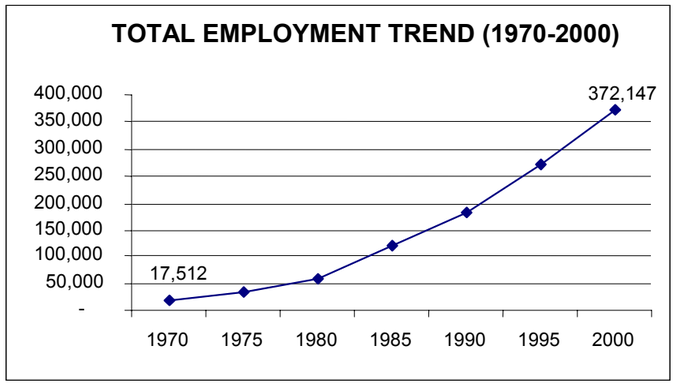


3.1.2 Total Employment

During the past 10 years, the growth rate of commercial development in the study area has outpaced residential development. Using employment estimates from Woods & Poole (a Washington, D.C. based firm specializing in demographic information services), the study found that total employment in the study area grew at a faster rate between 1990 and 2000 than population growth.

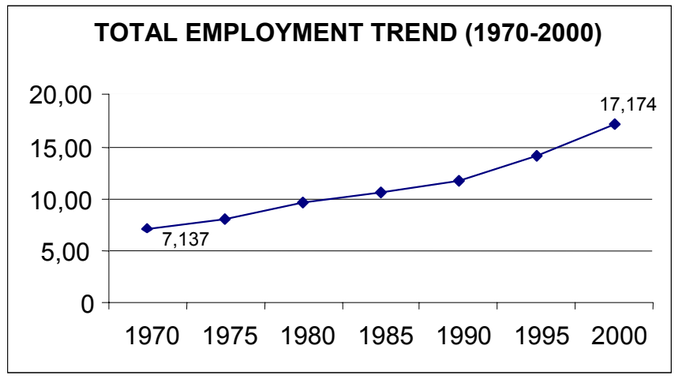
Gwinnett County. Its growth as an employment center has been as prolific as its residential growth. Total employment rose from 17,512 in 1970 to 372,147 in 2000 — more than a 20-fold increase. Employment gains have risen precipitously during the last 30 years. Total employment grew by just 41,574 from 1970 to 1980. More recently, however, 189,378 jobs were added between 1990 and 2000. The average annual growth rate was 10.5% per year over the 30-year time span. Total employment figures for the 30-year period between 1970 and 2000 are presented in Figure 3-5.

Figure 3-5
Gwinnett County Total Employment Trends



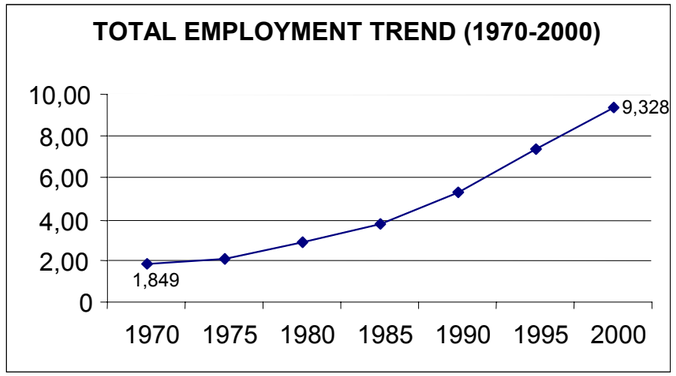
Barrow County. This county experienced modest growth in total employment during the last 30 years. The number of jobs more than doubled between 1970 and 2000, climbing from 7,137 to 17,174. The rate of employment growth during the past 10 years far exceeds that experienced earlier. Total employment grew by 2,561 from 1970 to 1980. In contrast, from 1990 to 2000, 5,360 jobs were added. Overall, the average annual growth rate was 3% per year. Between 1970 and 2000. Total employment numbers are presented in Figure 3-6.

Figure 3-6
Barrow County Total Employment Trends



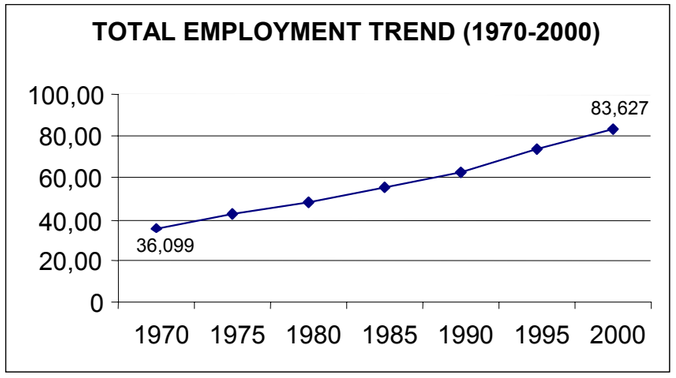
Oconee County. The SR 316 study area did not include all of Oconee County and the portions of the county south and east of Watkinsville are not reflected in the total employment numbers. The total number of jobs grew from 1,849 to 9,328 during the 30-year time frame. During the last decade 3,994 jobs were added in the county. The average annual growth rate was 5.5% per year. Employment figures for most of the County are presented in Figure 3-7.

Figure 3-7
Oconee County Total Employment Trends



Athens-Clarke County. Portions of Clarke County are not included in the demographic figures and jobs in areas northeast, east and southeast of the City of Athens are not reflected. It experienced steady growth during the last 30 years, particularly during the 1990-2000 decade. Athens-Clarke's total employment grew more than 130% from 1970 to 2000, rising from 36,099 to 83,627. From 1970 to 1980 employment grew by only 12,565. In contrast, during the last decade, jobs grew by 20,862. The average annual growth rate was 2.8% per year. Employment figures are presented in Figure 3-8.

Figure 3-8
Athens-Clarke County Total Employment Trends



3.1.3 Environmental Justice

Throughout the study's development, potential environmental justice (EJ) issues were identified for consideration and a preliminary analysis of EJ considerations was completed. These were addressed through focused demographic studies and proactive execution of the study's public involvement process. Environmental justice has been defined by the U.S. Environmental Protection Agency (EPA) as:

> *The fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the developing, implementation, and enforcement of environmental laws, regulations and policies. Fair treatment means that no group of people, including racial, ethnic, or socio-economic group should bear a disproportionate share of the negative environmental consequences resulting from industrial, municipal, and commercial operations or the execution of federal, state, local and tribal programs and policies.*

Each of Barrow, Gwinnett, Athens-Clarke and Oconee, contain (at the census tract level of geography) potential EJ populations. As illustrated in Figure 3-9 on the following page, there is one significant concentration of minority or low-income population directly along the SR 316 corridor itself that the study could address as an EJ area. It is a concentrated population of African-Americans in Barrow County between Winder and SR 316. While significant concentrations were found in other sections of the counties, both at the census tract and small community levels of geography, they were much further removed from the SR 316 Corridor in comparison with the Winder census tract. Based on the existing conditions under investigation, no readily identifiable environmental justice issues were discovered. The public involvement process reinforced this conclusion.

A statistical analysis by census tract for each county in the study area, as well as Athens-Clark County, was conducted in order to determine an overall impression of the types of potential EJ communities within the study area. In addition, the overall percentage of these groups within each of the counties within the study area was established. Statistical concentrations were calculated for the African American population, Asian population, other single-race populations, Native American population, Pacific Islanders population, and two-or-more-races population. Within each county, population by census tract was determined by race from the 2000 Census and a total percentage by race for each county was determined. These percentages are displayed in Table 3-1. This preliminary analysis set gave an initial illustration of areas that should be considered in more detail. Any census tract that had an overall concentration of a specific minority population greater than the countrywide average was identified as having a minority concentration. For example, Gwinnett County's population is 13% African American; any census tract in Gwinnett County that had more than a 13% African American population was identified as a minority concentration census tract. It should be noted that the EJ analysis in this study is a preliminary identification of potential EJ communities and issues; a more detailed EJ analysis will be performed on specific SR 316 improvement projects as they are developed and implemented.

Table 3-1
County Population by Race

Race	Gwinnett	Barrow	Oconee	Athens-Clarke
Total Population	588,448	46,144	26,225	101,489
White	73.0%	85.0%	90.0%	65.0%
Black	13.0%	10.0%	6.0%	27.0%
Indian	0.3%	0.3%	0.2%	0.2%
Asian	7.0%	2.0%	1.0%	3.0%
Islander	0.0%	0.0%	0.1%	0.0%
Other	4.0%	2.0%	1.0%	3.0%
2+	2.0%	1.0%	1.0%	1.0%

Source: 2000 Census of Population

From this initial analysis it was determined that there are three primary minority groups concentrated in the study area: African American, Asian and Hispanic. The study then conducted a more in-depth analysis on these three population groups to determine the possibility of adverse impact.

In order to identify populations, or neighborhoods, which are minority and low-income, a reference population was established. This reference population is the total population affected by policies or programs that are being evaluated. For the purpose of evaluating the environmental justice consequences of potential actions in this study, Gwinnett County was compared to Atlanta Regional Commission (ARC) averages, Athens-Clarke and Oconee Counties were compared to the ACORTS Region, and Barrow County percentages were used as a base for that county since there were no regional comparison populations for Barrow County. All base data is taken from the 2000 Census of Population.

EPA guidance suggests the use of a multiplier of 1.2 times the calculated percent of the minority populations for the reference area (i.e., the ARC Region, the ACORTS Region and Barrow County). Any census tract percentage of residents above the minority thresholds established for the study area is identified as potential EJ areas of concern. The EJ minority thresholds for the study area are identified in Table 3-2. Thus, any census tract in the study area that has a percent minority larger than the percentage of minority concentration listed in Table 3-2 will be considered an EJ. In addition, interviews were conducted with key municipal and county officials and contacts to find out detailed information regarding specific neighborhoods and potential small concentrations of minorities that may not show up as such in the census area analysis. These areas were identified and mapped in the full EJ analysis.

Table 3-2
EJ Threshold Comparison

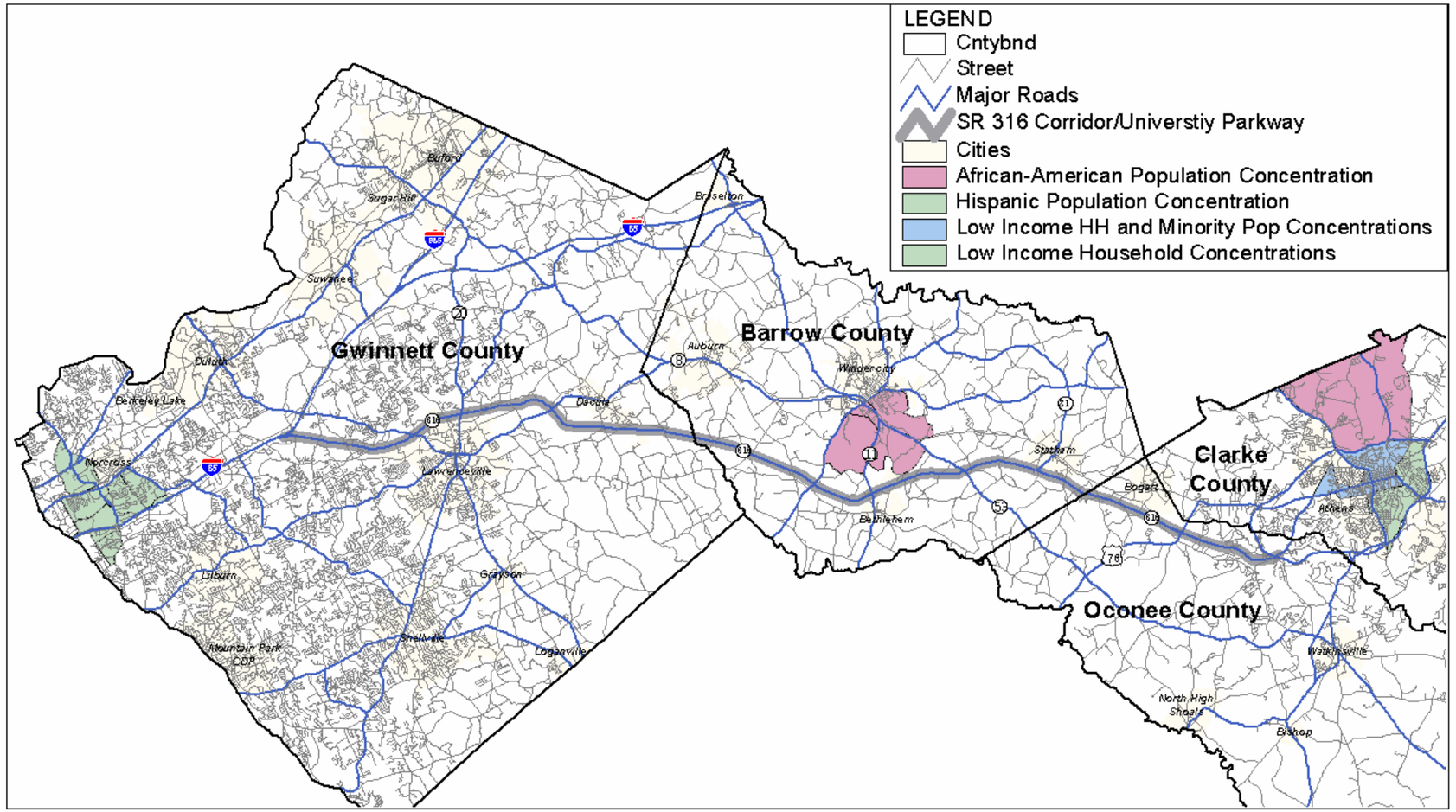
Race	EJ Region	% Minority Population	Threshold with EJ Multiplier
African-American	ARC	32%	39%
	ACORTS	23%	28%
	Barrow	10%	12%
Asian	ARC	4%	6%
	ACORTS	3%	3%
	Barrow	2%	3%
Hispanic	ARC	7%	9%
	ACORTS	6%	7%
	Barrow	3%	4%

Census tracts highlighted in Figure 3-9 denote concentrations of minorities and low-income households, but not strictly in accordance with the procedure described earlier. The highlighted areas follow EPA guidance, but add the following stipulation: the overall minority population percentage must comprise at least 15% of the total population. The full environmental justice analysis strictly followed the guidelines, but the minority "concentrations" presented herein more truly reflect census tracts containing communities of a significant size that are comprised of minority populations. Low-income census tracts depicted in the figure have a mean household income below the poverty threshold for a family of four, $17,463.

Census tracts with concentrations of low-income households in Athens-Clarke County are shown in the vicinity of the University of Georgia campus. This appears to denote where student housing is located as opposed to the presence of low-income families. There were no census tracts in Gwinnett, Barrow or Oconee Counties where the mean household income fell below the poverty line.

In light of SR 316's stature as an existing major transportation corridor, each county has based transportation and land use decisions to take full advantage of the importance of this corridor as a major commuting and commercial corridor. Because existing and future employment generators and attractors are planned for this corridor, any improvements to the SR 316 Corridor should provide improved access to employment opportunities, recreation facilities, education and housing choices for all people within the study area and metro Atlanta. Except for the possibility of a temporary disruption to commuting patterns due to construction, this study does not indicate that residential populations will be adversely affected. This study's preliminary analysis indicates there should not be a negative or disproportionately adverse effect on human health or to the surrounding environment in minority and/or low-income communities.

Figure 3-9
Environmental Justice Areas of Concern



3.2 Roadway Characteristics

Although there are currently a total of four lanes with the same cross-sectional design for the entire length of SR 316 between I-85 and the Athens Loop/SR 10, there are significant differences in how the roadway functions and is perceived by drivers over its 40 mile length. The roadway has three distinct areas. Starting at I-85 traveling eastbound, the first 5.5 miles of SR 316 is an urban, limited access freeway design with grade-separated intersections/interchanges. The posted speed limit is 55 miles per hour.

The next 5.0 miles, between Lawrenceville and Dacula, is an urban arterial type of roadway with frequently spaced at-grade intersections. Through this portion, the posted speed limit is 55 miles per hour.

Except for a one-mile portion, the remaining 29.5 miles to the east through Gwinnett, Barrow and Oconee counties is a rural arterial type of roadway traversing rolling hills. The intersections are at-grade and are spaced much further apart than in the urban portion. The posted speed limit is 65 miles per hour up until the edge of the Athens area, where the speed limit is reduced to 45 miles per hour. The exception to the rural arterial design occurs on the edge of Bogart in Oconee County around the US 78/SR 10 interchange.

The basic cross-sectional design for SR 316 is illustrated in Figure 3-10. Although there are major differences in the intersection/interchange design (access type) within the corridor, the basic cross-section design remains the same. It includes two 12 feet wide travel lanes in each direction. The different directions of travel are separated by 6-foot shoulders on the inside of the traveled way as well as a 32 feet wide grassy median. Along with 10-foot shoulders on the outside edge of the traveled way, the existing total width is 112 feet from outside of shoulder to outside of shoulder.

This cross-sectional design is generally perceived by motorists as similar to a rural freeway design for the rural 29.5-mile portion in northeast Gwinnett, Barrow County and Oconee County. Based on findings from the study's safety analysis, this perception creates a conflict with motorists who are crossing, getting onto, or getting off of SR 316 at any of the 26 existing at-grade intersections along the rural portion. Motorists traveling the full length of the corridor tend to drive this portion as if it were a freeway. They share the road with a significant number of motorists traveling at slower speeds because they have a trip starting or ending in Barrow County or Oconee County and are in the process of crossing SR 316, slowing down to exit SR 316 or getting onto SR 316 at an intersection.

Gwinnett County. SR 316 has 16.3 miles in Gwinnett County, which is 41% of the entire corridor. Of this, 5.5 miles are urban, limited access freeway; 5.0 miles are urban arterial with at-grade intersections; and the remaining 5.8 miles are rural arterial with at-grade intersections. The existing intersection access and spacing on SR 316 in Gwinnett County is displayed in Table 3-3.

On the urban freeway portion, interchanges are spaced approximately 1.1 miles apart, which is typical for this type of roadway and area type. Within the next 5.0 mile section, intersection spacing changes significantly; there are ten at-grade intersections, or one every 0.5 miles, on the urban arterial portion north of Lawrenceville. In contrast, the 5.8-mile rural arterial portion has three at-grade intersections, which results in an intersection density of approximately one every 1.9 miles.

Table 3-3
Gwinnett County Intersections/Interchanges

Cross Street Name	Move-ments	Access Design	Traffic Control	Milepost	Distance
Urban Freeway					
I-85	Partial	Grade-Separated	None	0.00	0.00
Boggs	Partial	Grade-Separated	None	0.47	0.47
Sugarloaf Pkwy.	Full	Grade-Separated	None	2.45	1.98
Riverside Pkwy.	Full	Grade-Separated	None	3.93	1.48
SR 120/Duluth Hwy.	Full	Grade-Separated	None	5.13	1.20
Urban Arterial					
Walther Blvd.	Partial	At-Grade	Stop	5.78	0.65
Collins Ind. Way	Partial	At-Grade	Stop	6.17	0.39
Collins Hill	Full	At-Grade	Signal	6.53	0.36
SR 20/Buford Dr.	Full	At-Grade	Signal	7.14	0.61
Hi-Hope	Full	At-Grade	Signal	7.90	0.76
Progress Center	Full	At-Grade	Stop	8.29	0.39
Cedars	Full	At-Grade	Signal	9.04	0.75
Hurricane Tr.	Full	At-Grade	Signal	9.92	0.88
Fence	Full	At-Grade	Stop	10.44	0.52
US 29/Winder Hwy.	Full	At-Grade	Signal	10.69	0.25
Rural Arterial					
Harbins	Full	At-Grade	Signal	12.97	2.28
Williams Farm	Partial	At-Grade	Stop	14.44	1.47
Drowning Ck.	Full	At-Grade	Stop	15.18	0.74
County Line	None	None	-NA-	16.34	16.34

Barrow County. There are 15.9 route miles in Barrow County, which accounts for 40% of the corridor length. All of SR 316 within the county is classified as a rural arterial type of roadway with at-grade intersections providing access to and from side streets. Existing intersection access and spacing on SR 316 in Barrow County is shown in Table 3-4.

There are 14 at-grade intersections, or an average of one every 1.1 miles through Barrow County. Compared to the rural arterial portion in northeast Gwinnett County, intersections are more closely spaced in Barrow County. Of these 14 intersections, six are controlled by traffic signals. Therefore, the driving behavior of motorists traveling completely through Barrow County on SR 316 is directly influenced by a traffic signal on average of every 2.64 miles.

Table 3-4
Barrow County Intersections/Interchanges

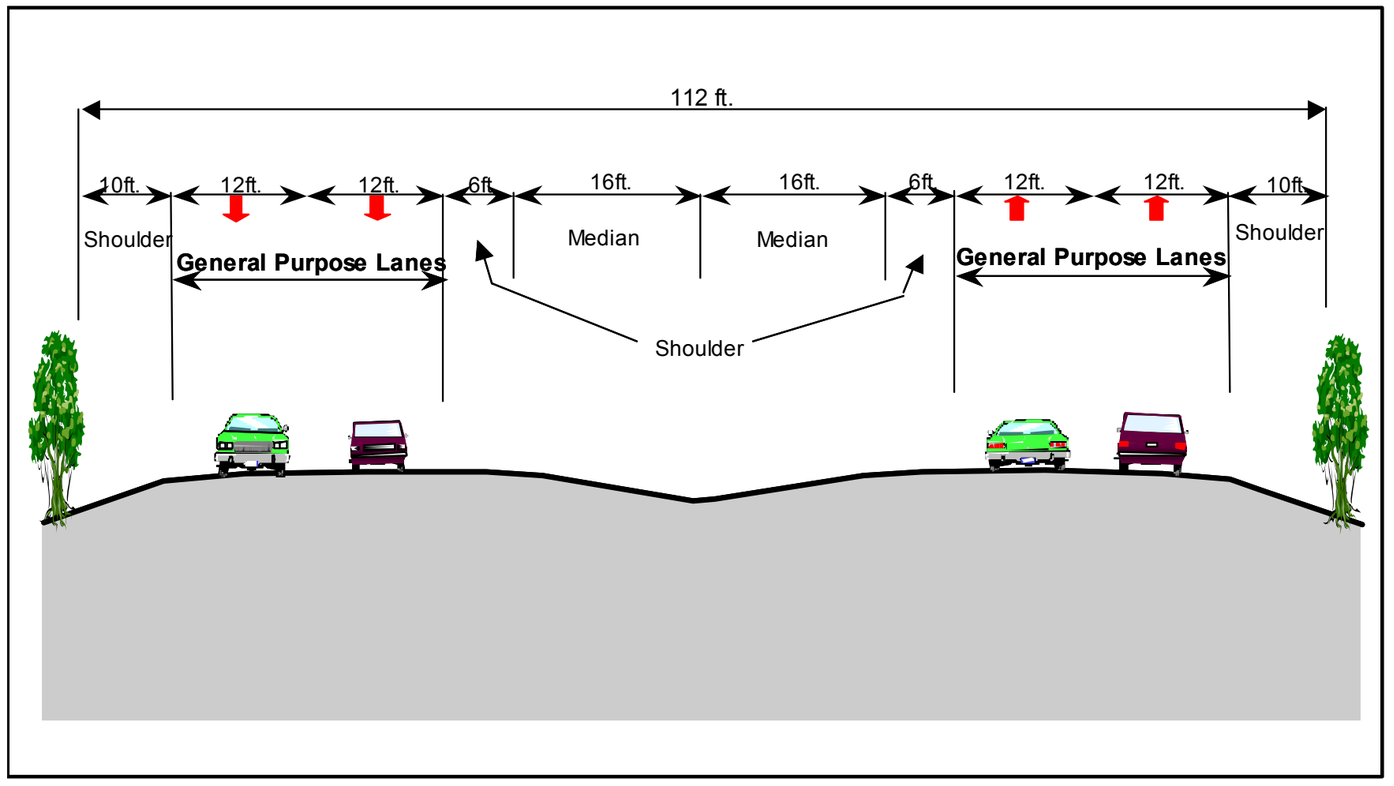
Cross Street Name	Move-ments	Access Design	Traffic Control	Milepost	Distance
Rural Arterial					
County Line	None	None	None	0.00	0.00
Kilcrease	Full	At-Grade	Stop	0.81	0.81
Patrick Mill	Full	At-Grade	Signal	2.22	1.41
SR 324/Carl Bethlehem	Full	At-Grade	Signal	3.95	1.73
SR 81/Charles Floyd	Full	At-Grade	Signal	4.89	0.94
Harry McCarty	Full	At-Grade	Stop	6.19	1.30
SR 11/Monroe Hwy.	Full	At-Grade	Signal	7.27	1.08
Harrison Mill	Full	At-Grade	Stop	8.32	1.05
Smith Cemetary Road	Full	At-Grade	Stop	9.02	0.70
Jackson Trail	Full	At-Grade	Stop	9.85	0.83
SR 53/Hog Mountain	Full	At-Grade	Signal	10.95	1.10
Wall	Full	At-Grade	Stop	12.36	1.41
McCarty	Full	At-Grade	Stop	13.39	1.03
SR 324/Statham	Full	At-Grade	Signal	13.90	0.51
Barber Creek Road	Full	At-Grade	Stop	14.93	1.03
Craft Road	Full	At-Grade	Stop	15.47	0.54
County Line	None	None	None	15.89	0.42

Oconee County. There are 7.5 route miles of SR 316 in the county, accounting for almost 20% of the corridor's total length. It is currently classified as a rural arterial type of roadway. With the exception of a grade-separated interchange at US 78/SR 10, SR 316 in Oconee County has mostly at-grade intersections providing access to and from its cross streets. Existing intersection access and spacing on SR 316 through Oconee County is presented in Table 3-5. There are ten existing at-grade intersections or an average of one every 0.75 miles. Intersection spacing is, on average, more frequent than the rural arterial portions in either Gwinnett or Barrow counties. Traffic signals control movements at three Oconee intersections: Jimmy Daniel; Oconee Connector; and the Athens Loop/SR 10.

Table 3-5
Oconee County Intersections/Interchanges

Cross Street Name	Move-ments	Access Design	Traffic Control	Milepost	Distance
Urban Freeway					
County Line	None	None	None	0.00	0.00
Dials Mill Ext.	Full	At-Grade	Stop	0.42	0.42
Dials Mill	Full	At-Grade	Stop	0.71	0.29
Pete Dickens	Full	At-Grade	Stop	1.46	0.75
McNutt Creek	Full	At-Grade	Stop	2.09	0.63
Mars Hill	Partial	At-Grade	Stop	2.81	0.72
US78/M. Moina Hwy.	Full	Grade-Separated	None	3.86	1.05
Julian Dr.	Full	At-Grade	Stop	4.61	0.75
Jimmy Daniel	Full	At-Grade	Signal	5.70	1.09
Virgil Langford	Partial	At-Grade	Stop	6.43	0.73
Oconee Connector	Full	At-Grade	Signal	6.88	0.45
SR10/Athens Loop	Full	Grade-Separated	Signal & Stop	7.50	0.62

Figure 3-10
Existing Roadway Cross Section



3.3 Safety

For the entire corridor, safety on SR 316 was the most pressing concern voiced at the study's Issues Forums (which were public meetings held in each county of the study area). In light of this, the study completed a comprehensive analysis of accident data so that safety issues would be fully considered in the formulation of recommendations for SR 316. Surprisingly, the investigation suggested that experience on SR 316 has not been entirely different from that experienced on comparable highways elsewhere in the state. If all accidents on SR 316 were grouped into a single class, the accident rate on SR 316 is not significantly different from rates experienced on comparable roadways elsewhere in Georgia. However, if only severe types of accidents are grouped together, the study found that these types of accidents occur more frequently on SR 316 than on comparable highways elsewhere in the State. Severe accidents were those where one or more persons was either injured or killed.

Safety analysis for this study was completed with respect to intersections and segments along a portion of the roadway having the same functional classification. Cross-sectional designs, intersection spacing and intersection configuration are generally related to the functional classification of a roadway.

In analyzing accident data on SR 316, the study distinguished different accident types according to severity. The category of "Total Accidents" is comprised of both "Severe Accidents" and "Property Damage-Only Accidents". "Severe Accidents" are typically broken down into two different classes:

- Injury – An accident involving one or more vehicles with at least one individual non-fatally injured; and
- Fatal – An accident involving one or more vehicles in which one or more individuals is fatally injured.

Accident statistics are listed in Table 3-6 by severity and for each county in the study area. Of the 13 fatal accidents that occurred between 1995 and 1997, all were located in either Barrow or Gwinnett counties. Six of fatal accidents occurred in Gwinnett County and seven in Barrow County. More fatal accidents were located in Barrow County even though there were nearly five times as many total accidents in Gwinnett compared to Barrow County.

Analysis shows that Barrow County has the highest severe accident rating of all counties in the study area. Between 1995 and 1997, approximately 40% of all accidents on SR 316 in Barrow County included an injury or fatality. In Gwinnett County, approximately 29% of all accidents were classified with an injury or fatality. Oconee County has a slightly lower percentage of approximately 28%.

Table 3-6
Number of Accidents By County and Severity (1995-1997)

County	Route Miles	Daily Traffic Range	Number of Accidents			Total Accidents
			Property Damage	Injury	Fatal	
Gwinnett	16.34	22,000-86,000	961	388	6	1,355
Barrow	15.89	15,000-25,000	172	106	7	285
Oconee	7.96	15,000-34,000	133	53	0	186

Differing types of roadway sections on SR 316 through the corridor may explain the relative difference in accident severity for each section. In Barrow County, which had the highest severe accident rate in the study area, all of the major cross streets meet SR 316 at an at-grade intersection. In contrast, US 78/SR 10 in Oconee County (the highest volume cross street in the county), intersects SR 316 as a grade-separated interchange. Between 1995 and1997, there were no fatal accidents on SR 316 in Oconee County. In Gwinnett County, traffic congestion caused by high traffic volumes tends to slow drivers' speeds; in absolute terms there were more accidents in Gwinnett County yet a smaller percentage of them were severe.

Vehicle speeds on SR 316 in Barrow County tend to be higher than in comparable portions in Gwinnett County. As a result, there is potentially added conflict between vehicles on SR 316 and those crossing, getting onto, or getting off of SR 316 at the existing at-grade intersections. In absolute terms, there are fewer total accidents in Barrow County compared to Gwinnett County, however when they do occur in Barrow County they typically involve higher speed differentials between vehicles and thus more severe.

Within each county of the study area, there are specific locations, especially at signalized intersections, where accidents are concentrated. Figure 3-11 shows the number of accidents on SR 316 between 1995 and 1997 by their location at individual intersections and over individual segments of the roadway.

3.3.1 Intersections

Most of the relatively higher accident intersections are located in Gwinnett County on the 5.0-mile portion classified functionally as an urban principal arterial. These intersections include:

- Buford Drive (SR 20) which averages more than 30 accidents per year;
- Collins Hill Road which averages between 21 and 30 accidents per year;
- Hi-Hope Road which averages between 11 and 20 accidents per year; and
- Cedars Road which averages between 11 and 20 accidents per year.

Another Gwinnett County intersection with a relatively higher accident frequency is Winder Highway (SR 8). This location is situated in a transition area, i.e., where SR 316 changes from an urban principal arterial to a rural principal arterial. ON average, more than 30 accidents per year took place at this intersection between 1995 and 1997.

There are two more intersections that experienced a relatively higher accident frequency during the 1995-1997 time period. In Barrow County, the SR 11 intersection averaged between 11 and 20 accidents per year. In Oconee County, the Mars Hill intersection fell into the 11-20 per year category based on 1995-1997 accident experience. GDOT recently eliminated turning movements through the median at the Mars Hill intersection; consequently, future accident frequency is anticipated to drop significantly at this location.

There is an intersecting cross street in Oconee County whose accident experience indicates the substantial safety improvements could be expected by reconstructing an at-grade intersection to a grade-separated interchange. Prior to 1996, SR 316 and US 78/SR 10 crossed as an at-grade intersection. By 1996, it was reconstructed by GDOT to the existing grade-separated interchange. Before this improvement, there were 20 accidents at or near the intersection in 1994 and 17 more in 1995. After the grade-separation, five accidents were recorded there in 1996 and also in 1997. In this case, grade-separation led to a 75% reduction in total accidents on SR 316 at US 78/SR 10.

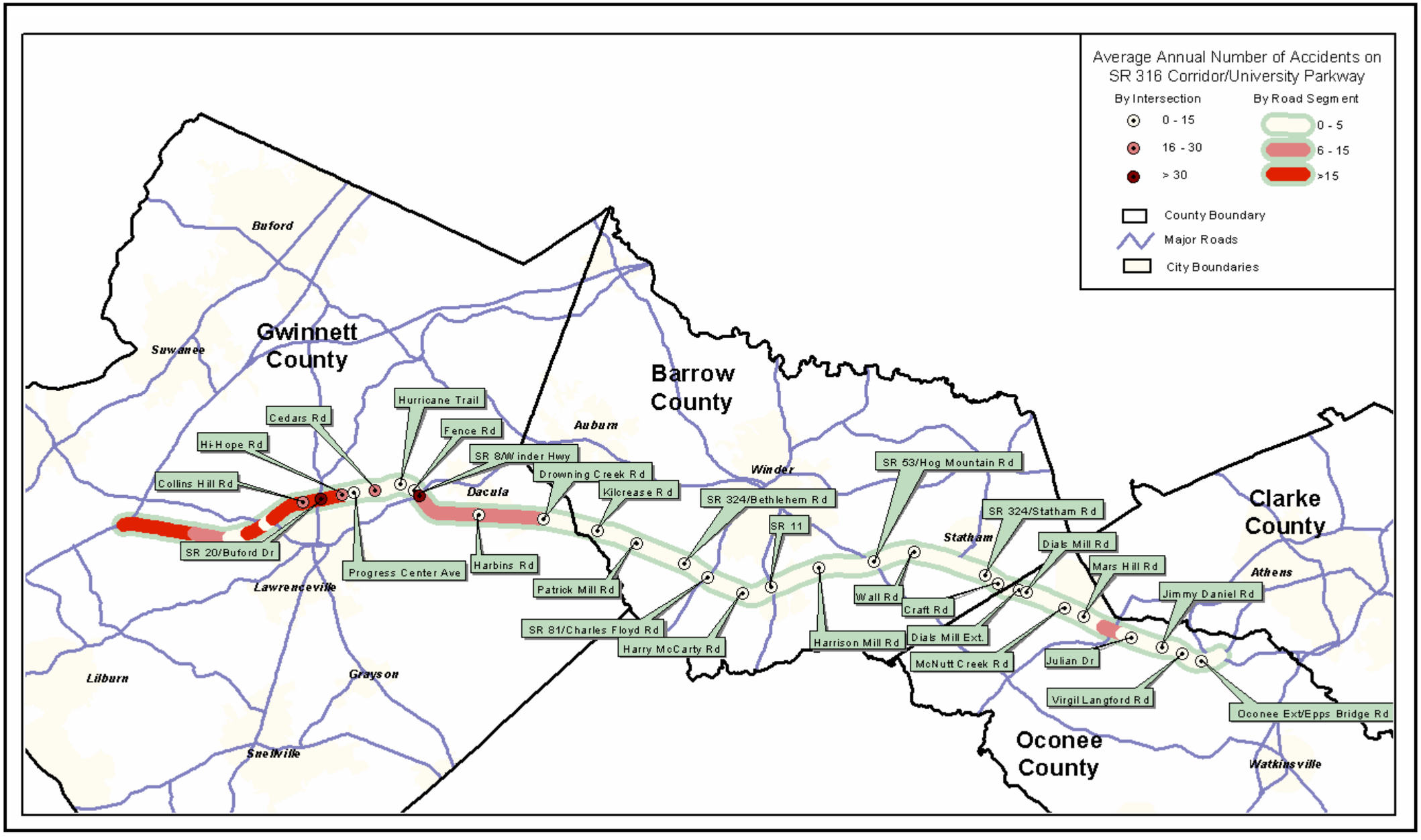
3.3.2 Segments

Accidents that were assigned to roadway segments of SR 316 were different from intersection accidents. Classification of individual accidents into intersection or segment types involved two steps. First, intersection accidents were identified. Accidents were given the intersection type label if they occurred within 105 feet of an existing intersection (as defined by its mile marker). The unit of measurement for the mile marker was "hundredths of miles". The second step was to classify segment accidents. All accidents that were not labeled as being an intersection type were given the segment label.

Similar to the intersection-based accident analysis discussed in the previous section, most of the high accident segments are located in Gwinnett County between Lawrenceville and Dacula. Relatively higher accident segments of SR 316, defined as those with more than 15 accidents per year, include those between:

- I-85 and Sugarloaf Parkway;
- Riverside Parkway and Duluth Highway (SR120);
- Duluth Highway (SR120) and Collins Hill Road;
- Collins Hill Road and Duluth Drive (SR20); and
- Duluth Drive (SR20) and Hi-Hope Road.

Figure 3-11
Accident Frequency By Intersection and Segments (1995-1997)



Outside of Gwinnett County, the only segment experiencing between six and 15 total accidents per year between 1995 and 1997 was the area near the US 78/SR 10 interchange area in Oconee County. Further analysis of this area showed that the data within the 1995-1997 timeframe included those accidents from 1995 that was before the grade separation was complete and open to traffic.

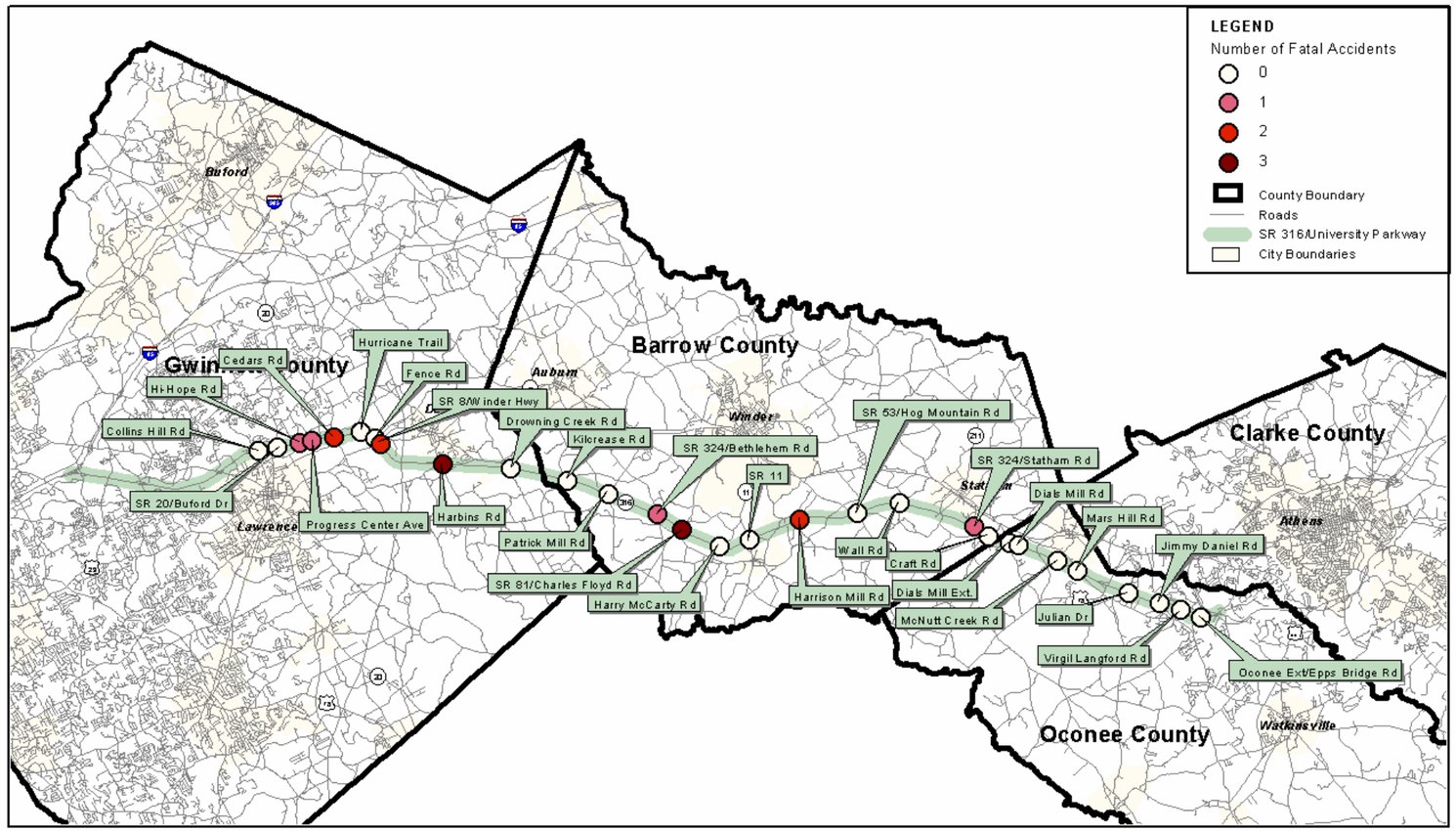
3.3.3 Fatal Accident Locations

A total of 31 fatal accidents occurred on SR 316 from 1995 through 2000. Nineteen took place in Gwinnett County, 12 occurred in Barrow and zero fatal accidents were recorded in Oconee County. The approximate locations of the fatal accidents are shown in Figure 3-12. Those intersections where more than one fatal accident occurred during this timeframe, as well as the total number of fatalities are:

- Harbins Road in Gwinnett County (4);
- Cedars Road in Gwinnett County (3);
- SR81 in Barrow County (3);
- Patrick Mill Road in Barrow County (2);
- Carl Bethlehem Road in Barrow County (2); and
- Riverside Pkwy. in Gwinnett County (2).

Most fatal accidents between 1995 and 2000 occurred at or near cross streets to SR 316 in the section between Lawrenceville and Winder. Out of the 31 fatal accidents within the entire corridor, 20 were located on the 13-mile segment between Progress Center Road and SR 81. The intersection at Harbins Road on the southern edge of Dacula had the highest frequency, with 4 fatal accidents. The area of this intersection is where the functional classification of SR 316 changes from being an urban principal arterial to a rural principal arterial. In this transition area, eastbound drivers on SR 316 may perceive that they are driving on a freeway because Harbins Road is 2.3-miles past the previous signalized intersection at Winder Highway. In the westbound direction of travel, drivers approaching Harbins Road have traveled 5.7 miles from the previous signalized intersection at Patrick Mill Road in Barrow County.

Figure 3-12
Fatal Accident Locations (1995-2000)



3.3.4 Accident Rate Analysis

The volume of traffic on a roadway is typically a strong indicator of how many accidents would occur on a particular type of roadway. Segments or intersections with high traffic volumes generally experience more absolute numbers of accidents than similar roadways having lower volumes. To negate the influence that traffic volume has on accident frequency, the "accident rate" statistic is used along with the absolute "number of accidents" statistic to determine whether certain highway portions have an unusually higher number of accidents notwithstanding the influence from traffic volume.

Vehicle miles of travel (VMT) are used to measure traffic volume along a portion of highway. For a typical section, VMT is computed by multiplying the daily traffic volume by its length. The factors used in calculating accident rates are:

- Annual number of accidents (NUMACCS); and
- Annual vehicle miles of Travel (AVMT).

The standard accident rate statistic used by the GDOT is the number of accidents per 100 million AVMT. The formula for computing it is:

$$\textit{Accident Rate} = \text{NUMACCS} * 10^8 / \text{AVMT}$$

For this study, accident rates were calculated for three individual portions of SR 316 with differing functional classifications. In addition, accident rates for SR 316 were computed for two severity groups: injury accidents and fatal accidents. SR 316's accident rates were compared with the comparable respective statewide statistics to determine if a significantly higher rate of injury or fatal accidents took place during the 1995 to 1997 time period. A summary of the accident rate analysis is illustrated in Figure 3-13 for fatal accidents, while Figure 3-14 shows injury accidents. The analysis reveals that that the accident frequency on the urban freeway and urban principal arterial portions of SR 316 in Gwinnett County are approximately the same or lower than the average rates computed for comparable highways within Georgia.

In contrast, the rural principal arterial portion shows a higher rate of injury and fatal accidents on SR 316 in comparison with other rural principal arterials elsewhere in the state. Specifically, this fatal accident rate of 2.83 per 100 million AVMT is 32% higher than the 2.15 computed for comparable roads elsewhere in the state.

Accident rates shown in Figures 3-13 and 3-14 give a preliminary indication of the safety benefits that could be achieved by reconstructing the arterial portions into a freeway design. For example, the fatal accident rate was 1.76 per 100 million AVMT on the 5.0-mile portion of SR 316 classified as urban principal arterial; this rate is 2.6 times greater than the rate for the portion existing as an urban Freeway of 0.67 fatal accidents per 100 million AVMT.

Figure 3-13
Accident Rates By Functional Class
Fatal Accidents

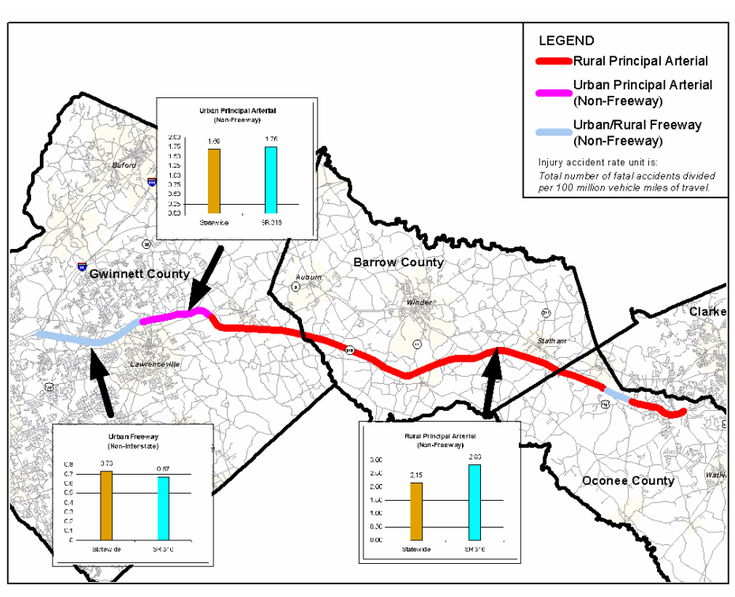
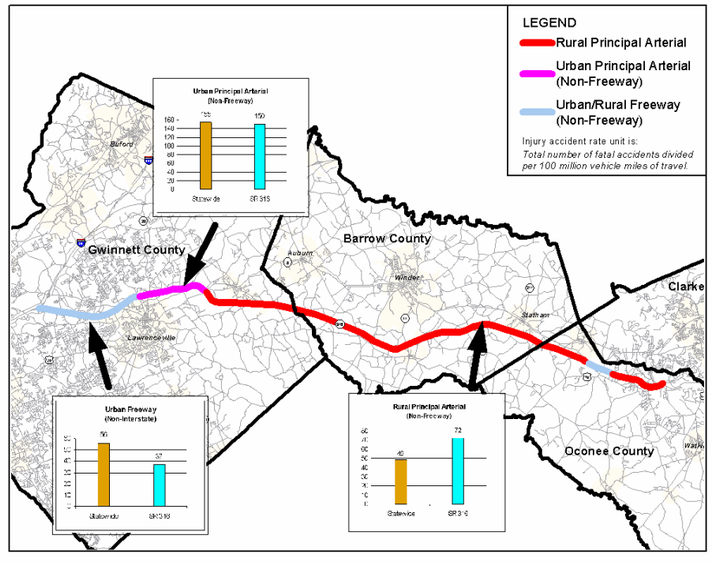


Figure 3-14
Accident Rates By Functional Class
Injury Accidents



3.4 Level-of-Service

Low levels of service on SR 316 are found mainly on the portions functionally classified as urban freeway and urban principal arterial near Lawrenceville and Duluth in Gwinnett County. Level-of-service (LOS) calculations essentially measure the ratio between the peak hour traffic volume and the roadway's capacity (also known as maximum service volume). As the ratio approaches a value of 1.0, peak hour traffic reaches the road's capacity. In this situation, the roadway is considered to have a low LOS because of congestion and there is little or no room for motorists to maneuver. Low LOS is characterized by low travel speeds and long delays near intersections. When the ratio reaches 1.0, the LOS is assigned a letter grade "F" and LOS conditions on the roadway are considered undesirable.

LOS conditions are typically assigned by a letter grade, ranging from A through F, to represent the condition of traffic flow. These letter grades can be assigned to freeway segment, arterial portions of the roadway, and each intersection. These grades are similar to those that children get on their report cards. The most desirable is LOS "A" that signifies that traffic can flow freely because the roadway's capacity greatly exceeds its peak hour traffic volume. At LOS "A" motorists experience little or no delay and have room to maneuver as they approach an intersection. This condition is always referred to as a "high" or adequate LOS. In many urban areas, LOS grades "A" through "D" are considered adequate in terms of traffic operations. At the other extreme, LOS "E" denotes that the peak hour volume is approaching the capacity threshold. Low travel speeds, congestion, delay at intersections and little room to maneuver characterize LOS "E". The most undesirable condition, however, is LOS "F". This condition occurs when more traffic attempts to pass through an intersection or portion of road than the intersection or segment is designed to accommodate. LOS "E" and "F" are considered "low" levels-of-service in urban and rural areas. Table 3-7 summarizes the general traffic conditions associated with each LOS at arterial intersections and freeway.

Table 3-7
Level-of-Service Definitions

LOS	Description		Category
	Arterial Intersections	Freeway Facilities	
A	Little or no delay	Free-flow operations	Adequate
B	Short delays	Reasonably free-flow	Adequate
C	Average delays	Noticeable congestion	Adequate
D	Long delays	Speeds decline	Undesirable
E	Very long delays	At capacity	Undesirable
F	Excessive delays	Breakdown conditions	Failing

In this study, a computer model called CORSIM was used to compute peak hour level-of-service grades. CORSIM is a model developed by the Federal Highway Administration (FHWA) to simulate traffic for an entire hour based on roadway data including the number of lanes, traffic control data, traffic signal timing and traffic volume data. The computer model keeps track of the operating characteristics of each individual vehicle passing through an intersection or traveling over a freeway segment. Once an intersection or freeway segment is simulated, the LOS through the intersection can be determined using parameters such as average vehicle delay for the approaches.

Calculated LOS values for the SR 316 corridor are shown in Figure 3-15. Table 3-7 describes the LOS category that corresponds to the color-coded categories shown on Figure 3-15. Low LOS values on freeway segments and at intersections near the Lawrenceville area are primarily due to high traffic volumes on SR 316. It is important to note that the actual observed LOS on the freeway segments between Lawrenceville and Duluth may be worse than reported in this analysis, because this portion of SR 316 is highly sensitive to traffic conditions that occur immediately to the east and west. Congestion experienced by westbound motorists in this area is typically caused by heavy traffic volumes or by incidents/crashes that occur on I-85, causing traffic to "back up" onto SR 316. Eastbound motorists are often subjected to delays that "back up" from the Collins Hill Road and/or SR 20 intersections. Therefore, the actual LOS observed by motorists on the freeway portions may be affected by conditions in the adjacent roadway portions of SR 316.

On the rest of the SR 316 corridor in east Gwinnett, Barrow and Oconee counties, current LOS values are better due to lower traffic volumes. There are exceptions to this for a relatively smaller number of motorists getting on SR 316 at unsignalized intersections. This is apparent to motorists stopped on the cross street waiting to make a left-turn onto SR 316 or who want to reach the other side of SR 316. These motorists experience significant delay waiting for an acceptable gap between vehicles on SR 316 so they can safely complete their turn.

A list of intersections considered deficient due to a relatively low LOS is presented below. If an entire intersection is listed as deficient, it means there are several approaches with a LOS "E" or LOS "F" in the peak hours. If an approach is listed as deficient, it means there are several turning movements within that approach with LOS "E" or LOS "F" in the peak hours. Otherwise, only the specific deficient turning movement(s) is listed. These intersections are also assumed to be signalized unless otherwise specified:

Gwinnett County

- SR 316 eastbound west of Sugarloaf Parkway (through-lanes)
- SR 316 eastbound off-ramp to Sugarloaf Parkway (exit ramp)
- SR 316 eastbound off-ramp at Riverside Parkway (eastbound left turns)
- SR 316 eastbound off-ramp at SR 120 (intersection)
- SR 316 WB off ramp at SR 120 (northbound approach)
- SR 316 at Collins Hill Road (intersection)
- SR 316 at Buford Drive/SR 20, (intersection)
- SR 316 at Hi-Hope Road, (eastbound and southbound approaches)
- SR 316 at Progress Center Avenue, intersection (unsignalized)
- SR 316 at Cedars Road (eastbound left turns)
- SR 316 at Hurricane Trail (eastbound left turns)
- SR 316 at Fence Road, intersection (unsignalized)
- SR 316 at Winder Hwy. /SR 8, (eastbound and northbound left turns)
- SR 316 at Drowning Creek Road, intersection (unsignalized)

Barrow County

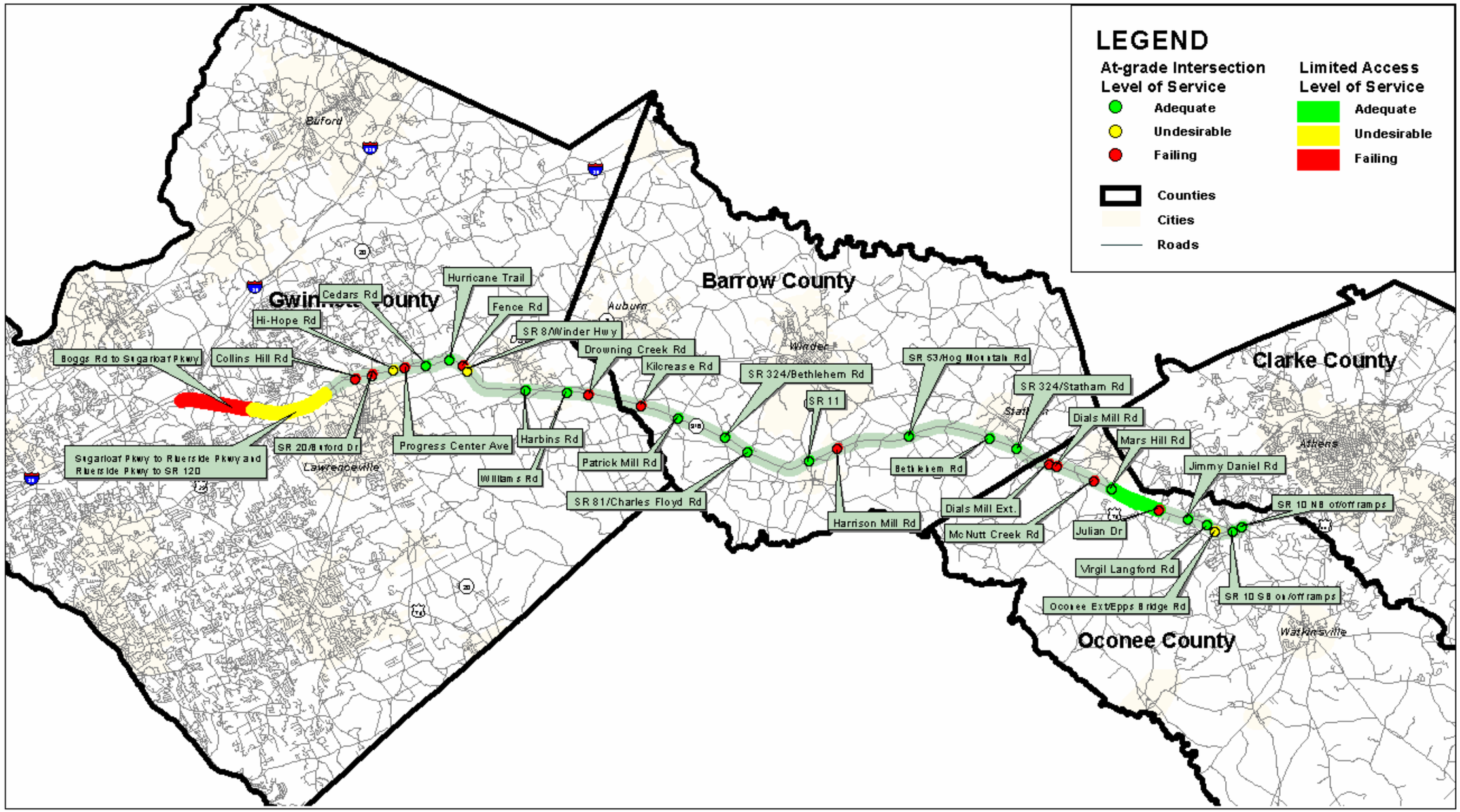
- SR 316 at Kilcrease Road, intersection (unsignalized)
- SR 316 at SR 11 (northbound left turns)
- SR 316 at Harrison Mill Road, intersection (unsignalized)
- SR 316 at Harry McCarty Road (northbound left turn and southbound approach) (unsignalized)
- SR 316 at Barber Creek Road, northbound approach (unsignalized)

Oconee County

- SR 316 at Crowe Road, intersection (unsignalized)
- SR 316 at Dials Mill Road, intersection (unsignalized)
- SR 316 at McNutt Creek Road, intersection (unsignalized)
- SR 316 westbound off-ramp at US 78, intersection (unsignalized)
- SR 316 at Julian Drive, intersection (unsignalized)

In many instances, adding a short right-turn lane or channelizing the approach lanes differently could improve the operational LOS at the unsignalized intersections. However, that type of improvement would likely be detrimental with respect to safety and is not recommended because it would encourage more vehicles to use the approaches to unsignalized intersections. More turns onto and off of SR 316 would increase the number of situations where conflicting movements would include high-speed differentials. As indicated previously in this report, these situations may contribute to the relatively higher rate of injury accidents and fatal accidents on the rural portions of the SR 316 corridor.

Figure 3-15
Base Year 2000 Levels-of-Service



3.5 Travel Patterns

The study predicted travel patterns within the corridor by using its travel demand model. The ability to identify significant travel patterns and movements in the corridor was important because study used this current (year 2000) travel pattern data, in combination with the analysis of the accident data, to provide valuable information in developing a short-term access management strategy to improve safety on SR 316. The study also used horizon year travel patterns to recommend the location of proposed interchanges on SR 316, as well as to refine the study's longer-range recommendations.

During the data collection phase of the study, origin-destination patterns of motorists traveling on SR 316 were obtained from nearly 4,000 motorists at selected sites in Barrow and Oconee Counties through the study's O-D survey. These origin-destination patterns were expanded to reflect daily travel patterns and then were incorporated into the study's travel demand model. Bandwidth maps illustrating base (year 2000) travel patterns on specific portions of SR 316 in Gwinnett, Barrow and Oconee counties are presented in figures 3-16, 3-17, and 3-18.

A sample of origin-destination patterns of motorists using SR 316 in Gwinnett County is illustrated by trips traveling westbound on SR 316 between Sugarloaf Parkway and Boggs Road. This segment of SR 316 is referred to as the "selected link" in the study. As shown on Figure 3-16, a total of 40,000 vehicles per day were estimated in this direction of travel. Places where these vehicles originated are shown by means of bandwidths in Figure 3-16; the largest share of traffic on this selected link originates in the Lawrenceville and Snellville areas. The travel demand model estimated that a total of 20,000 vehicles per day come from this direction. Of these, 8,600 come from the west end of Lawrenceville and 11,400 from the center of Lawrenceville or the east side. The second largest number of trips, approximately 6,600 trips per day, originated outside of the county from the direction of Barrow, Oconee and Athens-Clarke counties. Another 6,200 trips originated in the Lawrenceville area that is north of SR 316.

Travel patterns in Barrow County, as shown in Figure 3-17, are represented by eastbound and westbound traffic on SR 316 between SR 81 and SR 11. The study's travel demand model estimates a total of 13,500 vehicles per day in each direction on this portion of SR 316. Places from which these vehicles originated are also shown in Figure 3-17 by means of bandwidths. Travel patterns are shown for both westbound and eastbound travel.

In the westbound direction of travel in Barrow County, the largest segment of traffic comes from outside Barrow County. This includes 6,900 vehicles, just over 50% of total traffic on that link, from the direction of Oconee and Athens-Clarke counties. The rest comes from different parts of East Barrow: 2,000 from Bethlehem and Walton County; 1,700 from Winder; and, 1,700 from the Statham area.

The largest movement of traffic in Barrow County using the selected link in the eastbound direction comes from Gwinnett County and places to the west of Barrow County. A total of 10,300 vehicles per day or 76% come from the direction of Gwinnett County. A relatively small percentage of total eastbound traffic comes from inside Barrow County. The directional orientation of local traffic is distributed as follows: 1,100 vehicles from Walton County/southwestern Barrow County; 1,000 from Auburn; and 1,000 from southwestern Barrow County and eastern Gwinnett County.

Figure 3-16
Origin-Destination Travel Patterns - Base Year 2000
Gwinnett County

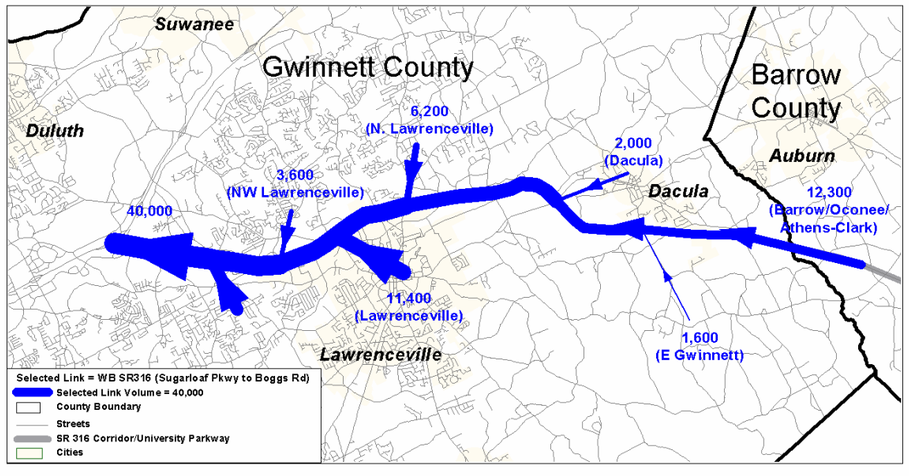
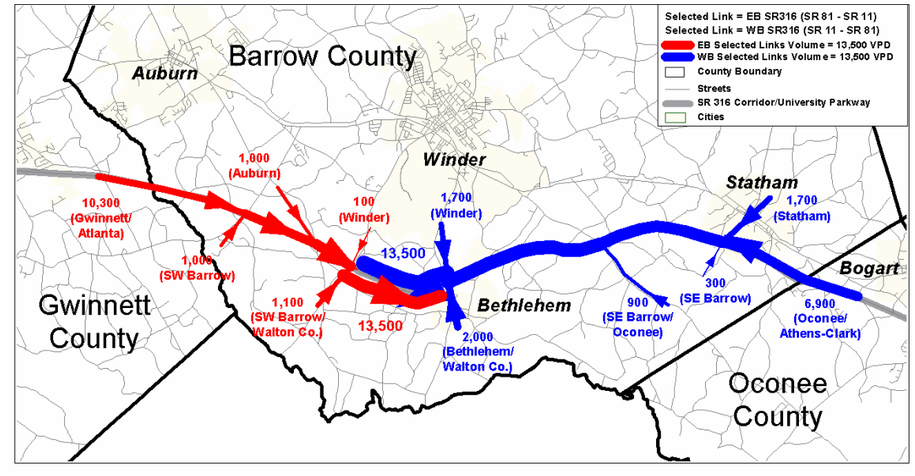


Figure 3-17
Origin-Destination Travel Patterns - Base Year 2000
Barrow County



Travel patterns in Oconee County are shown in Figure 3-18 by vehicles traveling eastbound on SR 316 between the Oconee Connector and the Athens Loop/SR 10. A total of 17,500 vehicles per day are estimated by the study's model as eastbound motorists. The largest component of traffic using this selected link comes from the Watkinsville area by way of Mars Hill Road and the Oconee Connector. A total of 7,300 vehicles per day or 40% enter SR 316 from the Oconee Connector. The second largest number of trips using the selected link comes from outside Oconee County in the direction of Barrow County, Gwinnett County and metro Atlanta. An estimated 5,600 trips per day or 32% come from Barrow and places further west.

Figure 3-18
Origin-Destination Travel Patterns - Base Year 2000
Oconee County