Chapel Hill Elementary School
Traffic Study

Douglas County, Georgia

Prepared for:
Douglas County

Prepared by:

JACOBS
Carter Burgess

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INTRODUCTION

Jacobs Carter Burgess has been retained by Douglas County to perform a traffic study to evaluate traffic circulation and pedestrian conditions of the surrounding roadways in the vicinity of the newly constructed Chapel Hill Elementary School in Douglas County, Georgia. The elementary school was recently opened in August of 2007. The purpose of this study is to determine the need for transportation and pedestrian related improvements to the adjacent roadways to improve traffic circulation and safety. The limits of the study area are illustrated in Figure 1.

This study examined the impact of Chapel Hill Elementary School on the surrounding roadway network, including Coursey Lake Road, Central Church Road, and Dorsett Shoals Road. In addition, this study took into consideration impacts due to an increase in background traffic and traffic generated by new development in the surrounding area. The study area includes the following intersections:

- Coursey Lake Road at Chapel Hill Elementary School
- Coursey Lake Road at Dorsett Shoals Road
- Coursey Lake Road at Central Church Road
- Central Church Road at Yancey Road

The primary goals of the study include:

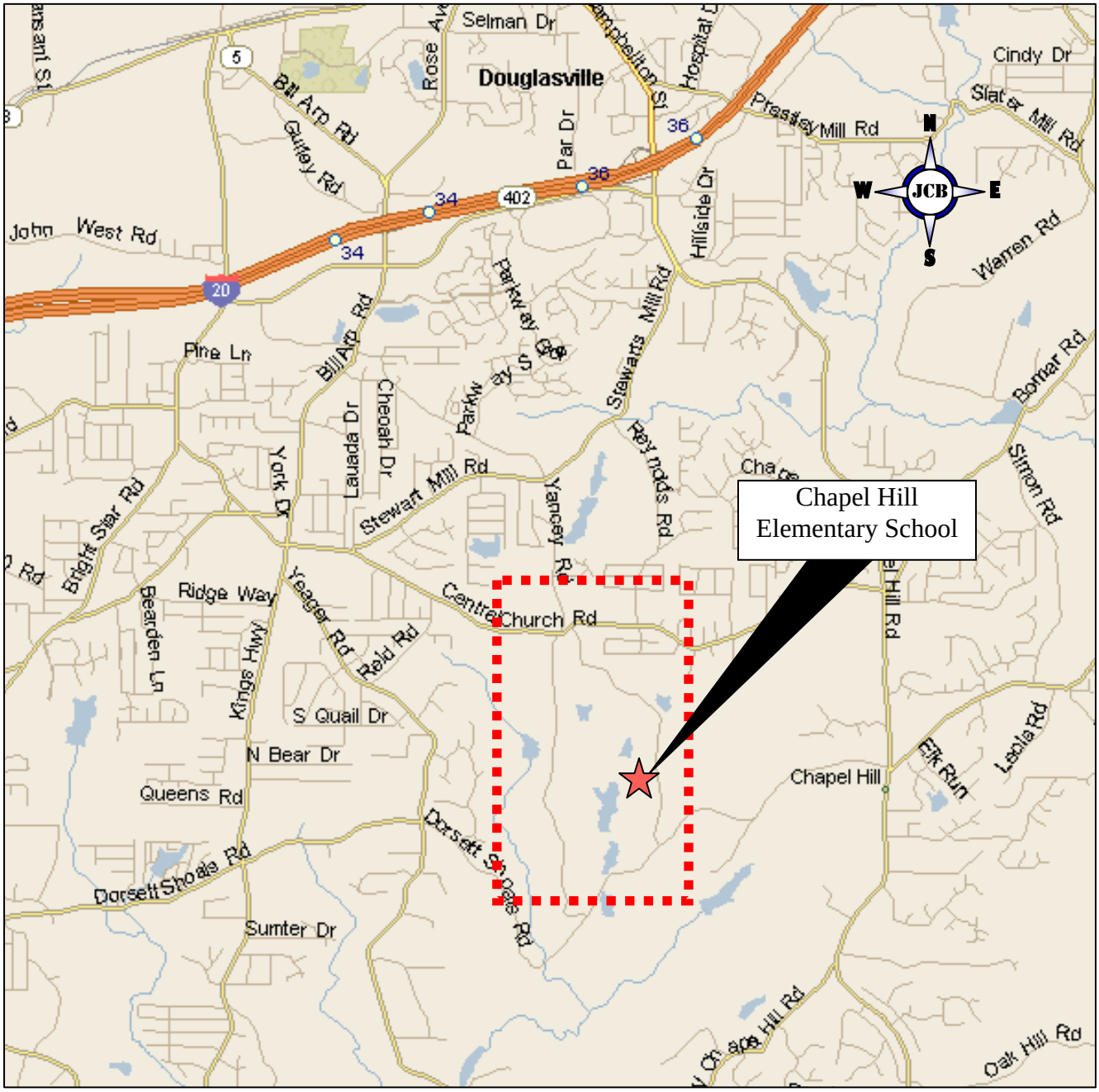
- Improve intersection traffic operations and safety within the study area.
- Provide pedestrian and bicycle improvements between Chapel Hill Elementary School and adjacent residential developments.

This study describes existing conditions along the roads and intersections within the study area, estimates future traffic conditions based on anticipated growth and development, examines the need for existing and future operational improvements, and recommends projects to improve the circulation, operation and safety. The existing study area characteristics, analysis results, and improvement recommendations are presented in the sections that follow.

EXISTING CONDITIONS

An assessment of the existing transportation network was performed to identify existing deficiencies and develop potential improvement recommendations. As part of the study, vehicular and pedestrian traffic conditions within the study area were observed during the peak hours of a typical weekday, including peak school arrival and dismissal periods. Traffic volume data collection was performed on the primary roadways and major intersections, and an inventory of the existing roadway network was conducted. The roadway network inventory consisted of road geometry, traffic control devices, pedestrian facilities, signing and pavement markings.

Figure 1
Location Map



Legend
Study Area

Roadway Network

The roadway network was examined to evaluate the existing operating conditions within the study area. The study area included Coursey Lake Road, the intersections of Coursey Lake Road at Central Church Road and Dorsett Shoals Road, and the Central Church Road at Yancey Road intersection. Chapel Hill Elementary School is located along Coursey Lake Road north of Dorset Shoals Road. The following paragraphs describe the roadways and intersections included in the study area. An aerial photograph illustrating the primary study area is shown in Figure 2. Intersection lane geometry is shown in Figure 3.

Coursey Lake Road

Coursey Lake Road is a two-lane local facility that provides connection to Central Church Road to the north and Dorsett Shoals Road to the south. The roadway consists of a series of vertical and horizontal curves as it winds through the residential area. The lane widths along the roadway vary from 11 to 12 feet. There are grass shoulders and no curb and gutter along the roadway, with the exception of in front of the school. The roadway has a posted speed limit of 35 miles per hour (mph), except within the school zone, which is posted at 25 mph from 7:30 to 8:30 AM and 2:30 to 3:30 PM. The land uses adjacent to Coursey Lake Road are primarily low-density single-family homes except for two higher density residential developments; The Plantation at Dorsett Shoals development located approximately 0.3 mile northeast of Chapel Hill Elementary School and Knollview at Coursey Lake development located just southeast of the elementary school.

Coursey Lake Road at Chapel Hill Elementary School Entrances

Chapel Hill Elementary School South Driveway

Chapel Hill Elementary School has two access driveways to Coursey Lake Road. The southern driveway provides access for school buses only, while the northern driveway is dedicated to teacher/visitor parking and passenger vehicles dropping off and picking up students. The northern driveway is located at the top of a crest vertical curve, which limits sight distance for southbound vehicles on Coursey Lake Road. Curb and gutter is present along the school property. Southbound right turn lanes are present at the north and south driveways. In addition to painted channelized right turn lanes for outbound vehicles, each driveway is stop-controlled with right-turn yield.

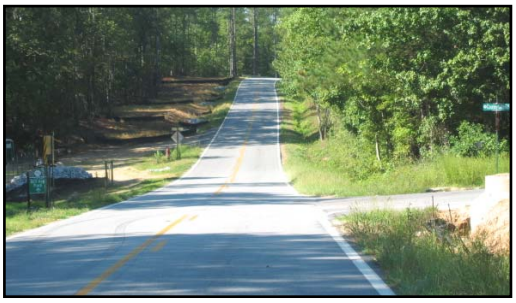
An advanced 25 mph school zone warning sign (S4-5) precedes a school zone ahead sign (S1-1 and W16-9p). A school zone speed limit 25 mph sign with hours of enforcement supplemental sign (S4-3, R2-1, and S4-1) is posted at the beginning of the school zone, approximately 415 feet south of the southern school driveway and 300 feet north of the northern school driveway. “SCHOOL” pavement marking are located at the beginning of the school zone in each direction.

Figure 2 – Study Area

Figure 3 – Existing Roadway Geometry

Dorsett Shoals Road at Coursey Lake Road

Dorsett Shoals Road is a two-lane local roadway with a 40 mph speed limit at the intersection with Coursey Lake Road. It provides a connection east to Chapel Hill Road and west to Bill Arp Road. The Dorsett Shoals Road approaches to the intersection consist of 10.5 foot lanes with no curb and gutter and grass shoulders. Dorsett Shoals Road has the right-of-way at the intersection and therefore no traffic control devices regulate the through movement. The eastbound approach has an intersection warning sign (W2-2) 250 feet from the intersection. No warning signs are present on the westbound approach.



Westbound Dorsett Shoals Road at Coursey Lake Road

The Coursey Lake Road approach forms a "T" intersection with 11.5 feet wide lanes. Coursey Lake Road is stop controlled at the intersection with no turn bays provided. Dual indicated trucks use lower gear (W7-2b) and 13% grade (W7-1b) sign assemblies are located southbound 930 feet prior to the intersection, followed by a left curve warning sign (W1-2), and dual indicated stop ahead warning signs (W3-1). Three left chevron signs (W1-8) warn drivers as they traverse the curve before stopping at the bottom of the hill. Along the southern side of Dorsett Shoals Road, there is a two directional large arrow sign (W1-7) and object marker signs (OM-3).

Southbound Coursey Lake Road at Dorsett Shoals Road

Central Church Road at Coursey Lake Road

Central Church Road is a two-lane collector that connects Chapel Hill Road with Stewart Mill Road. The roadway is oriented to the east-west within the study area with a speed limit of 45 mph. Travel lanes on Central Church Road vary in width from 10.5 feet to 12 feet with no curb and gutter and narrow grass shoulders. Central Church Road has right-of-way at the intersection and therefore no traffic control devices regulate the through movement. An intersection warning sign (W2-2) with a supplemental road name assembly is located westbound in advance of the

Westbound Central Church Road at Coursey Lake Road

intersection. Additionally, dual indicated westbound stop ahead warning signs are located east of Coursey Lake Road that apply to the Central Church Road at Yancey Road intersection west of Coursey Lake Road.

Northbound Coursey Lake Road at Central Church Road

The Coursey Lake Road approach forms a "T" intersection with 12-foot northbound and 13-foot southbound lanes. The posted speed limit is 35 mph at the intersection. Northbound Coursey Lake Road has dual indicated stop ahead warning signs posted 375 feet from the intersection. Dual indicated stop signs are located at the intersection, and a two directional large arrow sign (W1-7) and object marker signs (OM-3) are located north of the intersection.

The northbound Coursey Lake Road sight distance looking east onto Central Church Road was field measured at approximately 330-feet. Current American Association of State Highway and Transportation Officials (AASHTO) "A Policy on Geometric Design of Highways and Streets, 5th Edition" (2004) design guidelines indicate that the existing left turn departure sight distance does not meet current standard of 500-feet.

Central Church Road at Yancey Road

Yancey Road is a two-lane local roadway with a speed limit of 35 mph that provides connection between Stewart Mill Road to the north and Dorsett Shoals Road to the south. Lane widths are 10.5 feet and 11.5 feet for the northbound and southbound approaches, respectively. No curb and gutter is present at the intersection.

Southbound Yancey Road at Central Church Road

The southbound Yancey Road approach intersects Central Church Road at a 40-degree skewed angle, resulting in a poor alignment of the intersection. The skewed alignment and the turn radii necessary to accommodate vehicles on Central Church Road, results in large areas of unmarked pavement and poor guidance through the intersection.

Northbound Yancey Road at Central Church Road

The intersection operates under all-way stop condition, and dual indicated stop signs (R1-1) are present on all approaches. The Central Church Road eastbound approach has dual indicated stop ahead signs (W3-1) posted approximately 665-feet from the intersection, east of Coursey Lake Road.

Dual indicated stop ahead signs (W3-1) are also posted approximately 450-feet from the intersection on the northbound and westbound approaches and 700-feet on the southbound approach.

Pedestrian and Bicycle Facilities

There are no pedestrian or bicycle facilities along any of the main roadways and intersections within the study area. Sidewalks are present within the nearby residential developments located at The Plantation at Dorsett Shoals and Knollview at Coursey Lake Road. With no sidewalks or multi-use paths present along Coursey Lake Road there is no pedestrian or bicycle connection to Chapel Hill Elementary School available for students from the nearby residential developments. Students are currently prohibited from walking or riding a bicycle to Chapel Hill Elementary School although the main access points to the residential neighborhoods of Knollview at Coursey Lake and The Plantation at Dorsett Shoals are within 1500-feet of the school. Chapel Hill Elementary School students are either transported by parents or by school bus. Figure 4 illustrates the existing pedestrian facilities within the study area.

The Safe Routes to Schools Program

The Safe Routes to Schools (SRTS) program is designed to benefit school children by increasing their exercise, improving their health, and teaching them to enjoy the environment and learn independence and responsibility. In addition, successful implementation of the SRTS program could decrease traffic congestion and reduce vehicular pollution at and near schools. Comprehensive SRTS programs create an environment that is safe and exciting for children travel to and from school without the use of a vehicle. Two of the most important aspects of the SRTS program is reducing travel speed adjacent to schools and providing paths between neighborhoods and schools. Eligible projects for federal funds include sidewalk improvements, speed reduction, traffic calming, pedestrian and bicycle facilities, crossing improvements, and secure bicycle parking facilities. Figure 5 shows a map of the school district boundaries.

Traffic Volumes

Vehicular volume data collection was performed at the study intersections in September 2007 to be used in the intersection capacity analysis. The turning movement counts were recorded on a typical weekday morning (7:00-9:00 AM), school dismissal, and evening (2:00-6:00 PM) for the intersections along Central Church Road and Dorsett Shoals Road. The turning movement counts for the school driveways on Coursey Lake Road were taken from 7:30-8:30 AM, arrival peak, and 2:00-3:00 PM, departure peak.

In addition, twenty-four hour volume counts were taken at eight locations to supplement the turning movement data and to confirm the hourly distribution of the traffic flow. Twenty-four hour speed study counts were performed in conjunction with volume collection at four of these locations in the study area to determine local speeds and compliance with posted speed limits. Turning movement traffic volumes are shown in Figure 6. The 24-hour count locations and volumes are depicted in Figure 7. Refer to Appendix A for traffic volume data.

Figure 4 – Existing Pedestrian Facilities

Figure 5 – Map of School Boundaries

Speed Analysis

Another safety concern is vehicle travel speed within the study area, particularly adjacent to the Chapel Hill Elementary School. Speed studies were performed on Coursey Lake Road, north of the school, Dorsett Shoals Road, and Central Church Road for a 24-hour period. Figure 7 shows the locations of the speed study counts.

Figure 8
Speed Profile

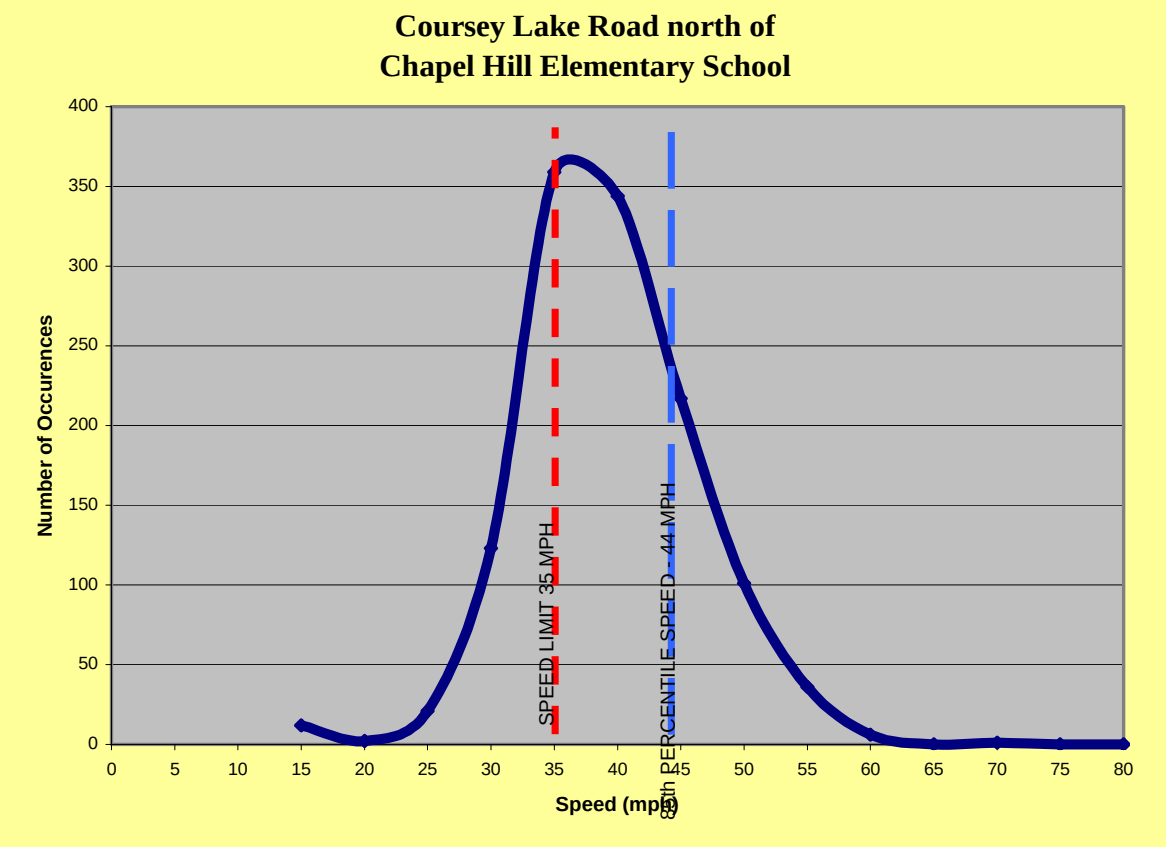
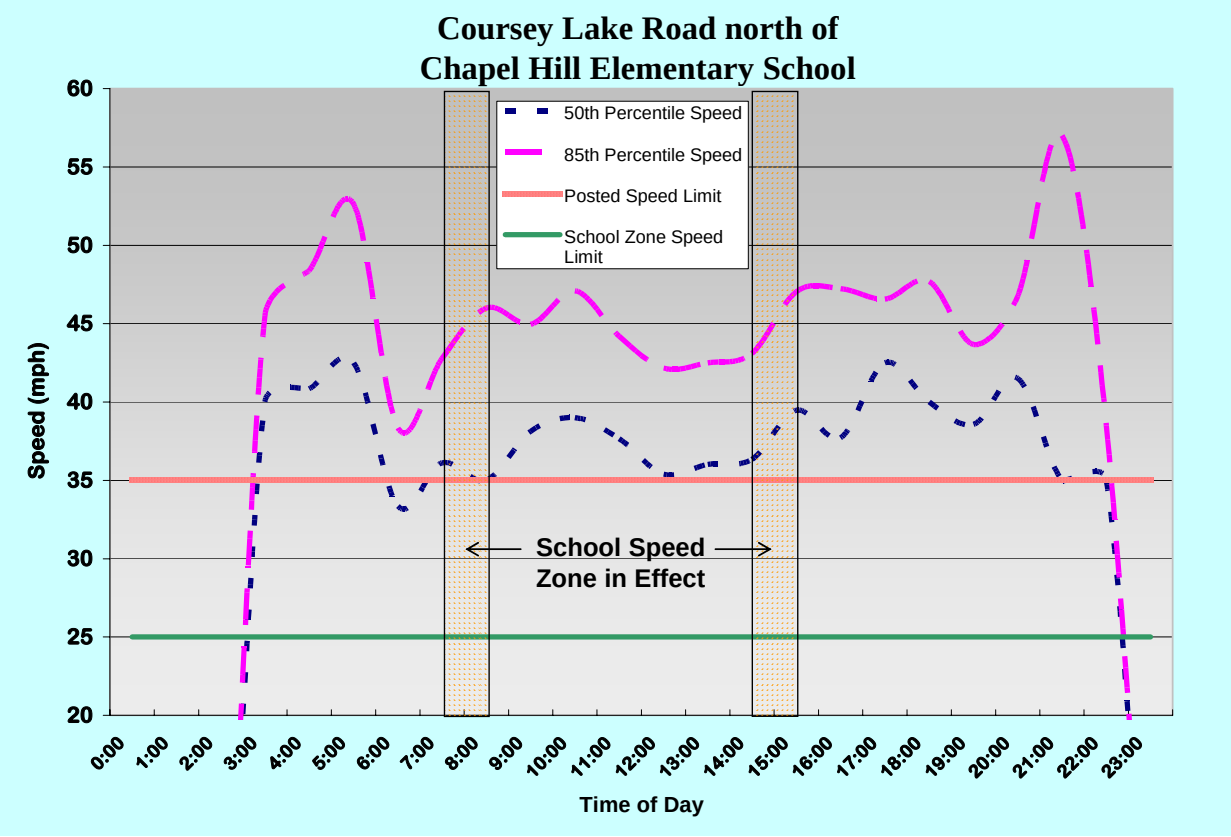


Figure 8 illustrates the number of occurrences a speed limit was surpassed during a 24-hour period. As the figure shows, the speed limit was exceeded by 58 percent of the vehicles at the Coursey Lake Road location.

The posted speed limit along Coursey Lake Road is 35 mph, but during Chapel Hill Elementary School arrival and dismissal times the designated school zone speed limit is reduced to 25 mph from 7:30 to 8:30 AM and from 2:30 to 3:30 PM. Although recorded vehicle travel speeds were reduced when the 25 mph speed limit is in effect, most vehicles continue to exceed the regularly posted speed limit of 35 mph. Figure 9 illustrates the 50th and 85th percentile speeds during a 24-hour period.

Figure 9
Speed Variance



The 85th percentile distribution of observed speeds is used to measure the speed at which most drivers travel during free-flow conditions at a particular location. The average daily directional 85th percentile speed of the southbound and northbound traffic on Coursey Lake Road was 44 and 43 mph, respectively.

Table 1 shows the number of vehicles traveling along Coursey Lake Road and travel speeds during the Chapel Elementary School's AM arrival and PM dismissal times. As Table 1 shows, 100 percent of the vehicles exceeded the 25 mph speed limit north of the school on Coursey Lake Road.

Table 1
Travel Speed Vehicle Volumes during School Arrival and Dismissal Hours

Location	Travel Speeds							
	1-25 mph		26-35 mph		36+ mph		% Speeding	
	AM	PM	AM	PM	AM	PM	AM	PM
Northbound Coursey Lake Rd	0	0	11	46	7	55	100%	100%
Southbound Coursey Lake Rd	0	0	7	5	16	40	100%	100%

Speed studies were also conducted along Yancey Road north of Central Church Road, along Central Church Road east of Coursey Lake Road, and on Dorsett Shoals Road east of Coursey Lake Road. The 85th percentile speed was calculated for each of the locations. Only the 85th percentile speed calculated on Central Church Road was equal to the posted speed limit. The results of these speed studies are shown in Table 2.

Table 2
Vehicle Speeds

Location	Speed Limit	85th Percentile	Exceeding Speed Limit
Northbound Yancey Rd	35 mph	49 mph	96%
Southbound Yancey Rd		45 mph	88%
Eastbound Central Church Rd	45 mph	45 mph	8%
Westbound Central Church Rd		45 mph	12%
Eastbound Dorsett Shoals Rd	40 mph	49 mph	65%
Westbound Dorsett Shoals Rd		49 mph	72%
Northbound Coursey Lake Rd	35 mph	43 mph	56%
Southbound Coursey Lake Rd		46 mph	71%

Collision History

In addition to analyzing traffic conditions, an examination of safety conditions was conducted. This analysis included an examination of collision history obtained from the Georgia Department of Transportation (GDOT) accident database for the last three available years.

Ten collisions occurred within the study area during 2003, 2004, and 2005, nine of which were at the study intersections. Five of the intersection collisions were angled, one was head-on, and two were rear end collisions. One crash was an overturned commercial vehicle, which occurred at the Dorsett Shoals Road intersection due to brake failure. The highest collisions location was the intersection of Central Church Road at Yancey Road, which experienced six collisions, three collisions during 2003. Collision diagrams are shown in Figures 10A through 10D.

Figures 10A to 10 D – Collision Diagrams

Intersection Capacity Analysis

Analysis of existing peak hour traffic conditions was performed to determine the level of service (LOS) at the study intersections. LOS for an intersection is based on vehicular delay and is a typical measure of effectiveness used to evaluate intersection operations. The Highway Capacity Manual (HCM) provides ranges of delay for each LOS definition, spanning from minimal delay (LOS A) to high delay (LOS F). LOS F conditions are considered unacceptable for most drivers.

For unsignalized intersections, the criterion for evaluating traffic operations is the LOS for the controlled turning movements at the intersection. Synchro software was used to determine LOS, based on methodology from the HCM to determine the delay and LOS for these turning movements based on the following input data:

- Intersection geometry
- Lane configuration
- Turning movement volumes

For signalizing an intersections, Synchro software was used to determine LOS, based on the following input data:

- Intersection geometry
- Lane configuration
- Turning movement volumes
- Existing signal phasing
- Existing signal timing

Traffic flow patterns and volume concentrations were examined throughout the study area to identify traffic congestion issues. In addition, observation of AM, school dismissal, and PM peak period traffic was conducted to ensure understanding of key traffic movements. The following intersections were evaluated:

- Central Church Road at Yancey Road
- Central Church Road at Coursey Lake Road
- North Chapel Hill Elementary School Driveway at Coursey Lake Road
- South Chapel Hill Elementary School Driveway at Coursey Lake Road
- Dorsett Shoals Road at Coursey Lake Road

The capacity analysis results indicate that all of the study intersections operated at acceptable LOS, D or above, during the peak hours of a typical weekday. The results for existing conditions capacity analysis are illustrated in Figure 9. Refer to Appendix B for detailed analysis results.

Figure 11 – 2007 Existing LOS

Turn Bay Analysis

Right turn bays on the major approach at side street stop controlled intersections can improve operations at the intersection by separating slow moving vehicles out of the through lane. The need for the installation of an exclusive right-turn bay for both the eastbound Central Church Road approach at Coursey Lake Road and westbound Dorsett Shoals Road approach at Coursey Lake Road has been examined using the guidelines established in the *National Cooperative Highway Research Program* (*NCHRP) Report 457.* The analysis indicates that exclusive right-turn bays are needed for both major road approaches. The results of the exclusive right-turn bay analysis are provided in Appendix A.

Additionally, left turn bays on the major approach at side street stop controlled intersections can also improve operations at the intersection by separating slow moving vehicles out of the through lane. The need for the installation of an exclusive left-turn bay for the westbound Central Church Road approach at Coursey Lake Road, eastbound Dorsett Shoals Road approach at Coursey Lake Road, and northbound school driveways on Coursey Lake Road has been examined using the guidelines established in the *NCHRP Report 457*. The analysis indicates that an exclusive left-turn bay is warranted for westbound Central Church Road approach under existing conditions. The results of the exclusive left-turn bay analyses are provided in Appendix A.

FUTURE CONDITIONS

Understanding the transportation needs within the Chapel Hill Elementary School study area requires a thorough examination of existing traffic operations in the area as well as the anticipated future traffic operations. The existing traffic volumes and intersection geometry data forms the base condition upon which the future traffic volumes are overlaid. Analysis was performed to determine the transportation needs in the years 2017 and 2027. The following paragraphs describe the growth rate, traffic volumes, turn bay analysis, and capacity analysis for future conditions in the study area.

Growth Rate

A future year 2017 and year 2027 growth rate for the study area was determined by examining historical traffic volume growth trends based on the past fifteen years of data provided at GDOT count stations 0181 and 0183. Table 3 illustrates the historical growth rates calculated from the two available GDOT count stations along Central Church Road in Douglas County.

Table 3
GDOT Historical AADT Growth

Count Station	Location	5-Year Trend	10-Year Trend	15-Year Trend
181	Central Church Rd east of Coursey Lake Rd	-1.24%	0.97%	1.03%
183	Central Church Rd west of Yancey Rd	1.52%	-1.64%	1.52%

The trend line growth rate determined from historical GDOT traffic volumes fluctuated between negative and positive growth rates for the 5 year and 10 year trend at both count locations. Additionally, the 15 year trend appears to be lower than anticipated and may not reflect the anticipated growth in the area the ARC model is projecting.

Future growth in the area was also examined utilizing the year 2005 and year 2030 traffic volumes obtained from Atlanta Regional Commission (ARC) TP+ travel demand model maintained by ARC for metropolitan Atlanta counties. Year 2005 and 2030 ARC traffic volumes were analyzed utilizing four segments within the study area and a weighted annual growth rate of 2.44 percent was projected. Utilizing an annual growth rate of 2.44 percent growth factors of 1.27 and 1.62 were applied to the existing background traffic volumes to derive the 2017 and 2027 future year traffic volumes, respectively. The results of the ARC growth rate analysis are shown in Table 4.

Table 4
ARC Projected Volumes

Location	Volume	
	2005	**2030**
West of Coursey Lake Road/Yancey Road Centroid	8,585	12,649
East of Coursey Lake Road/Yancey Road Centroid	4,811	10,982
Coursey Lake Road/Yancey Road Centroid	10,620	18,816
Dorsett Shoals Road East of Coursey Lake Road	1,612	4,392
Weighted Average Growth Rate (2005-2030)		**2.44%**
2017 Growth Factor		1.27
2027 Growth Factor		1.62

The historical GDOT traffic volume data was compared with travel demand model data to establish the traffic volume forecast. In an effort to be conservative in the future traffic volume projections, the higher ARC model growth rate was used for the future analysis.

In addition to the growth rate determined for Coursey Lake Road and Central Church Road, a growth rate was determined to reflect the additional growth along Dorsett Shoals Road due to anticipated development. Detailed development land use information was not available during the study; therefore, year 2005 and 2030 ARC model traffic volumes along Dorsett Shoals Road from table 4 were utilized to calculate an annual growth rate of 4.09 percent. The resulting growth factors of 1.49 and 2.23 for 2017 and 2027 analysis years, respectively, were applied to the existing traffic volumes on Dorsett Shoals Road.

Chapel Hill Elementary School opened in 2007 with more than 750 students and 70 staff. It is capable of supporting 850 students in the main building and has room for additional modular classrooms. The study has anticipated the schools enrollment will grow at the same rate as the surrounding study area. There are currently no planned expansions or new elementary schools that will influence the student population at Chapel Hill Elementary School.

Future Capacity Analysis

Future capacity analysis was performed utilizing the existing intersection geometry and projected year 2017 and 2027 traffic volumes to determine the impact future traffic volumes will have on the study intersections. Analysis was performed utilizing future AM, school dismissal, and PM peak hour volumes.

2017 Future Capacity Analysis

The two Chapel Hill Elementary School driveways along Coursey Lake Road and the intersection of Dorsett Shoals Road at Coursey Lake Road operate at acceptable LOS, D or better, during the analysis peak hours. The all-way stop controlled intersection of Central Church Road at Yancey Road operates at LOS E during the AM peak. Additionally, the northbound Coursey Lake Road approach at Central Church Road operates at LOS F during the AM peak hour. Year 2017 traffic volumes and the results of the capacity analysis are shown in Figures 12 and 13, respectively. See Appendix B for detailed capacity analysis results.

2027 Future Capacity Analysis

During the AM peak period the Chapel Hill Elementary School southern driveway at Coursey Lake Road operates at acceptable LOS. The remaining three intersections along Coursey Lake Road with side street approaches located at; Chapel Hill Elementary School northern driveway, Central Church Road, and Dorsett Shoals Road, experience LOS F during the AM peak period. The all-way stop controlled intersection located at Central Church Road and Yancey Road experiences LOS F during both the AM and PM peak hours. Additionally, the Coursey Lake Road approach at Central Church Road experiences poor LOS, E or below, during the AM, midday and PM peak periods. Year 2027 traffic volumes and the results of the capacity analysis are shown in Figures 14 and 15, respectively. See Appendix B for detailed capacity analysis results.

Future Turn Bay Analysis

The future need for the installation of an exclusive left-turn bay for the eastbound Dorsett Shoals Road approach at Coursey Lake Road has been examined using the guidelines established in *NCHRP Report 457*. The analysis indicates an exclusive left-turn bay is warranted for this approach to the intersection utilizing projected year 2027 traffic volumes. Refer to Appendix B for the exclusive turn bay analysis results.

Figure 12 – 2017 Future Traffic Volumes

Figure 13 – 2017 Future LOS without Improvements

Figure 14 – 2027 Future Traffic Volumes

Figure 15 – 2027 Future LOS without Improvements

SUMMARY OF TRANSPORTATION DEFICIENCIES

Traffic conditions within the study area were evaluated to assess the existing and future deficiencies of the transportation network. The purpose of this summary is to identify areas where existing and/or future concerns may occur, including and potential safety issues, intersection geometry deficiencies, and traffic control. The assessment of future conditions, combined with an understanding of existing traffic operations, will ensure the transportation infrastructure improvements meet the needs of the area.

Coursey Lake Road

Coursey Lake Road is composed of a series of vertical and horizontal curves between Central Church Road and Dorsett Shoals Road. Speed studies indicate the 85 percentile speed along the corridor exceeds the posted speed limit throughout the day. In the area of Chapel Hill Elementary School, the 85 percentile speed exceeds the posted 25 mph during the arrival and dismissal times by at least ten mph. Additionally, there are no pedestrian or bicycle facilities to encourage students to travel to school.

Central Church Road at Yancey Road

Yancey Road intersects Central Church Road at approximately a 40-degree skewed angle, which is below GDOT's current design guideline of 60 degrees. GDOT's current design guidelines indicate that an intersection angle should be close to a 90-degree angle, where practical. The closer an intersection angle is to 90-degrees, the greater the safety and operational benefits resulting from:

- minimized exposure time for crossing movements (vehicular and pedestrian)
- reduced sharp angle turns (especially for trucks)
- simplified signing and pavement markings, channelization, and signalization layouts

The skewed approaches to the intersection result in a large area of pavement and poor guidance for vehicles traveling through the intersection. Additionally the skewed alignment limits the lines of sight for intersection sight distance.

Future capacity analyses indicate the intersection will experience LOS F conditions during the AM peak hour by 2017 and during the AM and PM peak hours by 2027. The future capacity analysis results for 2017 and 2027 are shown in Figures 11 and 13.

Collision history analysis indicated the highest occurrence of collisions within the study area was recorded at the intersection. Four of the six collisions occurring at the intersections were either angled or head-on collisions, which are usually considered to be correctable by the installation of a traffic signal.

Central Church Road at Coursey Lake Road

The northbound Coursey Lake Road approach sight distance was measured in the field to be approximately 330 feet. The limited departure sight distance results from the horizontal curvature of the eastern Central Church Road approach and a berm on the southeast corner.

The results of the intersection capacity analyses indicate the northbound Coursey Lake Road approach will experience LOS F conditions during the AM peak hour in 2017 and LOS E or worse during all three peak hours by 2027. The future capacity analysis results for 2017 and 2027 are shown in Figures 13 and 15.

Dorsett Shoals Road at Coursey Lake Road

Coursey Lake Road approach to the Dorsett Shoals Road intersection is on a 13 percent downward grade. Although the approach to the intersection consists of vertical and horizontal curves, there are only two collisions reported at this location; one angled and one equipment failure unfortunately resulting in a fatality.

Year 2027 capacity analyses indicate the southbound Coursey Lake Road approach will experience LOS F conditions during the AM peak hour. The future capacity analysis results for 2017 and 2027 are shown in Figures 13 and 15.

Chapel Hill Elementary School at Coursey Lake Road

Capacity analysis indicates both the northern and southern driveways to Chapel Hill Elementary School on Coursey Lake Road operate at acceptable LOS, D or better, during existing and year 2017. Year 2027 analysis indicates that the northern drive will experience LOS F during the AM peak hour.

The field inventory of the existing pedestrian and bicycle facilities in the area around the school indicate that there are no facilities available along Coursey Lake Road. Comprehensive pedestrian facilities that are provided at the two residential developments just north and south of the school but do not exists along Coursey Lake Road and provide no connection to the adjacent Chapel Hill Elementary School.

RECOMMENDED IMPROVEMENTS

This section of the study summarizes recommended improvements necessary for mitigating the identified deficiencies. This section also discusses the implementation of recommended transportation improvement projects relating to traffic control, pedestrian facilities, and roadway improvements. Detailed conceptual drawings are presented for each of the recommendations.

Projects are prioritized into one of three categories (short-range, mid-range, or long-range projects) for implementation based primarily on the need for improvement during the existing, 2017, and 2027 analysis years.

In addition, preliminary construction cost estimates have been prepared for each alternative and are summarized in this section. The cost estimates are based on estimated quantities of materials determined from the conceptual improvements. Cost estimates are based on the Georgia Department of Transportation's mean item summary for 2006 projects. Detailed cost estimates are included in Appendix C.

Short-Range Improvements

The analysis of existing traffic operations, safety, and operational conditions in the study area resulted in the identification of potential improvement needs. A description of potential improvement needs for various portions of the study area are provided below. These recommended improvements are identified in Figures 16 through 19.

Central Church Road at Yancey Road

The skewed alignment of the northbound and southbound Yancey Road approaches at the intersection with Central Church Road results in a large area of unused pavement needed to accommodate adequate turn radius, which results in poor guidance for vehicles traversing the intersection. To improve the operation of the intersection, the following improvement actions are recommended (Refer to Figure 16):

- Install eastbound right-turn painted channelized island.
- Install westbound right-turn painted channelized island.
- Install yield signs (R1-2) at both channelized right turn lanes.

The preliminary construction cost estimates for the intersection improvements is $9420.

Dorsett Shoals Road at Coursey Lake Road

The existing need for the installation of an exclusive right turn bay for the westbound Dorsett Shoals Road approach at Coursey Lake Road has been examined using the guidelines established in the *NCHRP Report 457*, which indicated that an exclusive right-turn bay is needed at the intersections. To improve the operation of the intersection, the following improvement actions are recommended (Refer to Figure 17):

- Install westbound right-turn lane (305-foot bay length) on Dorsett Shoals Road.

The preliminary construction cost estimates for the intersection improvements is $61,800.

Figure 16

Figure 17

Coursey Lake Road at Chapel Hill Elementary School

Although the left-turn bay analysis for the northbound Coursey Lake Road school driveways did not indicate the need for a left-turn bay at either location, the installation of left-turn bays is recommended. The high travel speeds coupled with the vertical and horizontal alignment of Coursey Lake Road will improve the safety of the intersections.

The field inventory of the existing pedestrian facilities indicate there are no pedestrian or bike facilities adjacent to the school area. To improve the safety and operation of the intersection the following improvement actions are recommended (Refer to Figures 18 and 19):

- Install left turn lanes on the northbound Coursey Lake Road approaches to both the northern and southern school driveways.
- Install a 8-10 foot multi-use path between the neighborhoods of The Plantation at Dorsett Shoals and Knollview at Coursey Lake developments on the east side of Coursey Lake Road. Separate multi-use path from the roadway by curb and gutter.
- Install crosswalk across Coursey Lake Road, north of the southern Chapel Hill Elementary School driveway, connecting the proposed multi-use path on the east side of Coursey Lake Road to school property.
- Install 8-10 foot multi-use path from Coursey Lake Road crosswalk location to school building.
- Install a raised concrete island to replace the existing painted island at the southern driveway.
- Install overhead lighting along the multi-use path to provide for safety and visibility.
- Install flashing beacons with school speed limit sign assemblies to reduce travel speeds in place of existing signs. Vehicle feedback signs, along with increased enforcement, may also be beneficial for slowing traffic.
- Install in-street stop for pedestrians in crosswalk sign assembly (S4-3 and R1-6a) in crosswalk on Coursey Lake Road.

The preliminary construction cost estimates for the intersection improvements is $586,000

Figure 18

Figure 19

Mid-Range Improvements

The analysis of year 2017 traffic operations, and safety in the study area resulted in the identification of potential improvement needs. A description of potential improvement needs is provided below. Recommended improvements are identified in Figure 20.

Central Church Road at Yancey Road/Coursey Lake Road

The short-range recommended improvements on Central Church Road attempted to provide an interim improvement to the skewed Yancey Road alignment. GDOT's design guidelines have indicated that an approach alignment of greater than 70-degrees would provide greatly enhanced intersection operation and safety. Additionally, the Coursey Lake Road approach to Central Church Road has departure sight distance below current standards, which would be challenging and costly to improve. The two intersections are also located approximately 500-feet apart. As traffic volumes continue to increase, the operations and safety of the two intersections will become increasingly difficult to maintain. Year 2017 capacity analysis indicates that both the Yancey Road and Coursey Lake Road intersections with Central Church Road experience approach LOS F during at least one peak hour.

The poor geometric configurations and operations of both intersections lead to the examination of the realignment of the northern Yancey Road leg with the southern Coursey Lake Road approach at Central Church Road. Realignment of the southbound Yancey Road approach would improve the alignment of the approach to approximately 90-degrees and provide two higher volume approaches to intersect at one location. The realignment would also reroute traffic to the realigned intersection and warrant the installation of a traffic signal, the installation of which would mitigate the impact of the reduced departure sight distance for Coursey Lake Road approach.

In conjunction with the approach realignment, an analysis of the proposed traffic control at the intersection was evaluated. A traffic signal warrant analysis was performed using the criteria provided in the *Manual on Uniform Traffic Control Devices* (MUTCD) for the intersection of Central Church Road at Yancey Road/Coursey Lake Road utilizing rerouted existing traffic volumes. Based upon the analysis performed, existing rerouted volumes met Warrant 2: Four-Hour Vehicular Volume. It is assumed that any future year signal analysis would meet warrant criteria, also. The results of the signal warrant analysis are summarized in Table 5. More detailed signal warrant analysis results are provided in Appendix D.

Table 5
Signal Warrant Analysis Results

Warrant	Result	Hrs. Met / Required
1A	Not Met	7/8
1B	Not Met	5/8
1C	Not Met	N/A
2	**MET**	**4/4**
3A	Not Met	N/A
3B	Not Met	0/1
4	N/A	N/A
5	N/A	N/A
6	N/A	N/A
7	Not Met	N/A
8	N/A	N/A

In summary, to improve the operation of the intersection the following improvement actions are recommended (Refer to Figure 20):

- Realign southbound Yancey Road approach to intersect Central Church Road at Coursey Lake Road.
- Install a traffic signal at the intersection of Central Church Road at Yancey Road/Coursey Lake Road.
- Install left turn lanes with protected phasing on Central Church Road.
- Install left turn lanes with permitted/protected phasing on Yancey Road/Coursey Lake Road.
- Install right turn lanes on all approaches to the intersection.
- Install supplemental signal head on the northeast strain pole for westbound Central Church Road approach.
- Take existing southbound Yancey Road approach out of operation.

The preliminary construction cost estimates for the intersection improvements is $534,000.

Figure 20 – Central Church Rd @ Yancey/Coursey Lake, mid

Long-Range Improvements

The analysis of year 2027 traffic operations and observation of safety and operational conditions in the study area resulted in the identification of potential improvement needs. The potential improvement needs are provided below. Recommended improvements are shown in Figure 21 and 22.

Dorsett Shoals Road at Coursey Lake Road

The future need for the installation of an exclusive left turn bay for the eastbound Dorsett Shoal Road approach at Coursey Lake Road has been examined using the guidelines established in the *NCHRP Report 457*, which indicated that an exclusive left turn bay is warranted at the intersections. In summary, to improve the operation of the intersection the following improvement actions are recommended (Refer to Figure 21):

- Install eastbound left turn lane (340-foot storage) on Dorsett Shoals Road.

The preliminary construction cost estimates for the intersection improvements is $132,000.

Central Church Road at Yancey Road/Coursey Lake Road

The installation of an eight foot painted median is proposed as a long range improvement at this intersection to accommodate future development. The installation of a median in the area of the intersection would ensure the long range preservation of the operations of the intersection by providing access management. This improvement should not be implemented unless adjacent propertied are rezoned to commercial land use. In summary, to improve the operation of the intersection the following improvement actions are recommended (Refer to Figure 22):

- Install painted median along Central Church Road at the intersection.

The preliminary construction cost estimates for the intersection improvements is $585,000.

Recommended Improvements Capacity Analysis

Using the previously discussed methodology, capacity analyses were performed using recommended intersection improvements. Analysis was performed using AM, school dismissal, and PM peak hours for projected future volumes and recommended geometry for 2017 and 2027 analysis years. Analysis results are provided in Appendix B.

Figure 21 – Dorsett Shoals Rd @ Coursey Lake Rd, long

Figure 22 – Central Church Rd @ Yancey/Coursey Lake, long

2017 Capacity Analysis

The study intersections were analyzed for the year 2017 traffic conditions with recommended improvements. As the results show, the intersections and unsignalized approaches operate at LOS C or better. The recommended intersection configuration is shown in Figure 23. Figure 24 shows the rerouted 2017 volumes with the realignment and signalization at the intersection of Yancey Road/Coursey Lake Road at Central Church Road. LOS for the recommended improvements is shown in Figure 25.

2027 Capacity Analysis

The study intersections were analyzed for the year 2027 traffic conditions with recommended improvements. The analysis indicates, all minor stop controlled approaches at three of the unsignalized intersections operate acceptably at LOS D or better during the peak periods. The eastbound approach of the northern Chapel Hill Elementary School Driveway operates at LOS F during the AM peak period. Although future traffic projections indicate a poor intersection approach LOS at this location, the moderate delay is typical for minor streets and does not necessarily reflect the overall operation of the intersection. The signalized intersection of Coursey Lake Road/Yancey Road and Central Church Road operates at LOS C or above during the peak periods. The recommended intersection improvement configuration is shown in Figure 26. Figure 27 depicts the 2027 volumes with improvements. The results of the analysis for the future traffic conditions are shown in Figure 28. Analysis results are provided in Appendix A.

Appendices

Appendix A
Traffic Volume Data

Appendix B
Intersection Analysis

Appendix C
Detailed Cost Analysis

Appendix D
MUTCD Signal Warrant Analysis