

**City of Durham**  
**Department of Transportation**

February 4, 2011

**Memorandum**

To: Durham City-County Planning Department  
From: Bill Judge P.E., Transportation Engineer IV  
Subject: Leesville Road Active Adult Community (Z1000016) Traffic Impact Analysis

The City-County Unified Development Ordinance requires that a Traffic Impact Analysis (TIA) study be prepared for development plans estimated to generate 150 or more vehicle trips during the peak hour. The proposed Leesville Road Active Adult Community Development is located on the south side of Leesville Road east of Doc Nichols Road. The proposed development is estimated to include 1,020 detached senior housing units and 255 attached senior housing units. The development is expected to be completed in 2017. The development is projected to generate 4,786 external daily trips, with 238 occurring during the A.M. peak hour (84 entering and 154 exiting) and 301 occurring during the P.M. peak hour (183 entering and 118 exiting).

Three access points are proposed. Access #1 is located to the south of the proposed rezoning and will provide a proposed public north-south collector street connection to T.W. Alexander Drive at the existing median opening between US 70 and ACC Boulevard. Access #2 will be via the same proposed public north-south collector street connection where it connects to Leesville Road (approximately 1,100 feet east of Doc Nichols Road). This proposed public collector street will align with a proposed public collector street on the north side of Leesville for the proposed Sierra Development. Access #3 will also connect to Leesville Road and it will be located approximately 2,000 feet to the east of Access #2. The TIA study was prepared for the proposed development by Martin/Alexiou/Bryson, P.C. in November 2010.

**Study Area**

The TIA study includes analysis of nine (9) intersections listed below:

- US 70 and T.W. Alexander Drive; (City of Raleigh)
- ACC Boulevard and Brier Creek Parkway; (City of Raleigh)
- Leesville Road and Doc Nichols Road;
- Leesville Road and Carpenter Pond Road;
- Olive Branch Road and Carpenter Pond Road;
- Olive Branch Road and Doc Nichols Road;
- T.W. Alexander Drive and Site Access #1; (City of Raleigh)
- Leesville Road and Site Access #2;
- Leesville Road and Site Access #3.

## Traffic Data Collection

The A.M. and P.M. peak hour intersection turning movement counts were taken between the hours of 7:00 am to 9:00 am and 4:00 pm to 6:00 pm during October 2010 and November 2010.

## Trip Generation

Site generated traffic for the proposed development was computed based on ITE's *Trip Generation Manual, 8<sup>th</sup> Edition, 2008*. The TIA used the following ITE trip generation uses for the proposed development:

USE	UNITS	ITE CODE
Senior Adult Housing - Detached	1,020 units	251
Senior Adult Housing - Attached	255 units	252

The proposed use would generate a total of 4,786 daily trips with 238 trips occurring during the AM peak hour and 301 trips occurring during the PM peak hour.

## Trip Distribution and Assignment

The assignment of site traffic on the study area roadway network was based on the following trip distribution percentages:

- To/From the west via Leesville Road: 10% of site trips;
- To/From the southeast via Leesville Road: 6% of site trips;
- To/From the north via Olive Branch Road: 6% of site trips;
- To/From the east via Carpenter Pond Road: 4% of site trips;
- To/From the southwest via Brier Creek Parkway: 12% of site trips;
- To/From the west via T.W. Alexander Drive: 12% of site trips;
- To/From the northwest via US 70: 1% of site trips;
- To/From the southeast via US 70: 45% of site trips;
- To/From the south via ACC Boulevard: 4% of site trips.

## Approved or Proposed Developments and Background Growth

Approved developments are defined as approved or pending, but not yet constructed, projects within the vicinity of the subject project. The following approved developments were included in the TIA:

- Sierra Residential Development Phases 1 and 2: 1,050 single-family units and 150 townhomes located on the north side of Leesville Road east of Doc Nichols Road. This development has been previously called Doc Nichols Development and Sauternes;
- Eagles Mart: Convenience store with 18 fueling positions and a 1,368 square-foot automated car wash located on the northeast corner of US 70 and Leesville Road;
- Alexander Place Phases 13-17: Proposed development located within the City of Raleigh jurisdiction located near ACC Boulevard and T.W. Alexander Drive.

In addition to the traffic from these proposed developments, a uniform annual compounded growth rate of 1% was utilized to determine the background traffic projections.

**Transportation Improvement Program (TIP) Roadway Improvements**

There are two scheduled NCDOT roadway improvement projects in the area:

- 1) NCDOT TIP Project U-4720 will provide improvements to the US 70 corridor from Lynn Road to the Wake County Line. This project is currently unfunded;
- 2) NCDOT TIP U-4721 will construct the Northern Durham Parkway from US 70 to US 501 (N. Roxboro Street). This project is currently unfunded.

**Capacity Analysis**

Capacity analyses were performed using Synchro 7.0 for the AM and PM peak hours for the following scenarios:

- Existing (2010) conditions;
- No-Build (2018) conditions (2010 Existing + Background Growth + Approved Development Traffic);
- Build (2018) conditions (2018 No-Build + Site Traffic);
- Build (2018) with Improvements conditions (2018 Build + Improvements).

This development is located within the suburban tier where the adopted LOS standard is LOS D. The following table summarizes the average delay for the various Levels of Service (LOS) for unsignalized and signalized intersections:

	<b>Signalized Intersections</b>	<b>Unsignalized Intersections</b>
<b>Level of Service</b>	<b>Average Vehicle Delay (Seconds)</b>	<b>Average Vehicle Delay (Seconds)</b>
<b>A</b>	<b>0-10</b>	<b>0-10</b>
<b>B</b>	<b>10-20</b>	<b>10-15</b>
<b>C</b>	<b>20-35</b>	<b>15-25</b>
<b>D</b>	<b>35-55</b>	<b>25-35</b>
<b>E</b>	<b>55-80</b>	<b>35-50</b>
<b>F</b>	<b>&gt;80</b>	<b>&gt;50</b>

US 70 and T.W. Alexander Drive; (City of Raleigh)

The following table summarizes the Level of Service (LOS) for this signalized intersection.

<b>Scenario</b>	<b>AM LOS</b>	<b>PM LOS</b>
Existing (2010)	<b>E</b>	<b>F</b>
No-Build (2018)	<b>F</b>	<b>F</b>
Build (2018)	<b>F</b>	<b>F</b>
Build (2018) w/ Improvements	<b>E</b>	<b>F</b>

The TIA recommended the following improvements to accommodate the additional site traffic:

- Restripe eastbound US 70 to provide a third through lane with a minimum of 500 feet of storage while keeping the existing right-turn lane with a minimum of 100 feet of storage plus appropriate tapers;
- Upgrade the traffic signal to accommodate the additional eastbound through lane and adjust the signal timing accordingly.

With the recommended improvements the intersection will operate at a LOS E in the AM peak hour and a LOS F in the PM peak hour for the Build (2018) with improvements condition. Although this does not meet City of Durham’s requirement of a LOS D or better, this intersection is located within the City of Raleigh’s jurisdiction, therefore the required improvements for this intersection were determined by the City of Raleigh and NCDOT.

ACC Boulevard and Brier Creek Parkway; (City of Raleigh)

The following table summarizes the Level of Service (LOS) for this signalized intersection.

<b>Scenario</b>	<b>AM LOS</b>	<b>PM LOS</b>
Existing (2010)	<b>C</b>	<b>D</b>
No-Build (2018)	<b>D</b>	<b>F</b>
Build (2018)	<b>D</b>	<b>F</b>
Build (2018) w/ Improvements	<b>D</b>	<b>D</b>

The TIA recommended the following improvement to accommodate the additional site traffic:

- Revise signal timing to accommodate the additional site and background traffic growth.

With the recommended improvement the intersection will operate at a LOS D in both the AM and PM peak hour for the Build (2018) with improvements condition. Although this meets the City of Durham’s requirement of a LOS D or better, this intersection is located within the City of Raleigh’s jurisdiction, therefore the required improvements for this intersection were determined by the City of Raleigh and NCDOT.

Leesville Road and Doc Nichols Road

The following table summarizes the Level of Service (LOS) for this intersection.

Scenario	AM LOS	PM LOS
Existing (2010)	<b>B*</b>	<b>A*</b>
No-Build (2018)	<b>C</b>	<b>B</b>
Build (2018)	<b>C</b>	<b>B</b>
Build (2018) w/ Improvements	<b>C</b>	<b>B</b>

\* Unsignalized operation, with LOS reported for the worst (SB) approach

The existing unsignalized intersection currently operates at an acceptable LOS B in the AM peak hour and an acceptable LOS A in the PM peak hour. With the additional traffic from adjacent approved developments and the following improvements, the intersection will operate at a LOS C or better for both peak hours for the No-Build (2018) condition:

- Construction of an eastbound left-turn lane on Leesville Road at Doc Nichols Road with a minimum of 300 feet of storage plus appropriate tapers;
- Construction of an exclusive southbound left-turn on Doc Nichols Road at Leesville Road with a minimum of 150 feet of storage plus appropriate tapers;
- Installation of a traffic signal with steel poles and mast arms (subject to MUTCD warrants and approval by NCDOT).

With the additional site traffic and the improvements listed above, the intersection will operate at an acceptable LOS C or better for both the AM and PM peak hour for the Build (2018) and Build (2018) with improvements conditions. No additional improvements are proposed or required.

Leesville Road and Carpenter Pond Road

The following table summarizes the Level of Service (LOS) for this unsignalized intersection.

Scenario	AM LOS	PM LOS
Existing (2010)	<b>B*</b>	<b>B*</b>
No-Build (2018)	<b>B*</b>	<b>B*</b>
Build (2018)	<b>B*</b>	<b>B*</b>
Build (2018) w/ Improvements	<b>B*</b>	<b>B*</b>

\* Unsignalized operation, with LOS reported for the worst (WB) approach

The analysis indicates that the intersection will operate at acceptable levels of service for all scenarios and traffic conditions. No improvements are recommended or required at this intersection.

Olive Branch Road and Carpenter Pond Road

The following table summarizes the Level of Service (LOS) for this unsignalized intersection.

Scenario	AM LOS	PM LOS
Existing (2010)	B*	B*
No-Build (2018)	B*	B*
Build (2018)	B*	B*
Build (2018) w/ Improvements	B*	B*

\* Unsignalized operation, with LOS reported for the worst (SB) approach

The analysis indicates that the intersection will operate at acceptable levels of service for all scenarios and traffic conditions. No improvements are recommended or required at this intersection.

Olive Branch Road and Doc Nichols Road

The following table summarizes the Level of Service (LOS) for this intersection.

Scenario	AM LOS	PM LOS
Existing (2010)	A*	B*
No-Build (2018)	B*	B*
Build (2018)	B*	C*
Build (2018) w/ Improvements	B*	C*

\* Unsignalized operation, with LOS reported for the worst (EB) approach

The existing unsignalized intersection currently operates at an acceptable LOS A in the AM peak hour and an acceptable LOS B in the PM peak hour. With the additional traffic from adjacent approved developments and the following improvement, the intersection will operate at a LOS B for both peak hours for the No-Build (2018) condition:

- Construction of an exclusive southbound right-turn on Olive Branch Road at Doc Nichols Road with a minimum of 125 feet of storage plus appropriate tapers.

With the additional site traffic and the improvement listed above, the intersection will operate at an acceptable LOS C or better for both the AM and PM peak hour for the Build (2018) and Build (2018) with improvements conditions. No additional improvements are proposed or required.

T.W. Alexander Drive and Site Access #1; (City of Raleigh)

The following table summarizes the Level of Service (LOS) for this unsignalized intersection.

Scenario	AM LOS	PM LOS
No-Build (2018)	B*	B*
Build (2018)	C*	D*
Build (2018) w/ Improvements	C*	D*

\* Unsignalized operation, with LOS reported for the worst (NB) approach

The TIA recommended the following improvement to accommodate the additional site traffic:

- Construct Site Access #1 with one ingress and two egress lanes to provide a shared through/right-turn lane and an exclusive southbound left-turn lane with a minimum of 100 feet of storage plus appropriate tapers.

With the recommended improvement the intersection will operate at a LOS D or better for both the AM and PM peak hour for the Build (2018) with improvements condition. Although this meets the City of Durham’s requirement of a LOS D or better, this intersection is located within the City of Raleigh’s jurisdiction, therefore the required improvements for this intersection were determined by the City of Raleigh and NCDOT.

Leesville Road and Site Access #2

The following table summarizes the Level of Service (LOS) for this unsignalized intersection.

<b>Scenario</b>	<b>AM LOS</b>	<b>PM LOS</b>
No-Build (2018)	<b>C* (SB)</b>	<b>C* (SB)</b>
Build (2018)	<b>D* (NB)</b>	<b>E* (NB)</b>
Build (2018) w/ Improvements	<b>D* (NB)</b>	<b>E* (NB)</b>

\* Unsignalized operation, with LOS reported for the worst approach

With the additional traffic from adjacent approved developments, the intersection will operate at a LOS C for both peak hours for the No-Build (2018) condition. With the additional site traffic, the intersection will operate at a LOS D in the AM peak hour and a LOS E in the PM peak hour for the Build (2018) condition. To accommodate the proposed site traffic the TIA recommended the following additional improvements:

- Construction of an exclusive westbound left-turn lane on Leesville Road with a minimum of 100 feet of storage plus appropriate tapers;
- Construction of an exclusive eastbound right-turn lane on Leesville Road with a minimum of 75 feet of storage plus appropriate tapers. This improvement was not specified in the TIA, but is required by the City of Durham to accommodate the volume of right-turns;
- Installation of a traffic signal with steel poles and mast arms (subject to MUTCD warrants and approval by NCDOT). This improvement was not specified in the TIA, but is required by the City of Durham to accommodate the proposed traffic volumes;
- Construction of a collector street on the south side of Leesville Road to serve the proposed development and provide a north-south public street collector from T.W. Alexander (Access #1) to Leesville Road (Access #2). The collector street must have one ingress lane and two egress lanes at Leesville Road to provide an exclusive northbound left-turn lane with a minimum of 100 feet of storage plus appropriate tapers.

With the additional recommended improvement, the intersection will operate at a LOS D in the AM peak hour and a LOS E in the PM peak hour for the Build (2018) with improvements condition. Although a LOS E is undesirable at signalized intersections, a LOS E or F is typical of many unsignalized intersections and driveways during peak hours as the delay is limited to the side street (or driveway) approach.

Leesville Road and Site Access #3

The following table summarizes the Level of Service (LOS) for this unsignalized intersection.

Scenario	AM LOS	PM LOS
Build (2018)	B*	B*
Build (2018) w/ Improvements	B*	B*

\* Unsignalized operation, with LOS reported for the worst (NB) approach

The TIA recommended the following improvements to accommodate the proposed site traffic:

- Construction of an exclusive westbound left-turn lane on Leesville Road with a minimum of 100 feet of storage plus appropriate tapers;
- Construction of Site Access #3 on the south side of Leesville Road to serve the proposed development. Site access #3 should be constructed with one ingress lane and one egress lane.

With the improvements listed above, the intersection will operate at an acceptable LOS B for both peak hours for the Build (2018) and Build (2018) with improvements condition. No additional improvements are recommended or required.

**Summary of TIA Required Improvements**

US 70 and T.W. Alexander Drive (City of Raleigh)

1. Restripe eastbound US 70 to provide a third through lane while keeping the existing right-turn lane with adequate storage and appropriate taper for the eastbound right-turn movement;
2. Upgrade the traffic signal to accommodate the additional eastbound through lane and adjust the signal timing accordingly.

ACC Boulevard and Brier Creek Parkway (City of Raleigh)

1. Revise signal timing to accommodate the additional site and background traffic growth.

Leesville Road and Doc Nichols Road

1. Construct an eastbound left-turn lane on Leesville Road at Doc Nichols Road with adequate storage and appropriate tapers;
2. Construct an exclusive southbound left-turn on Doc Nichols Road at Leesville Road with adequate storage and appropriate tapers;
3. Install a traffic signal with steel poles and mast arms (subject to MUTCD warrants and approval by NCDOT).

Olive Branch Road and Doc Nichols Road

1. Construct an exclusive southbound right-turn on Olive Branch Road at Doc Nichols Road with adequate storage and appropriate tapers.

### T.W. Alexander Drive and Site Access #1 (City of Raleigh)

1. Construct Site Access #1 with one ingress and two egress lanes to provide a shared through/right-turn lane and an exclusive southbound left-turn lane.

### Leesville Road and Site Access #2

1. Construct an exclusive westbound left-turn lane on Leesville Road with adequate storage and appropriate tapers;
2. Construct an exclusive eastbound right-turn lane Leesville Road with adequate storage and appropriate tapers;
3. Install a traffic signal with steel poles and mast arms (subject to MUTCD warrants and approval by NCDOT);
4. Construct a collector street on the south side of Leesville Road to serve the proposed development and provide a north-south public street collector from T.W. Alexander (Access #1) to Leesville Road (Access #2). The collector street should have one ingress lane and two egress lanes at Leesville Road.

### Leesville Road and Site Access #3

1. Construct an exclusive westbound left-turn lane on Leesville Road with adequate storage and appropriate tapers;
2. Construct Site Access #3 on the south side of Leesville Road to serve the proposed development. Site Access #3 must be constructed with one ingress lane and one egress lane.