



**CITY OF DURHAM | NORTH CAROLINA**

**Date: July 28, 2015**

**To: Amy Wolff, Durham City County Planning Department**  
**From: Bill Judge PE, City of Durham Department of Transportation**  
**Subject: Farrington Mixed Use (Z1500009) Traffic Impact Analysis**

The Unified Development Ordinance (UDO) requires that a Traffic Impact Analysis (TIA) be prepared for proposed developments estimated to generate 150 or more peak-hour vehicle trips. The proposed Farrington Mixed Use (Smart Property) development includes 173,000 square-feet of medical office and 600 apartments. The development is expected to generate 8,300 daily trips with 595 a.m. peak-hour trips (295 entering and 300 exiting) and 649 p.m. peak-hour trips (310 entering and 339 exiting). The proposed development is located on the west side of Farrington Road and the north and south side of Cleora Drive. The expected completion year is 2016, and the TIA analysis year is 2017. The Farrington Mixed Use (Smart Property) TIA was prepared by Kimley-Horn and Associates, Inc. in January 2015 with an Addendum in May 2015.

### **Study Area**

The study area includes the following intersections:

- NC 54 and I-40 Westbound Ramp;
- NC 54 and I-40 Eastbound Ramps;
- NC 54 and Farrington Road;
- NC 54 and Celeste Circle / Falconbridge Road;
- Celeste Circle and NC 54 Service Road;
- Farrington Road and Ephesus Church Road;
- Farrington Road and Rutgers Place;
- Farrington Road and Cleora Drive;
- Farrington Road and Site Driveway;
- Cleora Drive and Site Driveway (east);
- Cleora Drive and Site Driveway (west);
- Crescent Drive and Site Driveway (north); and
- Crescent Drive and Site Driveway (south).

### **Trip Generation**

Trip generation numbers are based on the Institute of Transportation Engineers (ITE) *Trip Generation Manual, 9<sup>th</sup> Edition*, 2012. Although the ITE *Trip Generation Manual* includes medical office as a category, the proposed site is 50% larger than the largest medical office complex included in the ITE *Trip Generation Manual*. To account for this difference, the TIA utilized the general office category (ITE land use code 710) for the a.m. peak-hour and a modified rate for the p.m. peak-hour. This approach was reviewed by the City of Durham prior to the analysis.

Additionally, trip reductions to account for internal capture trips between the apartments and medical office were included in the study. The final adjusted external trips for the proposed site resulted in 8,300 daily trips with 595 a.m. peak-hour trips (295 entering and 300 exiting) and 649 p.m. peak-hour trips (310 entering and 339 exiting).

### **Traffic Data Collection**

The peak-hour intersection turning movement counts were taken from 7-9 a.m. and 4-6 p.m. in September 2014.

### **Trip Distribution and Assignment**

The assignment of site traffic on the study area roadway network for the 168,000 square-feet of medical office on the south side of Cleora Drive was based on the following trip distribution percentages:

- To/From the Southwest via NC 54: 35% of site trips;
- To/From the Northeast via NC 54: 15% of site trips;
- To/From the North via Farrington Road: 5% of site trips;
- To/From the West via Ephesus Church Road: 5% of site trips;
- To/From the South via Farrington Road: 10% of site trips;
- To/From the Northwest via I-40: 15% of site trips; and
- To/From the Southeast via I-40: 15% of site trips.

The assignment of site traffic on the study area roadway network for the 600 apartments and 5,000 square-feet of medical office on the north side of Cleora Drive was based on the following trip distribution percentages:

- To/From the Southwest via NC 54: 25% of site trips;
- To/From the Northeast via NC 54: 15% of site trips;
- To/From the North via Farrington Road: 20% of site trips;
- To/From the West via Ephesus Church Road: 5% of site trips;
- To/From the South via Farrington Road: 5% of site trips;
- To/From the Northwest via I-40: 10% of site trips; and
- To/From the Southeast via I-40: 20% of site trips.

### **Approved Developments and Background Growth**

There are no approved projects in the vicinity. A uniform annual compounded growth rate of 1% was utilized to determine the background traffic projections.

### **TIP Roadway Improvements**

The following roadway projects are proposed in the area:

- NCDOT TIP Project U-5774 will provide improvements to NC 54 from Barbee Chapel Road to I-40 including construction of a grade separation at Farrington Road and an interchange at Falconbridge Road. This project is included in the draft State Transportation Improvement Program (STIP) with right-of-way in FY 2023 and construction in FY 2024.

- The *NC 54-I40 Corridor Study* proposes multiple roadway, transit, pedestrian, and bicycle related improvements in this area.

Additionally, the applicant proposes a number of roadway improvements to mitigate the proposed site traffic impact. These improvements may impact multiple properties that are not part of this development plan. The applicant is responsible for acquiring additional right-of-way and/or construction easements needed to complete these roadway improvements in accordance with NCDOT and City of Durham standards.

**Capacity Analysis**

Capacity analyses were performed using the a.m. and p.m. peak-hour for the following scenarios:

- Existing (2014) conditions;
- No-Build (2017) conditions (2014 existing + background growth);
- Build (2017) conditions (2014 existing + background growth + site traffic); and
- Build (2017) with improvements conditions (2012 existing + background growth + site traffic + improvements).

The applicant adjusted the ideal flow rates and the peak-hour factors based on collected field data. These changes were reviewed and accepted by NCDOT.

This development is located within a Suburban Transit Area. As permitted under Comprehensive Plan Policy 2.3.2f and UDO Section 6.9.1.C, the applicant is utilizing the Compact Tier Standards, where the adopted LOS standard is LOS E. However, three of the study area intersections (NC 54 / I-40 Westbound Ramp, Celeste Circle / NC 54 Service Road, and Farrington Road / Ephesus Church Road) are 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>

NC 54 and I-40 Westbound Ramp

The following table summarizes the Levels of Service at this existing signalized intersection in the Suburban Tier with an adopted LOS Standard of LOS D:

<b>Scenario</b>	<b>a.m. LOS</b>	<b>p.m. LOS</b>
Existing (2014)	<b>B</b>	<b>A</b>
No-Build (2017)	<b>B</b>	<b>A</b>
Build (2017)	<b>B</b>	<b>B</b>

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.

NC 54 and I-40 Eastbound Ramps

The following table summarizes the Levels of Service at this existing signalized intersection in the Suburban Transit Area with an adopted LOS Standard of LOS E:

<b>Scenario</b>	<b>a.m. LOS</b>	<b>p.m. LOS</b>
Existing (2014)	<b>B</b>	<b>B</b>
No-Build (2017)	<b>B</b>	<b>B</b>
Build (2017)	<b>C</b>	<b>C</b>

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.

NC 54 and Farrington Road

The following table summarizes the Levels of Service at this existing signalized intersection in the Suburban Transit Area with an adopted LOS Standard of LOS E:

<b>Scenario</b>	<b>a.m. LOS</b>	<b>p.m. LOS</b>
Existing (2014)	<b>D</b>	<b>D</b>
No-Build (2017)	<b>D</b>	<b>D</b>
Build (2017) with improvements	<b>D</b>	<b>D</b>

The TIA recommended the following required improvements to address the queing and delays at this intersection:

- Construct a second southbound left-turn lane on Farrington Road at NC 54 with a minimum of 250 feet of storage plus appropriate tapers;
- Extend the existing eastbound left-turn lane on NC 54 at Farrington Road to provide a minimum of 300 feet of storage plus appropriate tapers;

- Construct an exclusive westbound right-turn lane on NC 54 at Farrington Road to maximize the storage between Farrington Road and the I-40 Eastbound Ramps with appropriate tapers;
- Construct an exclusive eastbound right-turn lane on NC 54 at Farrington Road with a minimum of 250 feet of storage plus appropriate tapers; and
- Construct a concrete island with a 4ft. minimum width along Farrington Road from NC 54 to Cleora Drive.

With the improvements listed above the intersection is expected to operate at an acceptable LOS D for both peak-hours for the Build (2017) with improvements condition.

NC 54 and Celeste Circle / Falconbridge Road

The following table summarizes the Levels of Service at this existing unsignalized intersection in the Suburban Transit Area with an adopted LOS Standard of LOS E:

Scenario	a.m. LOS	p.m. LOS
Existing (2014)	D*	C*
No-Build (2017)	D*	C*
Build (2017)	D*	D*

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

Celeste Circle and NC 54 Service Road

The following table summarizes the Levels of Service at this existing unsignalized intersection in the Suburban Tier with an adopted LOS Standard of LOS D:

Scenario	a.m. LOS	p.m. LOS
Existing (2014)	A*	A*
No-Build (2017)	A*	A*
Build (2017)	A*	A*

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

Farrington Road and Ephesus Church Road

The following table summarizes the Levels of Service at this existing unsignalized intersection in the Suburban Tier with an adopted LOS Standard of LOS D:

Scenario	a.m. LOS	p.m. LOS
Existing (2014)	B*	B*
No-Build (2017)	B*	B*
Build (2017)	B*	B*

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

Farrington Road and Rutgers Place

The following table summarizes the Levels of Service at this existing unsignalized intersection in the Suburban Transit Area with an adopted LOS Standard of LOS E:

Scenario	a.m. LOS	p.m. LOS
Existing (2014)	C*	C*
No-Build (2017)	C*	C*
Build (2017) with improvements	D*	C*

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

The analysis indicates that the intersection will operate at acceptable levels of service for all scenarios and traffic conditions. Although the overall intersection will operate at acceptable levels of service, the following safety improvements are required at this intersection to accommodate the additional site traffic:

- Construct an exclusive northbound left-turn lane on Farrington Road at Rutgers Place with a minimum of 100 feet of storage plus appropriate tapers; and
- Improve Rutgers Place to NCDOT and City of Durham public street standards to provide a three-lane curb and gutter cross-section with bicycle lanes and sidewalks from Farrington Road to Crescent Drive.

Farrington Road and Cleora Drive

The following table summarizes the Levels of Service at this existing unsignalized intersection in the Suburban Transit Area with an adopted LOS Standard of LOS E:

Scenario	a.m. LOS	p.m. LOS
Existing (2014)	C*	B*
No-Build (2017)	C*	B*
Build (2017) with improvements	C*	D*

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

The analysis indicates that the overall intersection will operate at acceptable levels of service for all scenarios and traffic conditions. Although the overall intersection will operate at acceptable levels of service, the following safety improvements are required to accommodate the additional site traffic:

- Construct an exclusive northbound left-turn lane on Farrington Road at Cleora Drive with a minimum of 100 feet of storage plus appropriate tapers;
- Improve Cleora Drive to NCDOT and City of Durham public street standards to provide a three-lane curb and gutter cross-section with bicycle lanes and sidewalks along both sides of the road from Farrington Road to Crescent Drive; and
- Construct a concrete island with a 4ft. minimum width along Farrington Road from NC 54 to Cleora Drive.

Farrington Road and Site Driveway

The following table summarizes the Levels of Service at this proposed unsignalized intersection in the Suburban Transit Area with an adopted LOS Standard of LOS E:

Scenario	a.m. LOS	p.m. LOS
Build (2017) with improvements	C*	D*

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

The TIA recommended the following required improvement to address the queuing and delays at this intersection:

- Construct an exclusive northbound left-turn lane on Farrington Road at the Site Driveway with a minimum of 150 feet of storage plus appropriate tapers.

With the improvement listed above the intersection is expected to operate at an acceptable LOS D or better for both peak-hours for the Build (2017) with improvements condition.

Cleora Drive and Site Driveway (east)

The following table summarizes the Levels of Service at this proposed unsignalized intersection in the Suburban Transit Area with an adopted LOS Standard of LOS E:

Scenario	a.m. LOS	p.m. LOS
Build (2017) with improvements	A*	A*

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

Although the overall intersection will operate at acceptable levels of service, the following safety improvement is required to accommodate the additional site traffic:

- Improve Cleora Drive to NCDOT and City of Durham public street standards to provide a three-lane curb and gutter cross-section with bicycle lanes and sidewalks along both sides of the road from Farrington Road to Crescent Drive.

With the improvement listed above the intersection is expected to operate at an acceptable LOS A for both peak-hours for the Build (2017) with improvements condition.

Cleora Drive and Site Driveway (west)

The following table summarizes the Levels of Service at this proposed unsignalized intersection in the Suburban Transit Area with an adopted LOS Standard of LOS E:

Scenario	a.m. LOS	p.m. LOS
Build (2017) with improvements	A*	A*

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

Although the overall intersection will operate at acceptable levels of service, the following safety improvement is required to accommodate the additional site traffic:

- Improve Cleora Drive to NCDOT and City of Durham public street standards to provide a three-lane curb and gutter cross-section with bicycle lanes and sidewalks along both sides of the road from Farrington Road to Crescent Drive.

With the improvement listed above the intersection is expected to operate at an acceptable LOS A for both peak-hours for the Build (2017) with improvements condition.

Crescent Drive and Site Driveway (north)

The following table summarizes the Levels of Service at this proposed unsignalized intersection in the Suburban Transit Area with an adopted LOS Standard of LOS E:

Scenario	a.m. LOS	p.m. LOS
Build (2017) with improvements	B*	B*

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

Although the overall intersection will operate at acceptable levels of service, the following safety improvement is required to accommodate the additional site traffic:

- Improve Crescent Drive to NCDOT and City of Durham public street standards with bicycle lanes and sidewalks from Rutgers Place to Cleora Drive.

With the improvement listed above the intersection is expected to operate at an acceptable LOS B for both peak-hours for the Build (2017) with improvements condition.

Crescent Drive and Site Driveway (south)

The following table summarizes the Levels of Service at this proposed unsignalized intersection in the Suburban Transit Area with an adopted LOS Standard of LOS E:

Scenario	a.m. LOS	p.m. LOS
Build (2017) with improvements	B*	B*

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

Although the overall intersection will operate at acceptable levels of service, the following safety improvement is required to accommodate the additional site traffic:

- Improve Crescent Drive to NCDOT and City of Durham public street standards with bicycle lanes and sidewalks from Rutgers Place to Cleora Drive.

With the improvement listed above the intersection is expected to operate at an acceptable LOS B for both peak-hours for the Build (2017) with improvements condition.

## **Summary of required TIA improvements:**

### NC 54 and Farrington Road

1. Construct a second southbound left-turn lane on Farrington Road at NC 54 with adequate storage and appropriate tapers.
2. Extend the existing eastbound left-turn lane on NC 54 at Farrington Road to provide adequate and appropriate tapers.
3. Construct an exclusive eastbound right-turn lane on NC 54 at Farrington Road with adequate storage and appropriate tapers.
4. Construct an exclusive westbound right-turn lane on NC 54 at Farrington Road with adequate storage and appropriate tapers.

### Farrington Road

1. Construct a concrete island per City of Durham and NCDOT Standards along Farrington Road from NC 54 to Cleora Drive.

### Farrington Road and Rutgers Place

1. Construct an exclusive northbound left-turn lane on Farrington Road at Rutgers Place with adequate storage and appropriate tapers.

### Rutgers Place

1. Improve Rutgers Place to NCDOT and City of Durham public street standards to provide a three-lane curb and gutter cross-section with bicycle lanes and sidewalks from Farrington Road to Crescent Drive.

### Crescent Drive

1. Improve Crescent Drive to NCDOT and City of Durham public street standards with bicycle lanes and sidewalks from Rutgers Place to Cleora Drive.

### Farrington Road and Cleora Drive

1. Construct an exclusive northbound left-turn lane on Farrington Road at Cleora Drive with adequate storage and appropriate tapers.

### Cleora Drive

1. Improve Cleora Drive to NCDOT and City of Durham public street standards to provide a three-lane curb and gutter cross-section with bicycle lanes and sidewalks along both sides of the road from Farrington Road to Crescent Drive.

### Farrington Road and Site Driveway

1. Construct an exclusive northbound left-turn lane on Farrington Road at the proposed Site Driveway with adequate storage and appropriate tapers.

### Cross-Access Driveway

1. Provide a cross-access connection via the adjacent parcel(s) to the south for a driveway connection between the site and the NC 54 Service Road.