CITY OF DURHAM | NORTH CAROLINA

**Date:** **August 26, 2014**

**To:** **Amy Wolff, Durham City County Planning Department**
**From:** **Bill Judge PE, City of Durham Department of Transportation**
**Subject:** **Sheetz Autopark Center (Z1400011) 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 development includes a convenience store with 16 fueling positions and an 8,000 square-foot retail building. The development is expected to generate 298 a.m. peak-hour trips (153 entering and 145 exiting) and 414 p.m. peak-hour trips (205 entering and 209 exiting). The proposed development is located on the west side of NC 751, north of I-40.

The site will utilize two driveway connections. The northern full-access driveway to NC 751 (Access #1) will align with the signalized intersection of NC 751 and Southpoint Autopark Boulevard. Additionally, a right-in/right-out driveway to NC 751 (Access #2) is proposed along the west side of NC 751 between Southpoint Autopark Boulevard and the I-40 Westbound Ramp intersection. The expected completion year is 2016, and the TIA analysis year is 2017. The Sheetz Autopark Center TIA was prepared by John Davenport Engineering, Inc. in May 2014.

**Study Area**
The study area includes the following intersections:

- NC 751 and Southpoint Autopark Boulevard / Site Access #1;
- NC 751 and Site Access #2;
- NC 751 and I-40 Westbound Ramp;
- NC 751 and I-40 Eastbound Ramp; and
- NC 751 and Renaissance Parkway.

**Trip Generation**
Trip generation numbers are based on the Institute of Transportation Engineers (ITE) *Trip Generation Manual*, 9th *Edition*, 2012. The TIA used the following ITE trip generation uses for the proposed development:

| USE | SIZE | ITE CODE |
|---|---|---|
| Convenience Store | 16 fueling positions | 853 |
| Retail | 8,000 square-feet | 820 |

These proposed uses will generate 298 a.m. peak-hour and 414 p.m. peak-hour trips. The a.m. and p.m. peak-hour trips were adjusted utilizing published ITE rates to account for pass-by trips. The final adjusted external trips for the proposed site resulted in 131 a.m. peak-hour and 176 p.m. peak-hour trips.

**Traffic Data Collection**

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

**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 East via I-40: 30% of site trips;
- To/From the West via I-40: 30% of site trips;
- To/From the North via NC 751: 15% of site trips;
- To/From the South via NC 751: 15% of site trips;
- To/From the East via Southpoint Autopark Boulevard: 5% of site trips; and
- To/From the East via Renaissance Parkway: 5% of site trips.

**Approved Developments and Background Growth**

There are no approved projects in the vicinity. A uniform annual compounded growth rate of 3% was utilized to determine the background traffic projections.

**TIP Roadway Improvements**

There are no significant scheduled transportation improvement projects in the study area vicinity.

**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 traffic);
- Build (2017) conditions (2017 No-Build + Site traffic); and
- Build (2017) with improvements conditions (2017 Build + improvements).

For the 2017 Build conditions and the 2017 Build with improvements conditions, the TIA included two scenarios to determine the impact of the site traffic and improvements with and without Site Access #2. The results reported in this TIA memo reflect the impact and required roadway improvements associated with Scenario 1 which includes Site Access #2.

This development and project study area 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:

| | Signalized Intersections | Unsignalized Intersections |
|---|---|---|
| **Level of Service** | **Average Vehicle Delay (Seconds)** | **Average Vehicle Delay (Seconds)** |
| **A** | **0-10** | **0-10** |
| **B** | **10-20** | **10-15** |
| **C** | **20-35** | **15-25** |
| **D** | **35-55** | **25-35** |
| **E** | **55-80** | **35-50** |
| **F** | **>80** | **>50** |

NC 751 and Southpoint Autopark Boulevard / Site Access #1

The following table summarizes the Levels of Service at this existing signalized intersection:

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

The intersection currently operates at a LOS A during both the a.m. and p.m. peak-hour. With the additional site traffic and the following improvements, the intersection will operate at an acceptable LOS C or better for both peak hours:

- Extend the northbound left-turn lane on NC 751 to provide a minimum of 200 feet of storage plus appropriate taper;
- Restripe the westbound approach of Southpoint Autopark Boulevard to provide an exclusive left-turn lane, an exclusive through lane, and an exclusive right-turn lane;
- Construct an exclusive southbound right-turn lane on NC 751 with a minimum of 150 feet of storage plus appropriate taper;
- Construct Site Access #1 with one (westbound) ingress lane and three (eastbound) egress lanes to provide an exclusive left-turn lane, an exclusive through lane, and an exclusive right-turn lane; and
- Install a steel pole and mast arm to provide traffic signals for the eastbound approach of Site Access #1. Modify the existing traffic signal, signal phasing, and signal timing to accommodate the revised lane geometry.

NC 751 and Site Access #2

The following table summarizes the Levels of Service at this proposed unsignalized intersection for Scenario #1 (with Site Access #2):

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

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

With the additional site traffic and the following improvement, the intersection will operate at an acceptable LOS A for both peak hours:

- Construction of an exclusive southbound right-turn lane on NC 751 with a minimum of 50 feet of storage plus appropriate taper.

NC 751 and I-40 Westbound Ramps

The following table summarizes the Levels of Service at this existing signalized intersection:

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

With the additional site traffic, the intersection will operate at an acceptable LOS D for both the a.m. peak-hour and the p.m. peak-hour for the Build (2017) condition. No improvements are proposed or required at this intersection.

NC 751 and I-40 Eastbound Ramps

The following table summarizes the Levels of Service at this existing signalized intersection:

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

With the additional site traffic, the intersection will operate at an acceptable LOS B in the a.m. peak-hour and an acceptable LOS C in the p.m. peak-hour for the Build (2017) condition. No improvements are proposed or required at this intersection.

NC 751 and Renaissance Parkway

The following table summarizes the Levels of Service at this existing signalized intersection:

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

With the additional site traffic, the intersection will operate at an acceptable LOS C in the a.m. peak-hour and an acceptable LOS D in the p.m. peak-hour for the Build (2017) condition. No improvements are proposed or required at this intersection.

**Summary of Required Improvements:**

NC 751 and Southpoint Autopark Boulevard / Site Access #1

1. Extend the northbound left-turn lane on NC 751 to provide adequate storage and appropriate taper.
2. Restripe the westbound approach of Southpoint Autopark Boulevard to provide an exclusive left-turn lane, an exclusive through lane, and an exclusive right-turn lane.
3. Construct an exclusive southbound right-turn lane on NC 751 with adequate storage and appropriate taper.
4. Construct Site Access #1 with one (westbound) ingress lane and three (eastbound) egress lanes to provide an exclusive left-turn lane, an exclusive through lane, and an exclusive right-turn lane.
5. Install a steel pole and mast arm to provide traffic signals for the eastbound approach of Site Access #1. Modify the existing traffic signal, signal phasing, and signal timing to accommodate the revised lane geometry.

NC 751 and Site Access #2

1. Construct an exclusive southbound right-turn lane on NC 751 with adequate storage and appropriate taper.