

**City of Durham  
Transportation Division**

November 13, 2009

**Memorandum**

To: Durham City-County Planning Department  
From: Bill Judge, P.E., Transportation Engineer IV  
Subject: Treyburn Middle School (D0800219) Traffic Impact Analysis

The City-County Unified Development Ordinance requires that a Traffic Impact Analysis (TIA) report be prepared for proposed developments estimated to generate 150 or more vehicle trips during the peak hour. The proposed development, Treyburn Middle School, is a new 850-student middle school expected to generate 711 trips in the AM peak hour and 276 trips in the PM peak hour. Based on the number of AM peak hour trips, a Transportation Special Use Permit (TSUP) is also required for this site per UDO Section 3.3.8. The TIA report was prepared by Martin/Alexiou/Bryson, PLLC (MAB) in September, 2008 with addendums in January 2009 and October 2009.

The school will be located in northern Durham County, just north of the intersection of Snow Hill Road and Altrada Drive. The school is proposed to be accessed through two driveways – the existing intersection of Snow Hill Road and Novaglen Road (Site Access #1) and a new access driveway (Site Access #2) on Snow Hill Road approximately 1,275 feet west of Snow Hill Drive. The expected completion year of the school is 2011 and the TIA analysis year is 2012.

**Study Area**

The study area includes the following five intersections along Snow Hill Road:

- Roxboro Road and Snow Hill Road / Mason Road (signalized)
- Snow Hill Road and Snow Hill Drive / Whispering Meadow Lane (unsignalized)
- Snow Hill Road and Altrada Drive (unsignalized)
- Snow Hill Road and Novaglen Road / Site Access #1 (unsignalized)
- Snow Hill Road and Site Access #2 (unsignalized)

**Traffic Data Collection**

Turning movement counts were collected for the following four intersections:

<b>Intersection</b>	<b>Date</b>	<b>AM</b>	<b>PM*</b>
Roxboro Road and Snow Hill Road	Thursday, 24 <sup>th</sup> April, 2008	7:00 to 9:00	2:00 to 4:00
Altrada Drive and Snow Hill Road	Tuesday, 22 <sup>nd</sup> April, 2008	7:00 to 9:00	2:00 to 4:00
Novaglen Road and Snow Hill Road	Tuesday January 13, 2009	7:00 to 9:00	2:00 to 4:00
Snow Hill Drive / Whispering Meadow Lane and Snow Hill Road	Thursday, 17 <sup>th</sup> April, 2008	7:00 to 9:00	2:00 to 4:00

\* Based on school peak hour

## **Trip Generation**

Trip generation estimates are based on North Carolina Department of Transportation's (NCDOT's) Municipal and School Transportation Assistance (MSTA) School Calculator spreadsheet. School faculty trips were excluded from peak hour analysis as they are expected to arrive before the AM school peak hour and leave after the PM school peak hour. No other reductions or adjustments were made. Per the MSTA calculator, the school is anticipated to generate 711 trips in AM peak hour (399 entering, 312 exiting) and 276 trips in PM school peak hour (138 entering, 138 exiting).

## **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 North on Roxboro Road: 25%
- To/From the West on Mason Road: 10%
- To/From the South on Roxboro Road: 30%
- To/From the South on Altrada Drive: 1%
- To/From the North on Snow Hill Drive: 11%
- To/From the East on Snow Hill Road: 14%
- To/From the South on Whispering Meadow Lane: 2%
- To/From the West on Snow Hill Road between Roxboro Road and Altrada Drive: 2%
- To/From the East on Snow Hill Road between Snow Hill Drive and Altrada Drive: 5%

## **Approved Developments and Background Growth**

A uniform annual growth rate of 3% was assumed for background traffic along with projected traffic from the following three (3) approved developments:

- **Treyburn Residential** – This 221 unit single-family residential development is located east of Sawmill Creek Parkway. The build-out year is 2010 and TIA was performed by MAB in Aug, 2006. The development is expected to generate 164 trips in the AM peak hour and 215 trips in the PM peak hour.
- **Treyburn Retail** – Treyburn Retail development will be located on the southern quadrant of Roxboro Road and Orange Factory Road intersection. This development is to consist of a 43,359 square-foot supermarket, a 23,000 square-foot shopping center, a bank with 3 drive-through windows, a 5,000 square-foot high-turnover sit-down restaurant and a 14,418 square-foot pharmacy with drive through window. The build-out year for the development is 2008 and the TIA was completed by Ramey Kemp and Associates (RKA) in May, 2006. The development is expected to generate 360 trips in the AM peak hour and 1,056 trips in the PM peak hour.
- **Belvin Property** – This residential development is located south of the Hebron Road and Danube Lane intersection. The development consists of 221 single-family residential units, 264 apartments and 208 townhomes. The build-out was scheduled for 2005 and TIA was completed by John R. McAdams Company, Inc. in Aug 2002 with an addendum in May, 2005. The development is expected to generate 390 trips in the AM peak hour and 491 trips in the PM peak hour. At the time traffic counts were taken, the development was expected to be 60% complete so only the remaining 40% of site traffic is considered on top of background traffic.

## Transportation Improvement Plan (TIP) Roadway Improvements

NCDOT TIP project U-4721 proposes the construction the Northern Durham Parkway through a substantial portion of this site. The cross-section and exact alignment for this improvement has yet to be determined; and the project is currently unfunded.

### Capacity Analysis

Capacity analyses were performed using Synchro 7. The following four scenarios were analyzed for AM and PM school peak hours:

- Existing (2008) conditions
- No-Build (2012) conditions (2008 Existing + 3% Background Growth + Traffic from three Approved Developments)
- Build (2012) conditions (2012 No-Build + Site Traffic)
- Build (2012) conditions with improvements

### Roxboro Road and Snow Hill Road / Mason Road (Signalized)

The following table summarizes the LOS for this signalized intersection.

Scenario	AM LOS	PM LOS
Existing (2008)	<b>B</b>	<b>B</b>
No-Build (2012)	<b>C</b>	<b>C</b>
Build (2012)	<b>D</b>	<b>C</b>
Build (2012) with Improvements	<b>D</b>	<b>C</b>

For No-Build conditions, the intersection would operate at a LOS C with average delay of 22 seconds during the AM peak hour, and a LOS C with average delay of 20 seconds during the PM school peak hour. For Build conditions, the intersection will operate at a LOS D with average delay of 36 seconds during AM peak hour and a LOS C with average delay of 26 seconds in the PM school peak hour.

The TIA recommends the following improvements:

- Extend the westbound left-turn lane on Snow Hill Road from 75 feet to 200 feet.
- Extend the southbound left-turn lane on Roxboro Road from 125 feet to 275 feet.

The above recommendations do not affect the LOS, but would improve queuing storage capacities. Without the proposed improvements the queuing from the additional site traffic would block the through lanes creating safety concerns at this intersection, therefore the storage lengths must be increased as recommended in the TIA.

Snow Hill Road and Snow Hill Drive / Whispering Meadow Drive (Unsignalized)

The following table summarizes the LOS for this two-way-stop-controlled intersection.

<b>Scenario</b>	<b>AM LOS</b>	<b>PM LOS</b>
Existing (2008)	<b>A*</b>	<b>A*</b>
No-Build (2012)	<b>B*</b>	<b>B*</b>
Build (2012)	<b>C*</b>	<b>B*</b>

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

The side street approaches of this intersection operate at an acceptable LOS for both the AM and PM school peak hour conditions. No improvements are recommended or required at this intersection.

Snow Hill Road and Altrada Drive (Unsignalized)

The following table summarizes the LOS for this two-way-stop-controlled intersection.

<b>Scenario</b>	<b>AM LOS</b>	<b>PM LOS</b>
Existing (2008)	<b>B*</b>	<b>A*</b>
No-Build (2012)	<b>B*</b>	<b>B*</b>
Build (2012)	<b>C*</b>	<b>B*</b>

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

This unsignalized intersection is located approximately 1,300 feet east of Novaglen Road / Site Access #1. With the additional site traffic, the intersection will operate at a LOS C in the AM peak hour and a LOS B in the PM peak hour. No improvements are recommended or required at this intersection.

Snow Hill Road and Novaglen Road / Site Access #1 (Unsignalized)

The following table summarizes the LOS for this two-way-stop-controlled intersection.

<b>Scenario</b>	<b>AM LOS</b>	<b>PM LOS</b>
Existing (2008)	<b>A*</b>	<b>A*</b>
No-Build (2012)	<b>B*</b>	<b>B*</b>
Build (2012)	<b>D*</b>	<b>C*</b>
Build (2012) with Improvements	<b>C*</b>	<b>C*</b>

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

The northbound approach of this intersection operates at an acceptable LOS B for both the AM and PM school peak hour conditions for the 2012 No-Build Condition. With the proposed development, Site Access #1 will be constructed on the north side of Snow Hill Road. This site access will serve buses, some staff parking and after-school parking activities. The TIA recommends the following improvements:

- Provide one ingress and two egress lanes with a minimum of 150 feet storage.
- Construct an eastbound left-turn lane with 150 feet of storage and appropriate taper.
- Construct a westbound left-turn lane with 75 feet of storage and appropriate taper.

With these proposed improvements, the side street approaches of this intersection will operate at an acceptable LOS C for both the AM and PM school peak hour conditions.

Snow Hill Road and Site Access #2 (Unsignalized)

The following table summarizes the LOS for this stop-controlled intersection.

Scenario	AM LOS	PM LOS
Build (2012) with Improvements	F*	B*

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

This new driveway will serve as the main entrance and provide access to staff parking and student loading/unloading operations. The TIA recommends the following improvements as part of the development:

- Construct an eastbound left-turn lane with a minimum of 250 feet storage.
- Provide one ingress and two egress lanes with a minimum of 250 feet storage

The southbound approach operates at a LOS F with 228 seconds of average delay for the Build condition during the AM peak hour. Although a LOS F is undesirable at signalized intersections, a LOS F is typical at many unsignalized intersections during a peak hour until such time as a traffic signal is warranted. Given the limited school traffic at times other than the school peak hours, a traffic signal at this location is not appropriate. The site plan shows that there is sufficient queuing storage space to allow carpool traffic circulation.

**Summary of TIA Required Improvements**

Roxboro Road and Snow Hill Road / Mason Road (signalized)

1. Extend the westbound left-turn lane on Snow Hill Road from 75 feet to 200 feet.
2. Extend the southbound left-turn lane from 125 feet to 275 feet.

Snow Hill Road and Site Access #1 (unsignalized)

1. Construct Site Access #1 with one ingress lane and two egress lanes with adequate storage and taper.
2. Construct an eastbound left-turn lane with adequate storage and appropriate tapers.
3. Construct a westbound left-turn lane with adequate storage and appropriate tapers.

Snow Hill Road and Site Access #2 (unsignalized)

1. Construct Site Access #2 with one ingress lane and two egress lanes with adequate queuing storage and taper.
2. Construct an eastbound left-turn lane with adequate storage and appropriate tapers.