

TECHNICAL MEMORANDUM

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Date: July 9, 2021

Subject: Loudoun County Public Schools ES-32 Site
Traffic Memorandum

Introduction

The following memorandum presents a trip generation in association with Loudoun County Public School's proposed ES-32 site. This has been prepared in association with a proposed commission permit. It is noted that a full-fledged traffic study is anticipated at the time of site plan submission.

Loudoun County Public Schools (LCPS) is proposing an elementary school (ES-32) on approximately 117 acres of land. The property is home to Lightridge High School (HS-9, opened Fall 2020) and the future Hovatter Elementary School (ES-29, opening Fall 2021). A LCPS public utility service center is located within an on-site barn. The property is situated west of Lightridge Farm Road and south of Braddock Road.

The proposed elementary school would be co-located on the Lightridge Farm Road property. When ES-32 opens, ES-29 (Hovatter) is planned to serve grades 3-5 and the proposed ES-32 would serve grades kindergarden-2. The estimated size of the new elementary school is 111,562 SF with a planned capacity of 960 students. ES-32 is included in the School Board adopted FY 2022-2027 Capital Improvement Program with a planned opening for 2025. Site access is via two existing entrances on Lightridge Farm Road. The site location map is shown in Figure 1 and the three school locations on the site are shown in Figure 2.

Prior Traffic Study

A previous traffic impact study was prepared in August 2017, with a supplemental trip generation memo in May 2019, for the HS-9 and ES-29 schools. The comprehensive traffic study evaluated the regional road network, identified associated impacts and recommended improvements. The study was reviewed and approved by Loudoun County and VDOT.



Figure 1: Site Location Map

Trip Generation

Trip generation calculations have been performed using the Institute of Transportation Engineers (ITE) **Trip Generation Manual**, 10th Edition. The trip generation is determined using the previously approved HS-9 and ES-29 schools and adding the trips generated by the 2nd proposed elementary school.

The bell schedule for the elementary schools and high school are staggered so their peak traffic occurs at different times. The typical elementary school bell schedule is 7:50 AM to 2:38 PM and the typical bell schedule for a high school is 9:00 AM to 3:38 PM. In the previous HS-9/ES-29 traffic impact study, the high school peak hours were analyzed because they represent the worst-case condition (the highest volumes during the day). The following peak hours were analyzed in the previous study:

- AM High School Peak Hour: 8:00 AM to 9:00 AM
- PM High School Peak Hour: 3:30 PM to 4:30 PM
- PM Commuter Peak Hour: 4:30 PM to 5:30 PM

The trip generation for the elementary school peak hours (7:00-8:00AM and 2:15-3:15PM) is shown in Table 1 and trip generation for the high school peak hours (8:00-9:00AM and 3:30-4:30PM) is shown in Table 2.

Table 1: Trip Generation –2023 Elementary School Peak Hours

Land Use	ITE Code	Size	Units	----- Week day -----									Weekday Total	
				AM Peak Hour (7:00-8:00AM)			PM School Peak Hour (2:15-3:15PM)			PM Commuter Peak Hour				
				In	Out	Total	In	Out	Total	In	Out	Total		
Proposed Use														
High School ¹ (Overlap: 25%/30%)	HS-9	530	1800	Students	132	62	194	52	105	157	110	124	234	2,784
Elementary School ¹	ES-29	520	960	Students	238	194	432	122	147	269	71	73	144	1,239
Elementary School ¹	ES-32	520	960	Students	238	194	432	122	147	269	71	73	144	1,239
Total Trips					608	450	1058	296	399	695	252	270	522	5,262
Previously Analyzed Traffic Study Trips					527	247	774	209	391	600	179	195	374	3,982
Percent Increase in Trips					15.4%	82.2%	36.7%	41.6%	2.0%	15.8%	40.8%	38.5%	39.6%	32.1%
¹ Since the elementary and high school peak hours occur at different times, 25% of the high school trips overlap during the elementary school AM peak hour and 30% of the high school trips overlap with the elementary school PM peak hour. Hence, the high school trips are multiplied by a factor of 0.25 for the 7:00-8:00AM hour and multiplied by a factor of 0.3 for the 3:30-4:30PM hour, respectively for the HS peak hour trips. The PM peak hour of adjacent street rates are used for the PM commuter peak hour. ² The AM peak hour of generator for the elementary school coincides with the morning commuter peak hour. The elementary school PM peak hour is 2:15-3:15PM. Therefore, the PM peak hour of generator rates are used for the PM school peak hour and the PM peak hour of adjacent street rates are used for the PM commuter peak hour														

Table 1: Trip Generation – 2023 High School Peak Hours

Land Use	ITE Code	Size	Units	----- Week day -----									Weekday Total	
				AM Peak Hour (8:00-9:00AM)			PM School Peak Hour (3:30-4:30PM)			PM Commuter Peak Hour				
				In	Out	Total	In	Out	Total	In	Out	Total		
Proposed Use														
High School ¹	HS-9	530	1800	Students	527	247	774	173	349	522	110	124	234	2,784
Elementary School ² (Overlap: 0%/30%)	ES-29	520	960	Students	0	0	0	37	44	81	71	73	144	1,239
Elementary School ² (Overlap: 0%/30%)	ES-32	520	960	Students	0	0	0	37	44	81	71	73	144	1,239
Total Trips					527	247	774	247	437	684	252	270	522	5262
Previously Analyzed Traffic Study Trips					527	247	774	209	391	600	179	195	374	3,982
Percent Increase in Trips					0.0%	0.0%	0.0%	18.2%	11.8%	14.0%	40.8%	38.5%	39.6%	32.1%
¹ The AM peak hour of generator for the high school coincides with the morning commuter peak hour. The high school PM peak hour is 3:30-4:30PM. Therefore, the PM peak hour of generator rates are used for the PM school peak hour and the PM peak hour of adjacent street rates are used for the PM commuter peak hour. ² Since the elementary and high school peak hours occur at different times, 0% of the elementary school trips overlap during the high school AM peak hour and 30% of the elementary school trips overlap with the high school PM peak hour. Hence, the elementary school trips are multiplied by a factor of 0.3 for the 3:30-4:30PM hour. The PM peak hour of adjacent street rates are used for the PM commuter peak hour.														

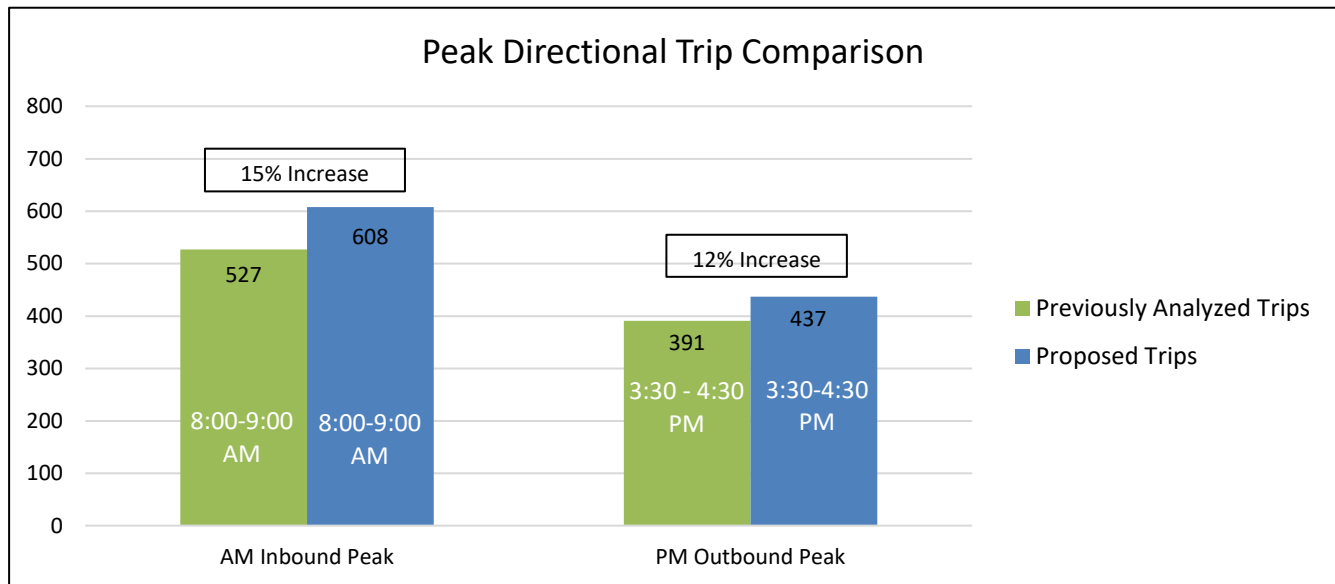


Figure 2: Peak Directional Trip Comparison

As shown in the trip generation tables and bar chart above:

- The bell schedule for the elementary schools and high school are staggered so their peak traffic occurs at different times. A small overlap of trips between the schools' peak hours has been assumed; these overlap % are consistent with those used in the previous traffic study. However these overlaps are conservative and, in reality, would likely be less resulting in less overall trips.
- The high school peak hours were analyzed in the previous 2017 traffic study as it represented the worst case (highest) trip generation hour. As shown in Tables 1 and 2, the two elementary schools would result in slightly higher AM peak hour trips as compared to the high school peak hour (37%) and minimally higher PM high school peak hour trips (14%).
- The school site entrance operations are mostly dictated by the peak directional trips - AM inbound and PM outbound trips. As shown in the bar charts in Figure 2, the directional peak hour trips only represent a minimal increase during the overall peak hours (15% in AM and 12% in PM).
- It is also noted that the previous traffic study showed additional available capacity at the site entrances and nearby roundabout (LOS B or better). Hence this minimal increase in the overarching directional peak hour trips is anticipated to be adequately handled.

Completed (2021) Improvements

The 2017 traffic study identified recommended transportation improvements. Several of these have been implemented to date and others are planned in the near future and are noted below.

- Braddock Road and Northstar Boulevard – *Signal and Turn Lane Improvements*
 - This intersection previously operated as an all-way stop. A traffic signal at the intersection was implemented by LCPS prior to the opening of the high school in Fall 2020.
 - The westbound left turn lane was previously striped for the all-way stop condition but is now restriped and operating as a left turn lane. The northbound and southbound approaches were restriped to provide dedicated left turn lanes. Southbound Northstar Boulevard was widened to accommodate the restriped right turn lane.
- Lightridge Farm Road and Braddock Road - *Roundabout*

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- A single-lane roundabout was constructed to replace the two-way stop-controlled intersection that had poor alignment and sight distance. A crosswalk is present on the north-western side of the roundabout.
 - Lightridge Farm Road
 - Previously a gravel road, LCPS paved and widened Lightridge Farm Road from the intersection with Braddock Road through the school's frontage. Turn lanes were also added at the site entrances.
 - South of the school site, a pave-in-place was implemented to Gardenia Drive.
 - Braddock Road and Trailhead Drive/Grassland Grove Drive – *All-Way Stop*
 - Northwest of the site, this intersection previously operated as a two-way stop control. LCPS implemented an all-way stop at this intersection prior to the opening of the high school in Fall 2020.

Future Improvements

- Braddock Road and Trailhead Drive/Grassland Grove Drive
 - As noted above, this intersection is currently operating as an all way stop. Loudoun County has proposed a roundabout at this intersection, with an estimated completion year of 2030.
- Northstar Boulevard Extension and Widening
 - Loudoun County plans to extend Northstar Boulevard between Tall Cedars Parkway north to Shreveport Drive as a four-lane median divided roadway. This will complete the missing link and provide a continuous north-south connection from Prince William County/Loudoun County border north to Route 7. Completion is currently estimated for 2024.
 - Loudoun County plans to widen the 2-lane section of Northstar Boulevard between Tall Cedars Parkway and Braddock Road to 4-lanes. Completion is currently estimated for 2028.

Summary and Conclusions

The analysis presented in this memorandum supports the following conclusions:

- LCPS is proposing a commission permit for a new elementary school (ES-32) on the property adjacent to Lightridge High School (HS-9, opened Fall 2020) and the future Hovatter Elementary School (ES-29, opening Fall 2021).
- A previous traffic impact study was prepared in August 2017, with a supplemental trip generation memo in May 2019, for the HS-9 and ES-29 schools. The comprehensive traffic study evaluated the regional road network, identified associated impacts and recommended improvements. The study was reviewed and approved by Loudoun County and VDOT.
- Significant site and regional road improvements have been implemented and are in place to support the multi-use school site, notably a roundabout at Braddock Road and Lightridge Farm Road, a traffic signal at Braddock Road/Northstar Boulevard, paving and widening Lightridge Farm Road, and an all-way stop at Braddock Road and Trailhead Drive/Grassland Grove Drive. Additional improvements are planned and funded in the vicinity of the site through the County's CIP.
- The high school peak hours were analyzed in the previous 2017 traffic study as it represented the worst case (highest) trip generation hour. As shown in Tables 1 and 2 of this memo, the two elementary schools would result in slightly higher AM peak hour trips as compared to the high school peak hour (37%) and minimally higher PM school peak hour trips (14%).
- The school site entrance operations are mostly dictated by the peak directional trips - AM inbound and PM outbound trips. As shown in the bar charts in Figure 2, the directional peak hour trips only represent a minimal increase during the overall peak hours (15% in AM and 12% in PM).
- **Given that the new school results in only a minimal increase in trip generation for the overarching peak hours, robust road improvements have been made to support the existing adjacent high school, and the previous traffic study showed additional available capacity at the site entrances and nearby roundabout (LOS B or better), the site entrances and surrounding road network is anticipated to adequately handle the new proposed elementary school (ES-32). A traffic study will be provided at the time of the ES-32 site plan submission.**