

STATE OF NEW HAMPSHIRE
INTRA-DEPARTMENT COMMUNICATION

FROM: John D. Butler, P.E. ^{JDB}
Geometrics Engineer

DATE: October 2, 2020
AT (OFFICE): Bureau of Highway Design

SUBJECT: MISC. ENG DISTRICT 5
1832-I
Hudson, NH Route 3A (Lowell Road)
Proposed Logistics Center (Amazon)

TO: Brian A. Desfosses, P.E.
Assistant District Engineer

MEMORANDUM

The Bureau of Highway Design has completed a review of the following materials relative to the proposed Hudson Logistics Center (Amazon) on the west side of NH Route 3A (Lowell Road), on the current Green Meadow golf course property:

- “Traffic Impact Study” (TIS) prepared by Langan, dated “April 2020, Revised September 2020”.
- “Traffic Impact Study Supplement” prepared by Langan, dated September 2020
- Synchro files associated with the TIS, received from Langan on September 9, 2020
- “VISSIM Evaluation of Merge and Weave Segments Along Sagamore Bridge Road” memo prepared by Stantec, dated August 20, 2020, and associated video clips of the VISSIM microsimulation
- “Potential Peak Season Trip Generation” memo prepared by Langan, dated September 22, 2020.

The proposed development consists of:

- Three “e-commerce fulfillment center warehouse buildings” with the following approximate building footprints:
 - Lot A – 1,079,660 sf
 - Lot B – 1,005,480 sf
 - Lot C – 529,844 sf

Access is proposed via two existing access points on the west side of NH 3A (Lowell Road). Both access points are existing signalized intersections.

- Shared driveway with the existing Sam’s Club private driveway.

- Shared driveway with the current private driveway to Mercury Systems. This access point is envisioned to become a town road called Green Meadow Drive.

Our review focused on the NH 3A (Lowell Road) corridor within NHDOT jurisdiction (Sagamore Bridge Road intersection southerly through the Dracut Road/Steele Road intersection), and on the Sagamore Bridge Road (Circumferential Highway) corridor between NH 3A and the FE Everett Turnpike.

We have the following comments:

NH 3A (Lowell Road) Corridor

1. In general, we concur that the proposed geometric modifications and adaptive signal control at the four NHDOT signalized intersections will adequately mitigate the development's traffic; however, we have specific concerns noted below.
2. Two alternatives were presented at the Dracut Road/Steele Road intersection: a 2-lane roundabout and a redesignation of the southbound lane use for dual left turns onto Dracut Road. We prefer the alternative to redesignate the southbound lane use. According to Table 10 of the TIS, this alternative results in significant improvement (Build vs. No Build) in the PM peak hour (LOS F to LOS C), and essentially no change in the AM peak hour (LOS B). If the roundabout were to be pursued, we would need to do a more thorough review of the geometrics but some initial concerns include a relatively small inscribed diameter (175') for a 2-lane roundabout, and the very poor deflection angle for the Dracut Road approach due to the skew.
3. The proposed geometry along NH 3A results in three "trap" lanes (where a through lane becomes an exclusive turning lane):
 - Northbound through lane at Walmart Boulevard becomes an exclusive left turn lane at Sagamore Bridge Road
 - Southbound through lane at Walmart Boulevard becomes an exclusive right turn lane at Green Meadow Drive
 - Southbound through lane at Green Meadow Drive becomes an exclusive left turn lane at Dracut Road.

Trap lanes are undesirable from a safety perspective. The consultant should investigate ways to eliminate the trap lane geometry. If this is not feasible, measures to mitigate the safety concern should be presented.

4. The next iteration of plans should include more detailed geometry including:
 - Alignments with curve data for NH 3A and all side roads
 - Lane, shoulder, and median widths
 - All lane and shoulder taper rates and lengths

Some unacceptably abrupt lane tapers are shown on the concept plans, such as on Dracut Road. See plan markups.

5. Several areas where widening is proposed lack adequate shoulder width. Where widening, paved shoulders should be a minimum of 4' wide if uncurbed, and 5' wide if curbing or guardrail is present.
6. Eleven-foot-wide travel lanes would be acceptable.
7. There appears to be several areas along NH 3A where right-of-way or easement acquisitions may be required from adjacent properties. Where widening is proposed, a minimum width from the edge of pavement to the right-of-way line needs to be provided for snow storage, signing, utilities, etc. We defer to District 5 as to what that minimum width should be in this particular location, but given the width of the road we would recommend at least 5' to 7', with 10' preferred. The developer would be responsible to acquire the necessary right-of-way or easements to accommodate their improvements.

Given the critical nature of the existing right-of-way lines, the developer should consider having their location certified by a licensed land surveyor.

8. The consultant needs to consider stormwater treatment needs along NH 3A. Given the proposed widening and additional impervious surface, and the fact that Hudson is an MS4 community, the expectations from NHDES for stormwater treatment will likely be significant, and may require right-of-way acquisition. District 5 should comment on maintenance expectations for any stormwater treatment areas.
9. It is unclear if the plans call for bringing the eastbound right turn lane from Sagamore Bridge Road into its own lane on NH 3A. This would be a benefit in terms of processing the heavy right turn volume but would create a potential safety concern with vehicles looking to weave over to turn left at Walmart. Recommend additional internal discussions with Bureau of Traffic and District 5 as to why the existing situation is a yield.
10. Need more details of the proposed triple left geometry at Sagamore Bridge Road. Concerns include more width needed on Sagamore Bridge Road to accept the triple left, and an unusual turning path as depicted on the concept plan (part tangent, part curve) which will not be intuitive if the cat tracks are obliterated or snow covered.
11. Confirm with Bureau of Traffic, but I believe they will require that all intersection approaches with five or more lanes will require advance overhead lane use signage. Sign supports within the median island would not be acceptable. Span wire might be acceptable.
12. Two of the intersections currently have at least some of the signal heads on span wires as opposed to mast arms. Coordinate with Bureau of Traffic as to if mast arms are required.

13. The concept plans show creating a third northbound through lane immediately north of the Rena Avenue intersection. We recommend that the creation of the third lane occur a short distance to the north so that there is no confusion as to which lanes the dual lefts from Green Meadow Drive or the dual northbound through lanes on NH 3A line up with.
14. NH 3A (River Road) southbound south of the Dracut Road/Steele Road intersection should be restriped to a single lane as there would now be only one lane feeding it.
15. There are several areas where existing shoulders are being partially repurposed as travel lanes. The consultant will need to investigate the current structural section in the shoulders to determine if it is adequate to serve as a travel lane.
16. While not required for purposes of the TIS, there is a fifth leg to the Dracut Road/Steele Road intersection that serves a driveway. This will need to be accounted for when developing formal signal plans.
17. Dracut Road is incorrectly noted to be a local (town) road. It is a State owned/maintained road. Also, NH 3A (Lowell Road) is incorrectly noted to be a State road throughout the project area. It is only a State road to the south of the Sagamore Bridge Road intersection, it is a local (town) road north of there.

Sagamore Bridge Road (Circumferential Highway) Corridor

1. Analysis of ramp merge, diverge, and weaving sections was done both by Langan using Highway Capacity Manual (HCM) software and by Stantec using VISSIM microsimulation. Based on the information provided to date, we are unsure as to if mitigation should be required. See comments below.
2. We are concerned with the statement in the Stantec memo regarding the VISSIM modeling calibration that says that they developed “*a specific driver behavior profile for merging and weaving segments that reflect cooperative lane changes which are typical for this area*”. This implies that default driver behavior parameters were manipulated to produce better results. It seems unlikely that drivers in this area are unusually polite. What are the results if standard driver behavior parameters are used? Further explanation required.
3. The section between NH 3A and the ramps to the DW Highway is technically a weaving area; however, it is quite long and probably better analyzed by the VISSIM analysis rather than by conventional HCM software. The VISSIM video clips and results summarized in Table 2 of the Stantec memo show that this area functions reasonably well in the 2032 Build condition. The westbound weave does show a relatively small increase in density, but the Build condition is a LOS C. The eastbound approach to NH 3A does show significant queuing, but it is improved over the No Build condition due to the added intersection capacity provided by the northbound triple left.

- The westbound and eastbound weaving sections between the DW Highway ramps and the Everett Turnpike ramps have relatively conventional geometry. As such, we would expect the HCM software to produce reasonably reliable results; however, the HCM results from Langan and the VISSIM results from Stantec are vastly different. No explanation was provided.

Langan (September 2020 TIS Supplement):

	2032 No Build		2032 Build	
	LOS (AM/PM)	Density (AM/PM)	LOS (AM/PM)	Density (AM/PM)
Westbound weave	E/E	38.6/38.5	E/F	41.6/>43
Eastbound weave	C/E	25.7/41.7	D/F	29.2/>43

Stantec (August 20, 2020 memo):

	2032 No Build		2032 Build	
	LOS (AM/PM)	Density (AM/PM)	LOS (AM/PM)	Density (AM/PM)
Westbound weave	B/B	19.06/18.56	C/C	20.22/20.67
Eastbound weave	B/B	14.82/16.07	C/C	21.04/22.49

Synchro/SimTraffic/VISSIM Comments

- Green Meadow Drive and Rena Avenue are coded with concurrent phasing in both the No Build and Build condition. With the large increase in volume on Green Meadow Drive in the Build condition, these approaches may need to be split phased for safety reasons. Coordinate with Bureau of Traffic.
- Synchro reports show the Sagamore Bridge Road eastbound right turn movement coded as “free”, but it is currently under yield control.
- All analyses show no right turn overlap for the Walmart and Sam’s Club approaches during the NH 3A northbound/southbound left turn phase. Is this accurate? If so, coordinate with Bureau of Traffic as to why not.
- Synchro model: The Dracut Road and northbound NH 3A (River Road) approaches at the Dracut Road/Steele Road intersection are not drawn long enough to contain the queuing observed in SimTraffic, making the SimTraffic queuing results inaccurate.

5. Very few trucks are observed in the SimTraffic and VISSIM micosimulations. Synchro is coded with only 1% or 2% trucks. Seems very low, even for the peak hours. Does field data support this?
6. The TIS notes that due to non-NEMA or atypical phasing at some intersections, Synchro cannot produce the typical HCM 6th Edition or HCM 2010 reports. We agree with this; however, our typical fall-back would be to use HCM 2000 report results for delay, LOS and v/c ratios. Langan chose to use the "Synchro Percentile Delay" results from the Lanes/Volumes/Timings reports in their summary tables. We are willing to accept this; however, we would want to discuss this up front if Langan is involved in future traffic impact studies for NHDOT.

cc: W. Cass W. Lambert
 W. Oldenburg N. Sanders
 R. Radwanski M. O'Donnell
 N. Spaulding J. Mathews

S:\HIGHWAY-DESIGN\TOWNS\MISC\M5-1832\HUDSON\GREEN MEADOW GOLF COURSE REDEVELOPMENT\DISTRIBUTION CENTER_2020\HUDSON_NH 3A_LOGISTICS CENTER_10022020.DOC