

# **84 LUMBER COMPANY SITE DEVELOPMENT**

SP# 09-22

## **STAFF REPORT**

January 25, 2023

**SITE:** 3 Sullivan Road; Map 145 Lot 015

**ZONING:** Industrial District (I)

**PURPOSE OF PLAN:** To depict the proposed lumber yard and associated site improvements over tax map 145 lot 15.

### **PLANS UNDER REVIEW:**

Site Development Plans / 84 Lumber Company, Map 145 Lot 15, 3 Sullivan Road, Hudson, New Hampshire; prepared by: Fieldstone Land Consultants, PLLC, 206 Elm Street, Milford, NH 03055; prepared for 84 Lumber Company, 1019 Route 519, Building 4, Eighty Four, PA 15330; consisting of 11 sheets and general notes 1-23 on Sheet 2; dated August 2, 2022; last revised January 6, 2023.

### **ATTACHMENTS:**

- A. Peer Review, prepared by Fuss & O'Neill, first round received August 22, 2022, current review letter received December 14, 2022.
- B. Department Comments – August 2022
- C. Department Comments – December 2022
- D. Department Comments – January 2023
- E. Applicant Response to Peer Review, prepared by Fieldstone Land Consultants, dated January 6, 2023, received January 12, 2023.
- F. Traffic Study, prepared by Vanasse & Associates, received October 28, 2022, received November 22, 2022.
- G. Sprinkler and Fire Flow Requirements for 84 Lumber, prepared by Triangle Fire Consultants, dated September 19, 2022, received January 11, 2023.
- H. Stormwater Management Report, prepared by Fieldstone Land Consultants, dated August 2, 2022, last revised January 6, 2023, received January 11, 2023.  
[provided digitally only]

### **APPLICATION TRACKING:**

- August 2, 2022 – Application received.
- December 28, 2022 – Public hearing deferred.
- January 25, 2023 – Public hearing scheduled.

## COMMENTS & RECOMMENDATIONS:

### BACKGROUND

The site is a 30.962 acre lot zoned Industrial but currently a single family residential use. An existing house sits on the northeast portion of the site surrounded by a clearing. The rest of the site is primarily wooded. A wetland runs from west to east through the center of the site, which is in the Special Flood Hazard Area. There is no access to municipal water or sewer and there is an existing well on the site. The adjacent use to the southeast is single-family residential.

The applicant plans to construct 55,500 SF of lumber sales and storage buildings, in two phases. The first phase includes 45,900 SF of buildings: the main building, including retail area; a 9,600 SF storage building; a 9,600 SF drive-through storage building; and two 9,600 SF storage sheds. The second phase includes a 9,600 SF expansion near the proposed drive-through storage building. See attached Project Narrative and Application.

### WAIVER REQUESTS

1. Waiver request for the General Plan Requirements [§276-11.1 B(12)c]: the applicant is requesting a waiver to allow a stormwater management pond, fencing, and landscaping improvements within the 100' building setback line from adjacent residential properties.

It is important to consider mitigating the impacts of sound and light from the lumberyard on the nearby residences: the applicant has requested a waiver from the 100' buffer in order to locate an infiltration basin next to the property line, and proposes leaving the outdoor lights on at night for security purposes. Understanding the proposed shielding of light fixtures and operation of machinery on site will help the Board understand potential impacts.

### DEPARTMENT COMMENTS

See **Attachments B through D** for comments from town departments. Attachment D shows the most current comments. The following issues still need to be addressed:

1. Engineering: The applicant shall consider offsite improvements to the intersection of Sullivan Road and Bridle Bridge Road. Currently the applicant is providing 1 hour of fire suppression where the minimum is 3 hours. The applicant shall also install conservation plates every 50 feet along the wetland buffer, shall consider installing a guard rail along the detention basin, and consider increasing the slope of the drainage pipe.

*Fire suppression concerns are further addressed by the Fire Department. While the added perimeter fencing alleviates some of Engineering Department's concerns with the elevation drop resulting from the drainage basin, it continues to recommend a guardrail around the basin internal to the site.*

2. Fire: The proposed 60,000 gallon cistern for water supply does not conform to the minimum fire flow and duration requirements listed in 2018 NFPA 1. The proposed 6 buildings totaling 55,500 SF with outside lumber storage is a high exposure risk. Automatic sprinkler system shall be required for storage in excess of 12 feet in height.

Storage of commercial vehicles shall not be permitted in buildings in excess of 5,000 SF without an automatic sprinkler system. Outside lumber staging shall not impinge on Fire Department access as defined in NFPA 1 Chapter 18. Provide a cistern that meets Hudson Fire Department requirements. The cistern details shown on the site plan do not meet the requirements.

*The applicant's Fire Consultant's letter (**Attachment G**) notes that storing lumber above 12-feet in areas greater than 2,500 sf will require the building to be sprinklered and that the staging area near Building #3 impinges upon the fire access lane.*

*The proposed heights are over 24-feet for storage buildings and over 18-feet for storage sheds, each of which measure 9,600 sf. It seems unlikely that the space above 12-feet in these buildings would not be used for storage. It does not appear that the current proposal complies with fire codes and if left unaddressed could be grounds for denial.*

3. Police: The applicant should evaluate whether a traffic light at the intersection of Sullivan Road and Route 111 is warranted.

*The Applicant has indicated that they are having a Traffic Signal Warrant Analysis performed. Staff has also communicated with NHDOT, who will review the analysis once complete.*

4. Zoning: the applicant has verified that the buildings meet the height requirement of section §334-14.

### PEER REVIEW COMMENTS

Fuss & O'Neill reviewed the plans and first provided comments on August 22, 2022 and then a revised version on December 14, 2022 (**Attachment A**). Fieldstone Land Consultants, PLLC provided a response to this second round of peer review (**Attachment E**). A review of the most recent revision is pending. It appears there are still items that need to be addressed.

### RECOMMENDATION

The applicant has provided all required materials necessary for plan acceptance but there are outstanding issues that must be resolved including but not limited to: adequate fire protection must be provided; traffic concerns at nearby intersections need to be addressed; the slope of the drainage system does not meet the regulations; and comments related to stormwater design are currently under review. If these items are not adequately addressed, site plan approval would not be recommended. Presently, Staff recommends application acceptance, consideration of the waiver request, and discussion of the outstanding items and other issues of interest.

**DRAFT MOTIONS**

**ACCEPT the site plan application:**

I move to accept the site plan application for the Site Development Plans / 84 Lumber Company, Map 145 Lot 15, 3 Sullivan Road.

Motion by: \_\_\_\_\_ Second: \_\_\_\_\_ Carried/Failed: \_\_\_\_\_

**To GRANT a waiver:**

I move to grant a waiver from §276-11.1 B(12)c, to allow a stormwater management pond, fencing, and landscaping improvements within the 100’ building setback line, based on the Board’s discussion, the testimony of the Applicant’s representative, and in accordance with the language included in the submitted Waiver Request Form for said waiver.

Motion by: \_\_\_\_\_ Second: \_\_\_\_\_ Carried/Failed: \_\_\_\_\_

**CONTINUE the public hearing to a date certain:**

I move to continue the site plan application for the Site Development Plans / 84 Lumber Company, Map 145 Lot 15, 3 Sullivan Road, to date certain, \_\_\_\_\_, 2023.

Motion by: \_\_\_\_\_ Second: \_\_\_\_\_ Carried/Failed: \_\_\_\_\_





December 14, 2022

Mr. Brian Groth  
Town Planner  
Town of Hudson  
12 School Street  
Hudson, NH 03051

Re: Town of Hudson Planning Board Review  
84 Lumber Site Plan, 3 Sullivan Road  
Tax Map 145 Lot 15; Acct. #1350-529  
Reference No. 20030249.2210

Dear Mr. Groth:

Fuss & O'Neill (F&O) has reviewed the second submission of the materials received on November 28, 2022, related to the above-referenced project. A list of items reviewed is enclosed. The scope of our review is based on the Site Plan Review Codes, Stormwater Codes, Driveway Review Codes, Sewer Use Ordinance 77, Zoning Regulations, and criteria outlined in the CLD Consulting Engineers Proposal approved September 16, 2003, revised September 20, 2004, June 4, 2007, September 3, 2008, and October 2015.

The project consists of the development of a lumber yard facility with 4 buildings and 2 storage sheds on a previously developed site. Proposed improvements to the site also include the construction of a driveway, parking areas, drainage improvements, landscaping, lighting, and other associated site improvements. The proposed buildings will be serviced by private water and sewer.

The following items have outstanding issues:

**1. Site Plan Review Codes (HR 275)**

- e. *Former Fuss & O'Neill Comment:* HR 275-8.C.(6). *The applicant has provided six designated off-street loading spaces on the plan set. Once phase 2 of the project is constructed nine such spaces would be required. We note that based on the open areas around the buildings it appears that trucks would be loaded adjacent to buildings. The applicant should review the need to show additional loading spaces on the plan to be sure the site meets the requirements.*

**Current Fuss & O'Neill Comment:** The applicant has revised the building sizes. We note that 6 loading spaces will now be adequate for the proposed buildings. The applicant should review the building dimensions of the proposed sheds. The length is still listed at 300 feet, but they appear to only be 240 feet long now.

**2. Administrative Review Codes (HR 276)**

- a. **Former/Current Fuss & O'Neill Comment:** HR 276-11.1.B.(4).(b). The applicant should provide the approval block on each sheet of the plan set. The block is missing from the Existing Conditions Plan and Construction Details.

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- b. **Former/Current Fuss & O'Neill Comment:** HR 276-11.1.B.(8). The locus plan provided does not meet the one-inch equals 1,000 feet scale required.
- c. **Former/Current Fuss & O'Neill Comment:** HR 276-11.1.B.(12).(c). The applicant has not shown the 100-foot setback between the commercial use and the residential use adjacent to the site. We note that the proposed infiltration basin and other improvements are proposed within this 100-foot setback, which is not allowed by the Regulation.
- d. **Former/Current Fuss & O'Neill Comment:** HR 276-11.1.B.(13). The applicant has not included details for any proposed site signage. The applicant should include a note stating that, "All signs are subject to approval by the Hudson Planning Board prior to installation."
- e. **Former/Current Fuss & O'Neill Comment:** HR 276-11.1.B.(15). The applicant should be sure that all buildings within 50 feet of the tract are shown on the plan set.
- f. **Former/Current Fuss & O'Neill Comment:** HR 276-11.1.B.(16). The applicant has not provided the locations of all driveways and travel ways within 200 feet of the site.
- g. **Former/Current Fuss & O'Neill Comment:** HR 276-11.1.B.(20). The applicant has not labeled the height of the existing buildings on site. We note that the existing buildings will all be razed as part of this project.

### 3. Driveway Review Codes (HR 275-8.B. (34)/Chapter 193)

- a. **Former/Current Fuss & O'Neill Comment:** HR 193.10.E. The applicant has not provided any sight distances information for the proposed driveway location on the plan set.
- b. **Former/Current Fuss & O'Neill Comment:** The applicant has proposed a gate at the driveway into the site. The applicant should provide additional information related to when the gate will be in use and if delivery trucks are expected to queue along Sullivan Road if they arrive when the gate is closed.
- c. *Former Fuss & O'Neill Comment: The applicant has not provided a gate detail or indicated how the Fire Department will be able to gain access to the site in an emergency when the gate is closed.*

**Current Fuss & O'Neill Comment:** The applicant has added a gate detail to the plan set. We continue to recommend emergency access information be provided.

### 4. Traffic

- a. *Former Fuss & O'Neill Comment: HR 275-9.B. The applicant has not provided any traffic information as part of their review package.*

**Current Fuss & O'Neill Comment:** We have reviewed the Traffic Assessment prepared by Vanasse & Associates, Inc. (VAI) dated October 28, 2022, for the proposed lumber yard to be located on the southeast corner of the Central Street (Route 111) with Sullivan Road/Lawrence Road in Hudson, New Hampshire. The VAI assessment evaluates access requirements, potential off-site improvements, safety considerations, and traffic impacts associated with the project.



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The site currently contains a single-family home, which will be razed and replaced with six new structures as part of the project. Of the six structures, five would be constructed immediately and one would be constructed in the future. The Traffic Assessment notes that the new structures will consist of 4,800 square feet of retail space, 2,700 square feet of office space and 48,000 square feet of storage space. The retail and office spaces will be located together in a single structure, while the remaining five structures will each house 9,600 sf of storage space. Parking will be provided on-site for 35 vehicles and access will be provided via a driveway on Sullivan Road.

The methodology used for determining traffic impacts associated with the proposed site are reasonable with the appropriate ITE data used for the provided scenario. However, it is worth noting that traffic from the Sullivan Road and Lawrence Road stop-controlled approaches of the intersection experience significant delays. For example, the 2034 Weekday Evening Peak Hour No-Build delays for the minor roads are 597 seconds which is approximately 10 minutes, and 1,065 seconds (approximately 18 minutes). These delays increase to 802 seconds (approximately 13 minutes) and 1,221 seconds (approximately 20 minutes) for 2034 Weekday Evening Peak Hour Build conditions. Although the issue of delays along these roads will exist under No-Build conditions, the traffic generated by the proposed site exacerbates these delays. We agree with the report that the site does not generate a significant amount of traffic and understand that the traffic generated by the site is not necessarily the cause of this concern.

These queue lengths along Sullivan Road are a concern both in No-Build and Build conditions as these queues are potentially expected to reach the road's intersection with Bridle Bridge Road even under 2034 No-Build. We recommend that a signal warrant analysis be performed for No-Build and Build scenarios to determine if/when signaling this intersection could be the proper mitigation for the long delays and queue described above. We recommend current traffic counts not impacted by Covid be used for any warrant analysis. Further, the Town would need to evaluate costs and responsibilities for the implementation of any mitigation measures, and coordination with the NHDOT would be required.

## 5. Utility Design/Conflicts

- a. *Former Fuss & O'Neill Comment: HR 276-13.G. The applicant has shown the location for the proposed leach field. We note that a septic tank location has not been shown and that typical designs for the system have not been provided as required by the Regulation.*

**Current Fuss & O'Neill Comment:** The applicant has added a septic tank location. We continue to recommend a typical system design detail be added to the plan set.

- b. *Former Fuss & O'Neill Comment: HR 276-13.H. The applicant has noted that the existing well on site is to be capped. The applicant should show a new proposed well location or water connection on the plan set.*



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**Current Fuss & O'Neill Comment:** The applicant is now showing a water service connection to the well that is indicated to be capped. The applicant should clarify the intent for this well and the source of water for the site. The applicant should also show the required protective well radius around whichever location for the well is proposed. Protective well radii shall conform to Env-Wq 1008.

- c. **New Fuss & O'Neill Comment:** The applicant has added a 60,000 gallon cistern system with corresponding details to the plans. The applicant should continue to coordinate with the Hudson Fire Department to confirm acceptability of the cistern design. No further Fuss & O'Neill comment.

#### 6. Drainage Design/Stormwater Management (HR 275-9.A./Chapter 290)

- a. *Former Fuss & O'Neill Comment:* HR 276-6.F. *The applicant should provide additional information on the groundwater recharge requirement. As an NHDES AOT permit will be required, the GRV BMP worksheet is appropriate.*

**Current Fuss & O'Neill Comment:** The applicant should provide the stage storage table to illustrate WQV is met upon the provided BMP worksheet.

- b. *Former Fuss & O'Neill Comment:* HR 275-9.A.3. & 290-5.A.4. *The applicant should provide test pit locations upon the plan set, test pit data, as well as all other information related to the NHDES infiltration feasibility report.*

**Current Fuss & O'Neill Comment:** The applicant should provide the requested information related to the NHDES infiltration feasibility report, including but not limited to test pit observations related to elevations, square footage of basins compared to number of test pits, controlling test pit within the basin. Please refer to Env-Wq 1504.13 for the full list of requirements.

- c. **Former/Current Fuss & O'Neill Comment:** HR 290-5.A.1. & 290-5.A.3. The applicant should provide language in the Drainage Analysis Report, stating if and how low impact development (LID) strategies for stormwater runoff were evaluated for this project.
- e. **Former/Current Fuss & O'Neill Comment:** HR 290-5.A.12. and 290-7.A.9. Due to the location of the project in respect to the onsite wetlands, the applicant should review the NHDES screening layers to verify if a winter maintenance and salt minimization plan is necessary.
- f. *Former Fuss & O'Neill Comment:* HR 290-6.A.1. *The applicant should add a detail for proposed inlet protection as well as a detail to the plan set.*

**Current Fuss & O'Neill Comment:** The applicant should add locations of inlet protection to the Grading and Drainage Plan or create an erosion control plan.

- g. **Former/Current Fuss & O'Neill Comment:** HR 290-6.A.7. The applicant should add the location of the proposed gravel construction exit to the plan set.
- h. **Former/Current Fuss & O'Neill Comment:** HR 290-6.A.8. The applicant should add a note of the requirement to coordinate a pre-construction meeting with the Town Engineer.
- i. **Former/Current Fuss & O'Neill Comment:** HR 290-7.A.6. The applicant should provide information as to how the stormwater system is designed to account for frozen ground conditions.



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- j. **Former/Current Fuss & O'Neill Comment:** HR 290-7.A.7. The applicant should confirm with the Town if any additional coordination is required due to the close proximity of the onsite wetland.
- k. **Former/Current Fuss & O'Neill Comment:** HR 290-7.A.13. The applicant should provide outlet protection calculations to ensure the forebays adequately prevent erosion from occurring.
- m. **Former/Current Fuss & O'Neill Comment:** HR 290-7.A.9. The applicant should add all onsite stormwater features to the I&M manual; including but not limited to catch basins and drainage runs.
- n. **Former/Current Fuss & O'Neill Comment:** HR 290-7.B.13. We note the requirement of the NHDES AoT permit to utilize HISS soils. If the use of HISS mapping revises the soil types, runoff numbers, and infiltration rates, the applicant should revise the drainage calculations appropriately.
- o. **Former/Current Fuss & O'Neill Comment:** HR 290-7.B.16. We note snow storage is illustrated within the infiltration basin, which is not permitted per NHDES AoT guidelines. The applicant should review the need for a fence and/or signage. If signage is utilized, the I&M Manual should be updated to note snow storage shall not occur within the stormwater basin.
- p. **Former/Current Fuss & O'Neill Comment:** HR 290-8.A.4. & 5. We note the requirement of the applicant to coordinate the need for a Bond or Escrow with the Town Engineer.
- q. **Former/Current Fuss & O'Neill Comment:** HR 290-10.A. The applicant should keep the Town informed of all communication with NHDES in relation to the required Alteration of Terrain and Wetlands Permits being requested to ensure NHDES comments do not alter drainage design/calculations.
- r. **Former/Current Fuss & O'Neill Comment:** HR 290-10.B. The applicant should ensure a note is upon the plan set stating the requirement of the EPA/GCP/NOI. We note the inclusion of the SWPPP within the drainage report, but contractors do not always review the drainage report.
- s. **Former/Current Fuss & O'Neill Comment:** ETGTD 920.4.1. through 920.4.5. The applicant shall illustrate the locations of the requested items upon the plan set.
- t. **Former/Current Fuss & O'Neill Comment:** ETGTD 920.3.12 and 920.3.13. The applicant shall illustrate the locations of the requested items upon the plan set.
- u. **Former/Current Fuss & O'Neill Comment:** ETGTD 920.4.14 The applicant should provide additional information on the type of seeding/hydroseeding to be used within the infiltration basin. A type with the ability to be inundated up to 72 hours after larger storms.
- v. **Former/Current Fuss & O'Neill Comment:** ETGTD 930.4 The applicant shall review the slope of the proposed drainage system with the City Engineer, although it is self-cleaning velocity, it does not meet the regulations.

## 7. Zoning (ZO 334)

- a. **Former/Current Fuss & O'Neill Comment:** ZO 334-14.A. The applicant has not





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provided the proposed building height on the plan set.

#### 9. Landscaping (HR 275-8.C.(7) & 276-11.1.B.(20)) and Lighting (HR 276-11.1.B.(14))

- a. *Former Fuss & O'Neill Comment:* HR 275-8.C.(7). The applicant does not appear to meet the requirements of the parking lot landscaping requirements. We note that 10% of the interior of the parking lot area has not been met and the applicant only appears to have provided 9 trees instead of the 10 calculated. We note that the trees and shrubs are located all over the site and not confined to the parking lot area.

**Current Fuss & O'Neill Comment:** The applicant had noted that they meet the 10% interior landscaping requirements but there does not appear to be any interior landscaping. All landscaping proposed is around the perimeter of the property. We also still only count nine trees. It appears that the applicant has only shown four maple trees instead of the five noted in the legend.

- d. **Former/Current Fuss & O'Neill Comment:** HR 276-11.1.B.(14). The applicant should note if the lights will be on at all times to provide safety and security for the facility or if they will operate around business hours.

#### 10. State and Local Permits (HR 275-9.G.)

- a. **Former/Current Fuss & O'Neill Comment:** HR 275-9.G. The applicant should list the required permits and statuses on the plan set. We note that an Alteration of Terrain permit and a Septic permit will be required from NHDES.

#### 11. Other

- a. **Former/Current Fuss & O'Neill Comment:** ETGTD Section 565.1.1. The applicant is reminded of Town of Hudson requirements for the importing of off-site fill materials for use in constructing this project. It is recommended that these requirements be stated on the plans for the Contractors attention.

The following items are resolved or have no further Fuss & O'Neill input:

#### 1. Site Plan Review Codes (HR 275)

- a. *Former Fuss & O'Neill Comment:* Hudson Regulation (HR) 275-6.C. The applicant has not proposed the installation of any sidewalks along the site.
- b. *Former Fuss & O'Neill Comment:* HR 275-6.I. The scope of this review does not include the adequacy of any fire protection provisions for the proposed buildings.
- c. *Former Fuss & O'Neill Comment:* HR 275-6.T. The applicant has not proposed any off-site improvements as part of the site plan.
- d. *Former Fuss & O'Neill Comment:* HR 275-8.C.(2) and Zoning Ordinance (ZO) 334-15.A. The applicant has provided parking calculations on the plan set. The applicant has noted that 33 parking spaces are required for the office and retail use and 33 spaces have been provided. The applicant has noted that parking for the warehouse and storage buildings will be in the open areas next to those buildings.
- f. *Former Fuss & O'Neill Comment:* HR 275-9.C.(11). The applicant has provided two handicap spaces



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*for the site which exceeds the minimum of one space required for the number of proposed parking spaces.*

- g. *Former Fuss & O'Neill Comment: HR 275-9.F. The applicant did not provide copies of any easements or deeds as part of the package received for review. An existing utility easement is shown on the plan. We note that only grading and silt fence installation is proposed within that easement area.*

## 2. Administrative Review Codes (HR 276)

- h. *Former Fuss & O'Neill Comment: HR 276-11.1.B.(23). The applicant has noted that there are no pertinent highway projects on the plan set.*
- i. *Former Fuss & O'Neill Comment: HR 276-11.1.B.(24). The applicant should provide open space calculations on the plan set.*

Current Fuss & O'Neill Comment: The applicant has added open space calculations. No further Fuss & O'Neill comment.

## 6. Drainage Design/Stormwater Management (HR 275-9.A./Chapter 290)

- d. *Former Fuss & O'Neill Comment: HR 290-5.A.9. The applicant should provide test pit data related to ESHWT information, to ensure treatment occurs as proposed within the basin.*

Current Fuss & O'Neill Comment: The applicant provided test pit data. No further Fuss & O'Neill comment.

- l. *Former Fuss & O'Neill Comment: HR 290-7.A. The applicant should add a PE stamp to all appropriate plan sheets.*

Current Fuss & O'Neill Comment: The applicant has added the PE stamp. No further Fuss & O'Neill comment.

- w. *Former/Current Fuss & O'Neill Comment: The applicant will be required to comply with all provisions of the Town of Hudson's MS4 permit, including but not limited to annual reporting requirements, construction site stormwater runoff control, and record keeping requirements.*

- x. *Former Fuss & O'Neill Comment: Please note that this review was carried out in accordance with applicable regulations and standards in place in New Hampshire at this time. Note that conditions at the site, including average weather conditions, patterns and trends, and design storm characteristics, may change in the future. In addition, future changes in federal, state, or local laws, rules or regulations, or in generally accepted scientific or industry information concerning environmental, atmospheric and geotechnical conditions and developments may affect the information and conclusions set forth in this review. In no way shall Fuss & O'Neill be liable for any of these changed conditions that may impact the review, regardless of the source of or reason for such changed conditions. Other than as described herein, no other investigation or analysis has been requested by the Client or performed by Fuss & O'Neill in preparing this review.*

## 7. Zoning (ZO 334)

- b. *Former Fuss & O'Neill Comment: ZO 334-17 & 334-21. The applicant has noted that the subject parcel is located within the Industrial (I) zoning district. The proposed use of a lumber yard is not specifically noted in the Regulation, but general retail is permitted by the Ordinance within the district.*
- c. *Former Fuss & O'Neill Comment: ZO 334-33. The applicant has not shown any proposed impacts to the wetlands or wetlands setbacks on the plan set.*
- d. *Former Fuss & O'Neill Comment: ZO 334-60. The applicant has not provided any information for any*



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*proposed signs on site.*

- e. *Former Fuss & O'Neill Comment: ZO 334-83 and HR 218-4.E. The applicant has shown the limits of the designated flood hazard area and provided the 100-year flood line. We note that no development is proposed within this area.*

**8. Erosion Control/Wetland Impacts**

- a. *Former Fuss & O'Neill Comment: The Town of Hudson should reserve the right to require any additional erosion control measures as needed.*

**9. Landscaping (HR 275-8.C.(7) & 276-11.1.B.(20)) and Lighting (HR 276-11.1.B.(14))**

- b. *Former Fuss & O'Neill Comment: HR 275-8.C.(8). The applicant has provided screening for the residential use to the south by a row of arborvitae.*
- c. *Former Fuss & O'Neill Comment: HR 276-11.1.B.(14). The applicant has shown lighting fixture locations on the plans with details and photometric information.*
- e. *Former Fuss & O'Neill Comment: We note that the landscape plan has not been stamped by a Licensed Landscape Architect.*

**10. State and Local Permits (HR 275-9.G.)**

- b. *Former Fuss & O'Neill Comment: HR 275-9.G. The applicant did not provide copies of any applicable Town, State or Federal approvals or permits in the review package.*
- c. *Former Fuss & O'Neill Comment: Additional local and state permitting may be required.*

Please feel free to call if you have any questions.

Very truly yours,

Steven W. Reichert, P.E.

SWR:

Enclosure

cc: Town of Hudson Engineering Division – File  
Fieldstone Land Consultants, PLLC – [cebranon@feildstonelandconsultants.com](mailto:cebranon@feildstonelandconsultants.com)



**From:** Dhima, Elvis  
**Sent:** Tuesday, August 9, 2022 11:38 AM  
**To:** Dubowik, Brooke; Groth, Brian  
**Subject:** RE: Dept Sign Off - 84 Lumber Site Plan SP# 09-22

Please find my comments below

1. Applicant shall install conservation plates every 50 feet along the 50 foot wetland buffer
2. Applicant shall not store snow within the wetland or wetland buffer
3. Applicant shall consider installing guard rail along the detention basin ( 7 foot plus drop)
4. Applicant indicates drainage pipe slopes less than 2%. Applicant should consider reducing the cover over the pipe to increase the slope

Thanks

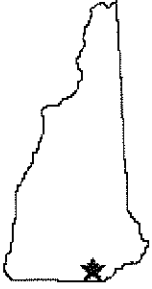
***Elvis Dhima, P.E.***  
***Town Engineer***

12 School Street  
Hudson, NH 03051  
Phone: (603) 886-6008  
Mobile: (603) 318-8286



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th.



# TOWN OF HUDSON

## Land Use Division



12 School Street • Hudson, New Hampshire 03051 • Tel: 603-886-6008 • Fax: 603-594-1142

Site Plan Review #09-22

BB 8-18-22

August 18, 2022

Re: Map 145 Lot 015  
Address: 3 Sullivan  
Zoning district: (I) Industrial  
Proposal: review for proposed lumber yard and associated site improvements

Submitted plan reviewed: #2 of 10 dated March 22, 2022 2022.

1) Verify that the height requirement complies with section §334-14: "...Height is measured from the average elevation of the finished grade within five feet of the structure to the highest point of the roof,...."

Sincerely,

Bruce Buttrick,  
Zoning Administrator/Code Enforcement Officer

cc: B. Groth - Town Planner  
file

*NOTE: this determination may be appealed to the Hudson Zoning Board of Adjustment within 30 days of the receipt of this letter.*

**From:** Dhima, Elvis  
**Sent:** Friday, December 2, 2022 8:11 AM  
**To:** Dubowik, Brooke; Groth, Brian  
**Cc:** Hebert, David  
**Subject:** RE: Dept Sign Off - 84 Lumber Company SP# 09-22 \*\*NEW\*\*  
**Attachments:** Proposed offsite improvement.jpg

Please see below

1. Applicant shall provide mechanical/oil separator for CB 6, 9 & 12
2. Applicant shall reevaluate the location of the entrance and try to line it up with Bridle Bridge Road (mimic a two way stop intersection)
3. Applicant shall consider offsite improvement, per attachment
4. Currently the applicant is proving 1 hour fire suppression at 1,000 gallons per minute (60,000 gallon cistern), minimum is 3 hours.
5. Applicant shall provide details regarding ownership and maintenance of the proposed cistern
6. Applicant shall provide sight distance plan and profile of the proposed entrance

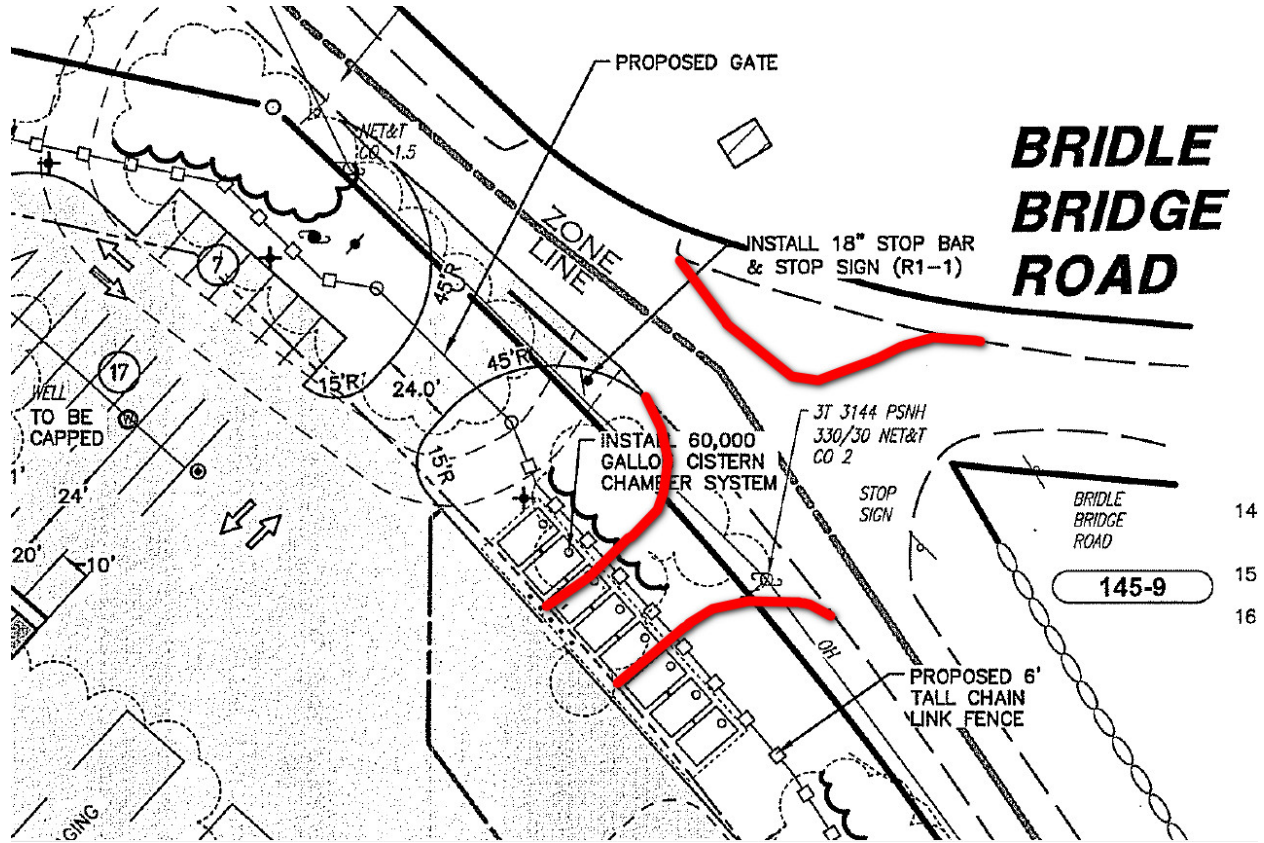
Thanks

E

***Elvis Dhima, P.E.***  
***Town Engineer***

12 School Street  
Hudson, NH 03051  
Phone: (603) 886-6008  
Mobile: (603) 318-8286







# TOWN OF HUDSON

FIRE DEPARTMENT

INSPECTIONAL SERVICES DIVISION



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12 SCHOOL STREET, HUDSON, NEW HAMPSHIRE 03051

Emergency 911  
Business 603-886-6005  
Fax 603-594-1142

Scott Tice  
Chief of Department

TO: Brian Groth  
Town Planner

FR: David Hebert  
Fire Marshal

DT: 12/2/2022

RE: 3 Sullivan Road, 84 Lumber Company  
Fire Department Access & Water Supply

The proposed 60,000 gallon cistern for water supply shown on the site plan does not conform to the minimum fire flow and duration requirements listed in 2018 NFPA 1, Table 18.4.5.2.1.

The site plan indicates 6 buildings totaling 55,500sqft in close proximity to each other with outside lumber storage along two sides of the site. High exposure risk.

Provide documentation and calculations for sizing of the proposed cistern/cisterns for the minimum required water supply from a Fire Protection Engineer. Have the plan and documents stamped by the engineer.

Provide a cistern drawing that meets Hudson Fire Department requirements. The cistern shall include 6" metal suction pipe, to 6" female, to 6" to 5" male reducer to be National Hose Thread. There shall also be a cap provided for the 6" to 5" reducer that will be left connected to the riser. Locks shall be provided for all access hatches. The cistern shall have a water level indicator. The cistern details shown on the site plan do not meet Hudson Fire Department requirements.

Hudson Fire Department cannot approve this submittal as submitted.

David Hebert  
Fire Marshall



**Comments for 84 Lumber project**

- 1) What kind of traffic in and out of the facility are they expecting? Truck and car traffic approximate numbers.
- 2) Are they going to do a traffic study for the intersection of Sullivan Road and Route 111?
- 3) Does a project like this in that location necessitate a traffic light at Route 111 and Sullivan?



# TOWN OF HUDSON

## Land Use Division



12 School Street • Hudson, New Hampshire 03051 • Tel: 603-886-6008 • Fax: 603-594-1142

### Site Plan Review #09-22

BH 12-1-22

December 1, 2022

Re: Map 145 Lot 015  
Address: 3 Sullivan  
Zoning district: (I) Industrial  
Proposal: review for proposed lumber yard and associated site improvements

Submitted plan reviewed: #2 of 11 dated March 22, 2022, rev A 11/17/22.

1) Verify that the height requirement of the proposed structures, comply with section §334-14:  
“....Height is measured from the average elevation of the finished grade within five feet of the structure to the highest point of the roof,.....”

Sincerely,

Bruce Buttrick,  
Zoning Administrator/Code Enforcement Officer

cc: B. Groth - Town Planner  
file

*NOTE: this determination may be appealed to the Hudson Zoning Board of Adjustment within 30 days of the receipt of this letter.*



**From:** Dhima, Elvis  
**Sent:** Friday, January 13, 2023 9:37 AM  
**To:** Groth, Brian; Dubowik, Brooke; Bianchi, Dave; Buttrick, Bruce; Rearick, Emma; Hebert, David; Kirkland, Donald; Michaud, Jim  
**Cc:** Twardosky, Jason  
**Subject:** Dept Sign Off - 84 Lumber Company SP# 09-22 \*\*NEW\*\* - Third review  
**Attachments:** Proposed offsite improvement.jpg

Brian

Below are the outstanding items from the original submittal that have not been addressed

1. Applicant shall install conservation plates every 50 feet along the 50 foot wetland buffer
2. Applicant shall not store snow within the wetland or wetland buffer
3. Applicant shall consider installing guard rail along the detention basin ( 7 foot plus drop)
4. Applicant indicates drainage pipe slopes less than 2%. Applicant should consider reducing the cover over the pipe to increase the slope

In addition the items listed below have not been addressed based on their most recent response letter

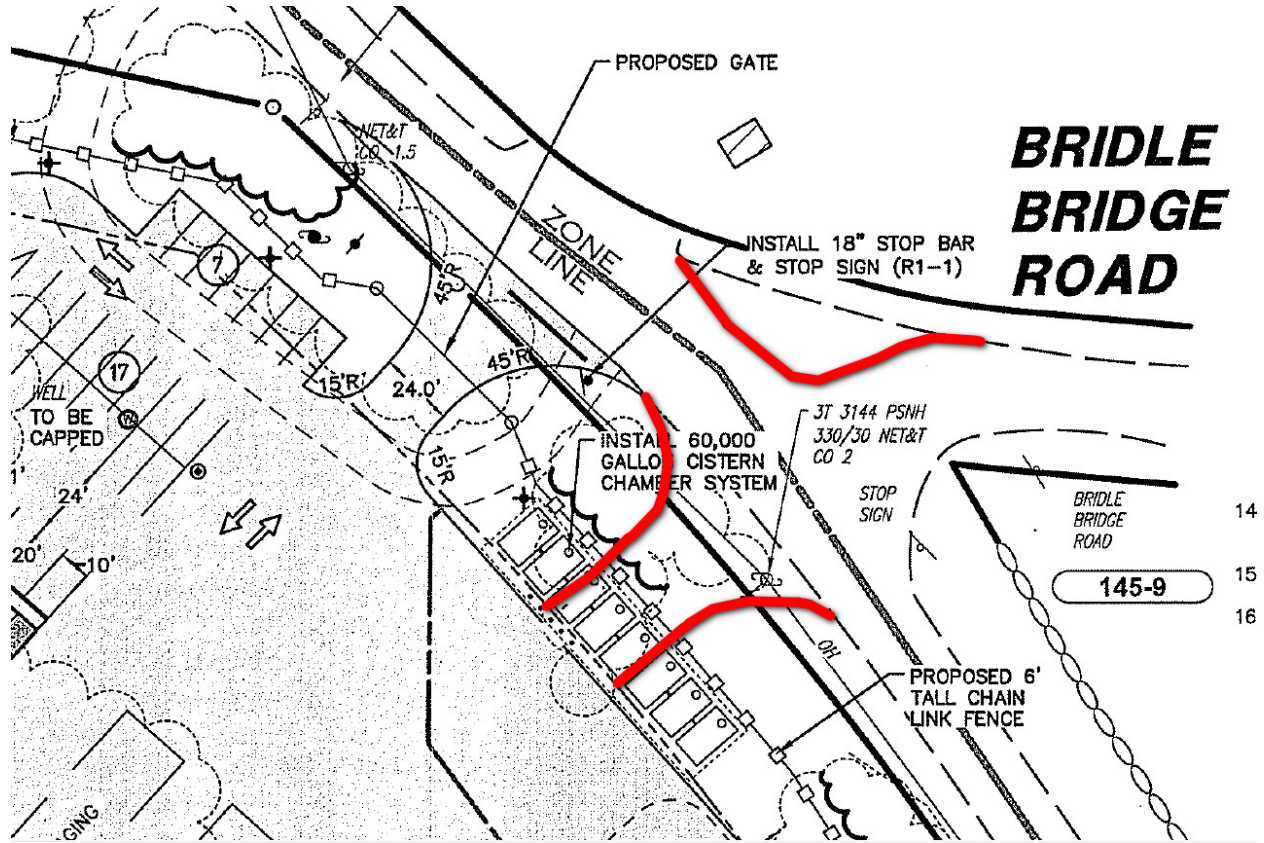
3. Applicant shall consider offsite improvement , per attachment ( I'm looking for a yes or a no on this one )
4. Currently the applicant is proving 1 hour fire suppression at 1,000 gallons per minute (60,000 gallon cistern) , minimum is 3 hours.

E

***Elvis Dhima, P.E.***  
***Town Engineer***

12 School Street  
Hudson, NH 03051  
Phone: (603) 886-6008  
Mobile: (603) 318-8286





14  
15  
16

145-9



# TOWN OF HUDSON

FIRE DEPARTMENT

INSPECTIONAL SERVICES DIVISION



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12 SCHOOL STREET, HUDSON, NEW HAMPSHIRE 03051

Emergency 911  
Business 603-886-6005  
Fax 603-594-1142

Scott Tice  
Chief of Department

TO: Brian Groth  
Town Planner

FR: David Hebert  
Fire Marshal

DT: 1/18/2023

RE: 3 Sullivan Road, 84 Lumber Company  
Fire Department Access & Water Supply

Automatic sprinkler system shall be required for storage in excess of 12 feet in height. High Pile Storage. [NFPA 1: 13.3.2.27.1]

Group S-1 Storage of commercial vehicles shall not be permitted in buildings in excess of 5000sqft without an automatic sprinkler system. [IBC903.2.9 (4)]

Outside lumber staging shall not impinge on Fire Department access as defined in [NFPA 1 Chapter 18]

Provide a cistern drawing that meets Hudson Fire Department requirements. The cistern shall include 6" metal suction pipe, to 6" female, to 6" to 5" male reducer to be National Hose Thread. There shall also be a cap provided for the 6" to 5" reducer that will be left connected to the riser. Locks shall be provided for all access hatches. The cistern shall have a water level indicator. The cistern details shown on the site plan do not meet Hudson Fire Department requirements.

David Hebert  
Fire Marshall

**Groth, Brian**

---

**From:** Buttrick, Bruce  
**Sent:** Friday, January 13, 2023 5:05 PM  
**To:** Groth, Brian  
**Cc:** Dubowik, Brooke  
**Subject:** RE: Dept Sign Off - 84 Lumber Company SP# 09-22 \*\*NEW\*\*  
**Attachments:** 3 Sullivan Rd - site plan 09-22 comments 1-13-23.pdf

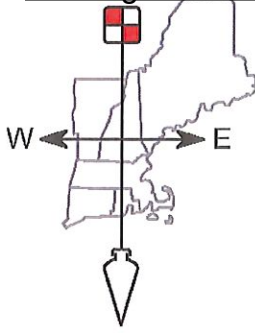
Brian,  
My elevation questions were addressed and answered, no issues.

However I do note the reference for P.B. approval for signage (note # 14), FYI.....

Copy in Brooke's in-box.

Bruce

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# FIELDSTONE

Surveying ♦ Engineering  
Land Planning ♦ Septic Designs

LAND CONSULTANTS, PLLC

206 Elm Street, Milford, NH 03055 - Phone: 603-672-5456 - Fax: 603-413-5456  
www.FieldstoneLandConsultants.com

January 6, 2023

Mr. Brian Groth, Town Planner  
Town of Hudson Planning Department  
12 School Street  
Hudson, NH 03051

Re: 84 Lumber Site Plan - **Review Response Letter**  
3 Sullivan Road, Map 145, Lot 15  
FLC Reference No. 3184.01

Dear Mr. Groth:

Fieldstone Land Consultants, PLLC (FLC) is in receipt of the staff review comments from the Zoning Administrator, Police Department, Fire Marshall, Town Engineer, as well as the peer review by Fuss & O'Neill for the above referenced application. FLC is writing this letter to document how we have addressed the comments to assist you in your review of the application. We have restated each of the original comments with the action taken to address the concern in bold italics below each comment.

## Zoning

1. Verify that the height requirement of the proposed structures, comply with section 334-14: "...Height is measured form the average elevation of the finished grade within five feet of the structure to the highest point of the roof..."  
*The 7,500 square foot main building and 9,600 storage buildings will be a maximum height of 24' 3" to the peak. The storage sheds will be 18' 8" to their peaks. Note #22 on sheet SP-1 calls the building heights as listed above. Building elevations have also been included in this package.*

## Police

1. What kind of traffic in and out of the facility are they expecting? Truck and car traffic approximate numbers.  
*The site is expected to generate a total of 210 trips on an average weekday (two way, 24 hour volume) with 26 vehicle trips expected during the weekday evening peak hour. Truck traffic will be on a schedule based on inventory.*
2. Are they going to do a traffic study for the intersection of Sullivan Road and Route 111?  
*A traffic study for the intersection of Sullivan Road and Route 111 has been performed by Vanasse & Associates, Inc. and was submitted to the planning department for review.*
3. Does a project like this in that location necessitate a traffic light at Route 111 and Sullivan?  
*A response from Vanasse & Associates about a determination if a traffic light is needed at the intersection is pending. We will submit their response as under separate cover once received.*



3 Sullivan Road – 84 Lumber Site Plan  
 Map 145, Lot 15

Page 2 of 9

### Fire

-The proposed 60,000 gallon cistern for water supply shown on the site plan does not conform to the minimum fire flow and duration requirements listed in 2018 NFPA 1, Table 18.4.5.2.1.

*A response from Triangle Fire Consultants, LLC, who performed the fire safety analysis is pending. We will submit their response under separate cover once it is received.*

-The site plan indicates 6 buildings totaling 55,500sqft in close proximity to each other with outside lumber storage along two sides of the site. High exposure risk.

Provide documentation and calculations for sizing of the proposed cistern/cisterns for the minimum required water supply from a Fire Protection Engineer. Have the plan and documents stamped by the engineer.

*A report from Triangle Fire Consultants, LLC describing their analysis of the needed fire suppression on site is included in this submission.*

Provide a cistern drawing that meets Hudson Fire Department requirements. The cistern shall include 6" metal suction pipe, to 6" female, to 6" to 5" male reducer to be National Hose Thread. There shall also be a cap provided for the 6" to 5" reducer that will be left connected to the riser. Locks shall be provided for all access hatches. The cistern shall have a water level indicator. The cistern details shown on the site plan do not meet Hudson Fire Department requirements.

Hudson Fire Department cannot approve this submittal as submitted.

*The cistern detail has been revised to call for a 6" suction pipe with adapters to 5" National Hose Thread. The access hatches are called to have locks and a "Typical Water Level Float Indicator Detail" is provided on the cistern detail sheet (DT-4).*

### Engineering

1. Applicant shall provide mechanical/oil separator for CB 6, 9 & 12.

*An oil separator is proposed on catch basins 6, 9, and 12 on sheet GR-1 and detailed on sheet DT-3.*

2. Applicant shall reevaluate the location of the entrance and try to line it up with Bridle Bridge Road (mimic a two way stop intersection)

*The entrance has been shifted further southeast on Sullivan Road.*

3. Applicant shall consider offsite improvement, per attachment

*The proposed reworking of Bridle Brook Road as depicted on the attached sketch should be discussed with the board. Currently there is a stop sign on Sullivan Road at the intersection with Bridle Brook Road. The attached sketch shows a layout that appears to remove that stop sign and relocate it to Bridle Brook. An offsite improvement of this magnitude and nature should be more thoroughly discussed.*

4. Currently the applicant is proving 1 hour fire suppression at 1,000 gallons per minute (60,000 gallon cistern), minimum is 3 hours.

*A response from Triangle Fire Consultants, LLC, who performed the fire safety analysis is pending. We will submit their response under separate cover once it is received.*

5. Applicant shall provide details regarding ownership and maintenance of the proposed cistern.

*The cistern will be owned and maintained by the owner of the site.*

6. Applicant shall provide sight distance plan and profile of the proposed entrance

*A sight distance exhibit plan for the new proposed entrance is provided at the end of the revised plan set.*

### Fuss & O'Neill (12/14/2022)

#### 1. Site Plan Review Codes (HR 275)

- e. Former Fuss & O'Neill Comment: HR 275-8.C.(6). The applicant has provided six designated off-street



3 Sullivan Road – 84 Lumber Site Plan  
 Map 145, Lot 15

Page 3 of 9

*loading spaces on the plan set. Once phase 2 of the project is constructed nine such spaces would be required. We note that based on the open areas around the buildings it appears that trucks would be loaded adjacent to buildings. The applicant should review the need to show additional loading spaces on the plan to be sure the site meets the requirements.*

Current Fuss & O'Neill Comment: The applicant has revised the building sizes. We note that 6 loading spaces will now be adequate for the proposed buildings. The applicant should review the building dimensions of the proposed sheds. The length is still listed at 300 feet, but they appear to only be 240 feet long now.

*The building labels on sheet SP-1 have been revised to state the storage sheds are 240' long, not 300'.*

## 2. Administrative Review Codes (HR 276)

- a. Former/Current Fuss & O'Neill Comment: HR 276-11.1.B.(4).(b). The applicant should provide the approval block on each sheet of the plan set. The block is missing from the Existing Conditions Plan and Construction Details.

*The approval block has been added to the details sheets and existing conditions plan.*

- b. Former/Current Fuss & O'Neill Comment: HR 276-11.1.B.(8). The locus plan provided does not meet the one-inch equals 1,000 feet scale required.

*The cover sheet shows the site at a scale small enough to show the proposed site improvements. The locus located on sheets SP-1, EX-1, GR-1, and UT-1 is at 1 in = 1,000 ft. per the regulations.*

- c. Former/Current Fuss & O'Neill Comment: HR 276-11.1.B.(12).(c). The applicant has not shown the 100-foot setback between the commercial use and the residential use adjacent to the site. We note that the proposed infiltration basin and other improvements are proposed within this 100-foot setback, which is not allowed by the Regulation.

*In discussion with Mr. Groth, town planner, we have prepared a waiver request for improvements to be constructed within the setback.*

- d. Former/Current Fuss & O'Neill Comment: HR 276-11.1.B.(13). The applicant has not included details for any proposed site signage. The applicant should include a note stating that, "All signs are subject to approval by the Hudson Planning Board prior to installation."

*Note #14 on sheet SP-1 states "All signs are subject to approval by the Hudson Planning Board prior to installation thereof."*

- e. Former/Current Fuss & O'Neill Comment: HR 276-11.1.B.(15). The applicant should be sure that all buildings within 50 feet of the tract are shown on the plan set.

*All buildings within 50' of the site are shown.*

- f. Former/Current Fuss & O'Neill Comment: HR 276-11.1.B.(16). The applicant has not provided the locations of all driveways and travel ways within 200 feet of the site.

*The driveways apron locations along Sullivan Road are shown on the plan set. The driveways to the south on Cheney Drive are further than 200' from the site.*

- g. Former/Current Fuss & O'Neill Comment: HR 276-11.1.B.(20). The applicant has not labeled the height of the existing buildings on site. We note that the existing buildings will all be razed as part of this project.

*The existing building is called out as a two-story residential structure that will be removed on sheet EX-1.*

3 Sullivan Road – 84 Lumber Site Plan  
 Map 145, Lot 15

Page 4 of 9

### 3. Driveway Review Codes (HR 275-8.B. (34)/Chapter 193)

- a. Former/Current Fuss & O'Neill Comment: HR 193.10.E. The applicant has not provided any sight distances information for the proposed driveway location on the plan set.

*A sight distance exhibit plan is provided at the end of the revised plan set.*

- b. Former/Current Fuss & O'Neill Comment: The applicant has proposed a gate at the driveway into the site. The applicant should provide additional information related to when the gate will be in use and if delivery trucks are expected to queue along Sullivan Road if they arrive when the gate is closed.

*The gate will be locked when the store is closed. When deliveries are expected there will be an employee on site and the gate will be unlocked. The gate is also proposed 60' into the site which will allow passenger vehicles, and even large trucks to pull into the site and turn around if the gate is closed.*

- c. Former Fuss & O'Neill Comment: The applicant has not provided a gate detail or indicated how the Fire Department will be able to gain access to the site in an emergency when the gate is closed.

Current Fuss & O'Neill Comment: The applicant has added a gate detail to the plan set. We continue to recommend emergency access information be provided.

*The fire department will be provided with means to unlock the gate in the case of an emergency situation.*

### 4. Traffic

- a. Former Fuss & O'Neill Comment: HR 275-9.B. The applicant has not provided any traffic information as part of their review package.

Current Fuss & O'Neill Comment: We have reviewed the Traffic Assessment prepared by Vanasse & Associates, Inc. (VAI) dated October 28, 2022, for the proposed lumber yard to be located on the southeast corner of the Central Street (Route 111) with Sullivan Road/Lawrence Road in Hudson, New Hampshire. The VAI assessment evaluates access requirements, potential off-site improvements, safety considerations, and traffic impacts associated with the project.

The site currently contains a single-family home, which will be razed and replaced with six new structures as part of the project. Of the six structures, five would be constructed immediately and one would be constructed in the future. The Traffic Assessment notes that the new structures will consist of 4,800 square feet of retail space, 2,700 square feet of office space and 48,000 square feet of storage space. The retail and office spaces will be located together in a single structure, while the remaining five structures will each house 9,600 sf of storage space. Parking will be provided on-site for 35 vehicles and access will be provided via a driveway on Sullivan Road.

The methodology used for determining traffic impacts associated with the proposed site are reasonable with the appropriate ITE data used for the provided scenario. However, it is worth noting that traffic from the Sullivan Road and Lawrence Road stop-controlled approaches of the intersection experience significant delays. For example, the 2034 Weekday Evening Peak Hour No-Build delays for the minor roads are 597 seconds which is approximately 10 minutes, and 1,065 seconds (approximately 18 minutes). These delays increase to 802 seconds (approximately 13 minutes) and 1,221 seconds (approximately 20 minutes) for 2034 Weekday Evening Peak Hour Build conditions. Although the issue of delays along these roads will exist under No-Build conditions, the traffic generated by the proposed site exacerbates these delays. We agree with the report that the site does not generate a significant



3 Sullivan Road – 84 Lumber Site Plan  
 Map 145, Lot 15

Page 5 of 9

amount of traffic and understand that the traffic generated by the site is not necessarily the cause of this concern.

These queue lengths along Sullivan Road are a concern both in No-Build and Build conditions as these queues are potentially expected to reach the road's intersection with Bridle Bridge Road even under 2034 No-Build. We recommend that a signal warrant analysis be performed for No-Build and Build scenarios to determine if/when signaling this intersection could be the proper mitigation for the long delays and queue described above. We recommend current traffic counts not impacted by Covid be used for any warrant analysis. Further, the Town would need to evaluate costs and responsibilities for the implementation of any mitigation measures, and coordination with the NHDOT would be required.

*The request for a Signal Warrant should be being addressed by Vanasse & Associates.*

## 5. Utility Design/Conflicts

- a. *Former Fuss & O'Neill Comment: HR 276-13.G. The applicant has shown the location for the proposed leach field. We note that a septic tank location has not been shown and that typical designs for the system have not been provided as required by the Regulation.*

Current Fuss & O'Neill Comment: The applicant has added a septic tank location. We continue to recommend a typical system design detail be added to the plan set.

*A proposed septic disposal plan is included as an exhibit plan at the end of the attached plan set.*

- b. *Former Fuss & O'Neill Comment: HR 276-13.H. The applicant has noted that the existing well on site is to be capped. The applicant should show a new proposed well location or water connection on the plan set.*

Current Fuss & O'Neill Comment: The applicant is now showing a water service connection to the well that is indicated to be capped. The applicant should clarify the intent for this well and the source of water for the site. The applicant should also show the required protective well radius around whichever location for the well is proposed. Protective well radii shall conform to Env-Wq 1008.

*The well will be capped below final grade and provide water to the office and retail area. The 75' well radius is shown.*

- c. *New Fuss & O'Neill Comment: The applicant has added a 60,000 gallon cistern system with corresponding details to the plans. The applicant should continue to coordinate with the Hudson Fire Department to confirm acceptability of the cistern design. No further Fuss & O'Neill comment.*

*The Hudson Fire Department has reviewed the site for fire safety and we have addressed their comments above.*

## 6. Drainage Design/Stormwater Management (HR 275-9.A./Chapter 290)

- a. *Former Fuss & O'Neill Comment: HR 276-6.F. The applicant should provide additional information on the groundwater recharge requirement. As an NHDES AOT permit will be required, the GRV BMP worksheet is appropriate.*

Current Fuss & O'Neill Comment: The applicant should provide the stage storage table to illustrate WQV is met upon the provided BMP worksheet.

*A storage table for each of the three forebays is provided in the drainage report to illustrate the volume is sufficient to meet state guidelines for pre-treatment.*

- b. *Former Fuss & O'Neill Comment: HR 275-9.A.3. & 290-5.A.4. The applicant should provide test pit*



3 Sullivan Road – 84 Lumber Site Plan  
 Map 145, Lot 15

Page 6 of 9

locations upon the plan set, test pit data, as well as all other information related to the NHDES infiltration feasibility report.

Current Fuss & O’Neill Comment: The applicant should provide the requested information related to the NHDES infiltration feasibility report, including but not limited to test pit observations related to elevations, square footage of basins compared to number of test pits, controlling test pit within the basin. Please refer to Env-Wq 1504.13 for the full list of requirements.

*An infiltration feasibility report is included in the drainage report and provides information as required in Env-Wq 1504.13.*

- c. Former/Current Fuss & O’Neill Comment: HR 290-5.A.1. & 290-5.A.3. The applicant should provide language in the Drainage Analysis Report, stating if and how low impact development (LID) strategies for stormwater runoff were evaluated for this project.

*The developments on site along with the drainage improvements result in a net reduction of runoff from the site. The purpose of the site is a lumber yard, which requires large areas for storage as well as maneuvering of trucks through the site. The narrative of the drainage report includes language describing low impact strategies used on site.*

- e. Former/Current Fuss & O’Neill Comment: HR 290--5.A.12. and 290-7.A.9. Due to the location of the project in respect to the onsite wetlands, the applicant should review the NHDES screening layers to verify if a winter maintenance and salt minimization plan is necessary.

*The maintenance manual has been updated to include winter maintenance and deicing procedures.*

- f. Former Fuss & O’Neill Comment: HR 290-6.A.1. The applicant should add a detail for proposed inlet protection as well as a detail to the plan set.

Current Fuss & O’Neill Comment: The applicant should add locations of inlet protection to the Grading and Drainage Plan or create an erosion control plan.

*There are silt sack sediment filter’s proposed on every catch basin as shown on sheet GR-1 and a silt sack detail is detail #1 on sheet DT-3. The silt sack is also called for on sheet GR-1 and is labeled on the sheet legend.*

- g. Former/Current Fuss & O’Neill Comment: HR 290-6.A.7. The applicant should add the location of the proposed gravel construction exit to the plan set.

*The gravel construction exit is shown on sheet GR-1.*

- h. Former/Current Fuss & O’Neill Comment: HR 290-6.A.8. The applicant should add a note of the requirement to coordinate a pre-construction meeting with the Town Engineer.

*Note #19 on sheet SP-1 states a pre-construction meeting will be held on site prior to earth moving operations and following installation of erosion control measures.*

- i. Former/Current Fuss & O’Neill Comment: HR 290-7.A.6. The applicant should provide information as to how the stormwater system is designed to account for frozen ground conditions.

*A leaching trench within the infiltration basin will allow stormwater to infiltrate into the ground even in frozen conditions. The leaching trench will be below the frost allowing the system to work in all conditions.*

- m. Former/Current Fuss & O’Neill Comment: HR 290-7.A.9. The applicant should add all onsite stormwater features to the I&M manual; including but not limited to catch basins and drainage runs.

*The Inspection and Maintenance manual has been revised to include catch basins, forebays, and outlet protection rip rap aprons.*



3 Sullivan Road – 84 Lumber Site Plan  
Map 145, Lot 15

Page 7 of 9

- n. Former/Current Fuss & O'Neill Comment: HR 290-7.B.13. We note the requirement of the NHDES AoT permit to utilize HISS soils. If the use of HISS mapping revises the soil types, runoff numbers, and infiltration rates, the applicant should revise the drainage calculations appropriately.

*The site has been designed per the test pits performed over the site. A High Intensity Soil Map is included at the end of the submitted plan set.*

- o. Former/Current Fuss & O'Neill Comment: HR 290-7.B.16. We note snow storage is illustrated within the infiltration basin, which is not permitted per NHDES AoT guidelines. The applicant should review the need for a fence and/or signage. If signage is utilized, the I&M Manual should be updated to note snow storage shall not occur within the stormwater basin.

*The plans have been revised and do not allow snow storage in the stormwater management area. The Winter Maintenance Basics section of the maintenance manual, second bullet point regarding snow removal states that no snow should be plowed into the proposed stormwater basin.*

- p. Former/Current Fuss & O'Neill Comment: HR 290-8.A.4. & 5. We note the requirement of the applicant to coordinate the need for a Bond or Escrow with the Town Engineer.

*Note #20 on sheet SP-1 states a bond may be required by the engineering department to the satisfaction of the town. Note #21 states the engineering department may require a deposit to an escrow in order to cover the towns cost for inspections and compliance monitoring.*

- q. Former/Current Fuss & O'Neill Comment: HR 290-10.A. The applicant should keep the Town informed of all communication with NHDES in relation to the required Alteration of Terrain and Wetlands Permits being requested to ensure NHDES comments do not alter drainage design/calculations.

*As part of an NHDES Alteration of Terrain application the State requires a copy of the application to be submitted to the town. At the time of submission to the state, copy of materials will also be submitted to the town to ensure NHDES comments do not drastically alter drainage design.*

- r. Former/Current Fuss & O'Neill Comment: HR 290-10.B. The applicant should ensure a note is upon the plan set stating the requirement of the EPA/GCP/NOI. We note the inclusion of the SWPPP within the drainage report, but contractors do not always review the drainage report.

*Note #23 on sheet SP-1 states the project will require an EPA construction general permit for stormwater discharges associated with construction activity (GCP).*

- s. Former/Current Fuss & O'Neill Comment: ETGTD 920.4.1. through 920.4.5. The applicant shall illustrate the locations of the requested items upon the plan set.

*A proposed material stockpile area is shown on sheet SP-1 along with equipment storage. Stumps are to be removed from the site and disposed of properly per note #3 of the Construction Sequence notes, sheet DT-1. There are existing and proposed 2' contours on sheet GR-1 which show where areas of cut and fill are located.*

- t. Former/Current Fuss & O'Neill Comment: ETGTD 920.3.12 and 920.3.13. The applicant shall illustrate the locations of the requested items upon the plan set.

*A velocity sheet for closed drainage is included in the drainage report to show maximum velocity is not exceeded.*

- u. Former/Current Fuss & O'Neill Comment: ETGTD 920.4.14 The applicant should provide additional information on the type of seeding/hydroseeding to be used within the infiltration basin. A type with the ability to be inundated up to 72 hours after larger storms.

*Note #5 on detail 11 on sheet DT-2 calls specifies Ernst Seed Retention Basin Floor Mix, item number*



3 Sullivan Road – 84 Lumber Site Plan  
 Map 145, Lot 15

Page 8 of 9

*ERNMX-126 or equivalent.*

- v. Former/Current Fuss & O'Neill Comment: ETGTD 930.4 The applicant shall review the slope of the proposed drainage system with the City Engineer, although it is self-cleaning velocity, it does not meet the regulations.

*The town has received a copy of the drainage report, the town engineer has not commented on the slope of the drainage pipes. A summary of each drainage pipe with velocity of stormwater in the 25 year storm is provided in the drainage report.*

**8. Zoning (ZO 334)**

- a. Former/Current Fuss & O'Neill Comment: ZO 334-14.A. The applicant has not provided the proposed building height on the plan set.

*Note #22 on sheet SP-1 calls the main building and storage buildings to be 24' 3" tall and storage sheds to be 18' 8" tall.*

**9. Landscaping (HR 275-8.C.(7) & 276-11.1.B.(20)) and Lighting (HR 276-11.1.B.(14))**

- a. *Former Fuss & O'Neill Comment: HR 275-8.C.(7). The applicant does not appear to meet the requirements of the parking lot landscaping requirements. We note that 10% of the interior of the parking lot area has not been met and the applicant only appears to have provided 9 trees instead of the 10 calculated. We note that the trees and shrubs are located all over the site and not confined to the parking lot area.*

Current Fuss & O'Neill Comment: The applicant had noted that they meet the 10% interior landscaping requirements but there does not appear to be any interior landscaping. All landscaping proposed is around the perimeter of the property. We also still only count nine trees. It appears that the applicant has only shown four maple trees instead of the five noted in the legend.

*The parking lot layout has been revised along with the entrance. This provides two interior landscape islands of 680 and 780 square feet to provide the 10% interior parking lot landscaping. An additional maple tree was intended to be planted and has been added to the landscaping plan.*

- d. Former/Current Fuss & O'Neill Comment: HR 276-11.1.B.(14). The applicant should note if the lights will be on at all times to provide safety and security for the facility or if they will operate around business hours.

*The lights are proposed to be used for security of the facility and to remain on during the night.*

**10. State and Local Permits (HR 275-9.G.)**

- a. Former/Current Fuss & O'Neill Comment: HR 275-9.G. The applicant should list the required permits and statuses on the plan set. We note that an Alteration of Terrain permit and a Septic permit will be required from NHDES.

*Note #18 on sheet SP-1 lists required permits to be acquired from the state.*

**11. Other**

- a. Former/Current Fuss & O'Neill Comment: ETGTD Section 565.1.1. The applicant is reminded of Town of Hudson requirements for the importing of off-site fill materials for use in constructing this project. It is

3 Sullivan Road – 84 Lumber Site Plan  
Map 145, Lot 15

Page 9 of 9

recommended that these requirements be stated on the plans for the Contractors attention.

*Note #11 on sheet GR-1 states that “Contractor shall not import any fill over the amount of ten cubic yards cumulative total per source to any job site in the Town of Hudson without soils testing, verifying the absence of all Constituents of Concern, and without prior approval by Engineering Department staff. Documentation such as test reports, certifications and sieve analyzes of fill shall be provided to the Engineering Department for approval prior to transporting the material to Hudson.*

Fieldstone Land Consultants, PLLC trusts that this letter in conjunction with the revised plans addresses your comments regarding this application. Should you have questions please do not hesitate to contact me.

Sincerely,

**Fieldstone Land Consultants, PLLC**



Chuck L. Ritchie, E.I.T.  
Project Engineer



## MEMORANDUM

**TO:** Chad E. Branon, P.E.  
Fieldstone Land Consultants, PLLC  
206 Elm Street  
Milford, NH 03055

**FROM:** Scott W. Thornton, P.E.,  
*and*  
Derek Roach, P.E.  
Vanasse & Associates, Inc.  
35 New England Business Center Drive,  
Suite 140  
Andover, MA 01810-1066

**DATE:** October 28, 2022

**RE:** 9517

**SUBJECT:** Traffic Assessment – Proposed Lumber Yard  
Hudson, New Hampshire

Vanasse & Associates, Inc. (VAI) has prepared this Traffic Assessment to identify traffic impacts associated with the proposed lumber yard to be located on the southeast corner of the intersection of Central Street (Route 111) with Sullivan Road/Lawrence Road in Hudson, New Hampshire (hereafter referred to as the “Project”). This assessment evaluates the following specific areas as they relate to the Project: i) access requirements; ii) potential off-site improvements; and iii) safety considerations; and identifies and analyzes existing and future traffic conditions, both with and without the Project.

### PROJECT DESCRIPTION

Currently, the site contains a single-family home. The Project entails razing the existing structure on-site and constructing six new structures of which five will be constructed immediately and one will be constructed in the future. The structures will consist of 4,800 square feet (sf) of retail space, 2,700 sf of office space, and 48,000 sf of storage space. The retail and office uses will be located together in one of the six structures while the remaining five structures are stand-alone and will each have 9,600 sf of storage space. Parking will be provided on-site for 35 vehicles. Access to the site is proposed via one driveway onto Sullivan Road.

### EXISTING CONDITIONS

A comprehensive field inventory of existing conditions within the study area was conducted in October 2022. The field investigation consisted of an inventory of existing roadway geometrics; traffic volumes; and operating characteristics; as well as posted speed limits, sight distance, and land use information within the study area. The study area is listed below and graphically depicted on Figure 1.

- Central Street (Route 111) at Sullivan Road/Lawrence Road

The following describes the study area roadway and intersection, also shown on Figure 2.







Figure 1

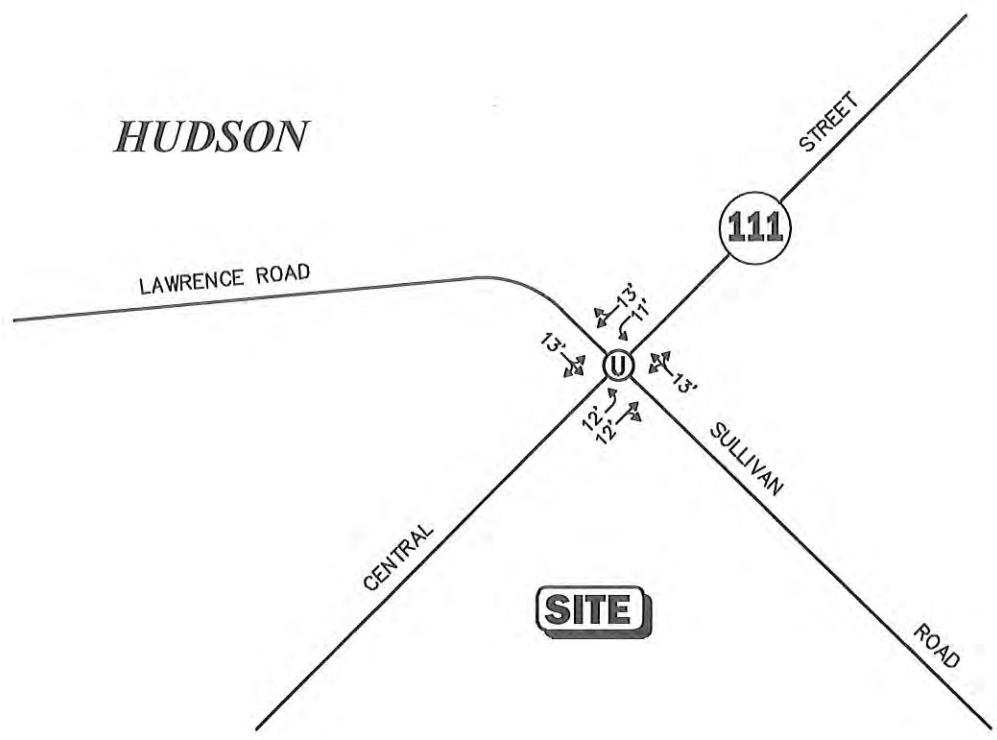
Study Area and Site Location Map





**Legend:**

- ⓪ Unsignalized Intersection
- xx' ↔ Lane Use and Travel Lane Width



Not To Scale Figure 2



**Existing Intersection Lane Use and Travel Lane Width**

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**Study Area**

Central Street is classified as a principal arterial under the jurisdiction of the New Hampshire Department of Transportation (NHDOT) District 5. Central Street runs in a general southwest-northeast alignment throughout the study area. Central Street allows two-way travel separated by a double-yellow centerline. Land use along Central Street generally consists of open and wooded areas and residential and commercial properties. Figure 2 summarizes existing lane use and travel lane widths at the study area intersection as observed in October 2022.

**Traffic Volumes**

In order to establish existing traffic-volume demands and flow patterns within the study area, manual turning movement counts (TMCs) were completed in October 2022. The TMCs were performed from 7:00 to 9:00 AM and from 4:00 to 6:00 PM at the study area intersection.

**Traffic-Volume Adjustments**

In order to develop 2022 Baseline traffic-volume conditions, the data collected required adjustment due to the effects of the COVID-19 pandemic. To achieve this, count data from the NHDOT permanent count station ID 02297001 located on Route 3 north of Hilton Drive was used. Daily count data from October 2019 and October 2021 were used to develop COVID-19 correction factors. At the time of this report, no data for October 2022 was available, so October 2021 data was used. Based on this evaluation, the 2022 weekday evening peak-hour traffic volumes were increased by 7 percent and Saturday midday peak-hour traffic volumes were left unadjusted.

In addition to correction factors for COVID-19, adjustments were made to bring the volumes to peak-month conditions. The NHDOT permanent count station ID 02297001 data again was used. Based on this data, it was determined that October traffic volumes are approximately 4 percent lower than peak-month conditions for this station. Therefore, traffic volumes were increased by 4 percent to peak-month conditions. The 2022 Baseline traffic volumes on Central Street are summarized in Table 1.

**Table 1  
2022 BASELINE TRAFFIC VOLUMES**

Location	Weekday Evening Peak Hour		Saturday Midday Peak Hour	
	Volume (vph) <sup>a</sup>	Predominant Flow	Volume (vph)	Predominant Flow
Central Street, south of Sullivan Road	1,530	60% NB	1,047	56% NB

Source: COVID-19 correction factors and peak-month adjustment applied to TMCs conducted in October 2022.

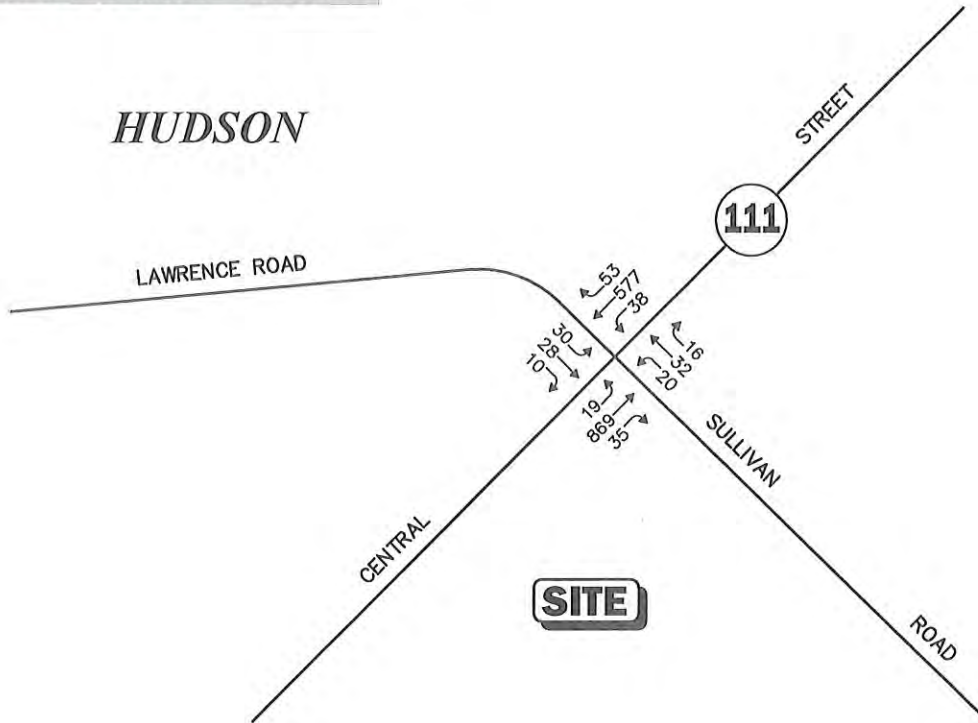
<sup>a</sup>Two-way peak-hour volume expressed in vehicles per hour.

NB = northbound.

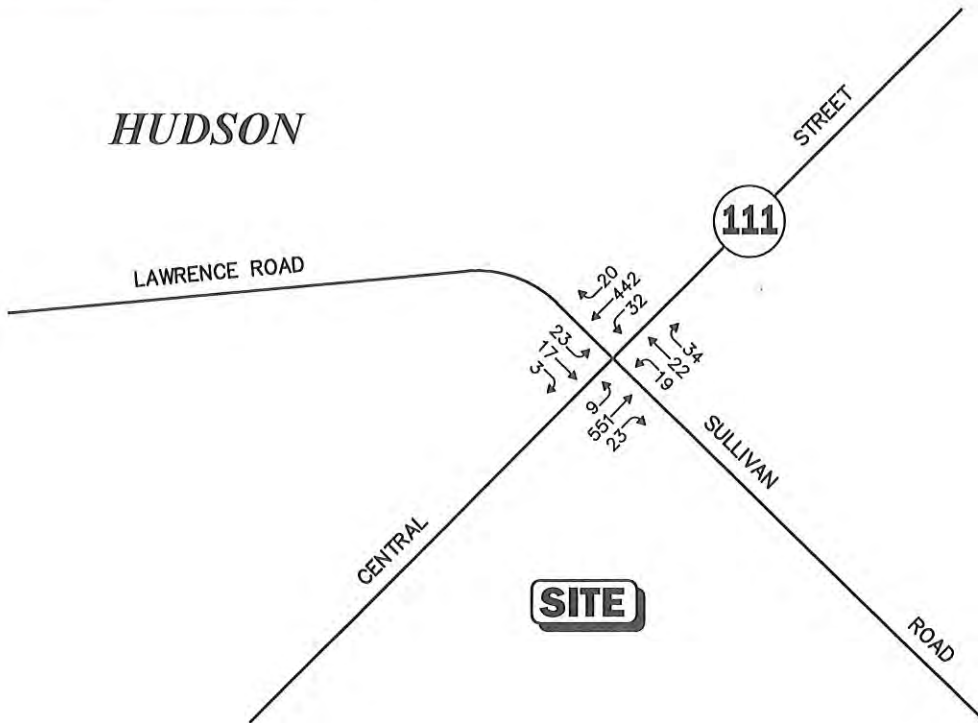
As can be seen in Table 1, Central Street was found to carry approximately 1,530 vehicles per hour (vph) during the weekday evening peak hour and 1,047 vph during the Saturday midday peak hour. During the weekday evening peak hour, 60 percent of the traffic is traveling northbound and during the Saturday midday peak hour, 56 percent of the traffic is traveling northbound. The weekday evening and Saturday midday baseline traffic volumes for the study area intersections are graphically depicted on Figure 3.



**WEEKDAY EVENING PEAK HOUR**



**SATURDAY MIDDAY PEAK HOUR**



Not To Scale

**Figure 3**



**2022 Baseline Peak-Hour Traffic Volumes**

**Motor Vehicle Crash Data**

Motor vehicle crash information for the study area intersection was provided by the Hudson Police Department for the most recent three-year period available (2019 through 2021) in order to examine motor vehicle crash trends occurring within the study area. The data is summarized in Table 2 by intersection, type, weather condition, lighting condition, pavement condition, and severity.

**Table 2**  
**MOTOR VEHICLE CRASH DATA SUMMARY<sup>a</sup>**

	Central Street at Sullivan Road/Lawrence Road
<i>Year:</i>	
2019	3
2020	1
2021	<u>4</u>
Total	8
Average <sup>a</sup>	2.67
<i>Type:</i>	
Angle	6
Rear-End	1
Head-On	0
Sideswipe	0
Fixed Object	0
Pedestrian	0
Bicyclist	0
<u>Unknown/Other</u>	<u>1</u>
Total	8
<i>Weather Conditions:</i>	
Clear	6
Cloudy/Rain	1
Snow/Ice	1
Fog	0
<u>Unknown/Other</u>	<u>0</u>
Total	8
<i>Lighting Conditions:</i>	
Daylight	4
Dawn/Dusk	0
Dark (lit)	2
Dark (unlit)	2
<u>Unknown/Other</u>	<u>0</u>
Total	8
<i>Pavement Condition:</i>	
Dry	7
Wet	0
Snow/Ice	1
<u>Unknown/Other</u>	<u>0</u>
Total	8
<i>Severity:</i>	
Property Damage Only	5
Personal Injury	3
Fatality	0
<u>Unknown/Other</u>	<u>0</u>
Total	8

<sup>a</sup>Source: Hudson Police Department, 2019-2021.





As can be seen in Table 2, the study area intersection experienced 2.67 crashes per year over the three-year review period. The majority of these crashes are angle collisions, that occurred in the daylight, on dry roadways, in clear weather, and caused property damage only. Additionally, no fatalities were reported over the three-year period reviewed.

**SIGHT DISTANCE EVALUATION**

Sight distance measurements were performed at the location of the proposed site driveway intersection with Sullivan Road in accordance with American Association of State Highway and Transportation Officials (AASHTO)<sup>1</sup> recommendations. Both stopping sight distance (SSD) and intersection sight distance (ISD) measurements were performed. In brief, SSD is the distance required by a vehicle traveling at the design speed of a roadway, on wet pavement, to stop prior to striking an object in its travel path. ISD or corner sight distance (CSD) is the sight distance required by a driver entering or crossing an intersecting roadway to perceive an on-coming vehicle and safely complete a turning or crossing maneuver with oncoming traffic. *In accordance with AASHTO standards, if the measured ISD is at least equal to the recommended SSD value for the appropriate design speed, the intersection can operate in a safe manner.* Table 3 presents the measured SSD and ISD at the site driveway intersection with Sullivan Road.

**Table 3  
SIGHT DISTANCE MEASUREMENTS<sup>a</sup>**

Intersection/Sight Distance Measurement	Recommended Distances (Feet)	Field Measured Distances (Feet)
	Posted Speed Limit (30 mph)	
<b><i>Sullivan Road at Site Driveway</i></b>		
<i>Stopping Sight Distance:</i>		
Sullivan Road approaching from the east	200	500+
Sullivan Road approaching from the west	200	495
<i>Intersection Sight Distance:<sup>b</sup></i>		
Left turn from Site Driveway (looking east)	335	500+
Left turn from Site Driveway (looking west)	335	466

<sup>a</sup>Recommended values obtained from *A Policy on Geometric Design of Highways and Streets*, 7<sup>th</sup> Edition; American Association of State Highway and Transportation Officials (AASHTO); 2018.

<sup>b</sup>Values shown are the intersection sight distance for a vehicle turning right or left exiting a roadway under STOP control such that motorists approaching the intersection on the major street should not need to adjust their travel speed to less than 70 percent of their initial approach speed.

As can be seen in Table 3, the sight distance at the proposed site driveway intersection with Sullivan Road was found to exceed the recommended values for both SSD and ISD in both directions, based on the posted speed limit of 30 mph.

In order to encourage safe and efficient flow of traffic to and from the site, should any landscaping or signage along the site frontage or the site driveway be proposed or requested by others, these features are

<sup>1</sup>*A Policy on Geometric Design of Highway and Streets*, 7<sup>th</sup> Edition; American Association of State Highway and Transportation Officials (AASHTO); Washington D.C.; 2018.



recommended to be no higher than 24 inches or be set back sufficiently from the edge of the roadways so as not to inhibit the available sightlines.

### **FUTURE CONDITIONS**

To determine the impact of site-generated traffic volumes on the roadway network under future conditions, baseline traffic volumes in the study area were projected to the years 2024 and 2034 consistent with NHDOT guidelines. Traffic volumes on the roadway network at that time, in the absence of the Project (that is, the No-Build condition), would include existing traffic, new traffic due to general background traffic growth, and traffic related to specific development by others expected to be completed by 2024 and 2034. Inclusion of these factors resulted in the development of 2024 and 2034 No-Build traffic volumes. Anticipated site-generated traffic volumes were then superimposed upon these No-Build traffic-flow networks to develop the 2024 and 2034 Build traffic-volume conditions.

#### **Future Traffic Growth**

Traffic growth on area roadways is a function of the expected land development impacting the study area. Several methods are used to estimate this growth. A procedure frequently employed estimates an annual percentage increase in traffic growth and applies that percentage to all existing traffic volumes under study. The drawback to such a procedure is that some turning volumes may actually grow at either a higher or a lower rate at particular intersections.

In addition, we identified the location and type of planned development affecting the study area, estimated the traffic to be generated by that development, and assigned it to the area roadway network. This produces a more realistic estimate of growth for local traffic. However, the drawback of this procedure is that the potential growth in population and development external to the study area would not be accounted for in the traffic projections.

To provide a conservative analysis framework, both procedures were used in this TIA.

#### **General Background Growth**

Traffic-volume data compiled by NHDOT from permanent count stations and historic traffic counts in the area were reviewed in order to determine general background traffic growth trends. Based on a review of this data and other area traffic studies, it was determined that the traffic volumes are fluctuating in the area depending on location with an average increase of approximately 0.90 percent per year. To be conservative, a 1.0 percent per year compounded annual background traffic growth rate was used to account for future traffic growth including presently unforeseen development within the study area.

#### **Specific Development by Others**

The Town of Hudson was contacted in order to determine if there are any planned or approved specific development projects within the area that would have an impact on future traffic volumes at the study intersections. Based on these discussions the following project was identified for inclusion in this assessment.

**334 Central Street** – This project entails the construction of 19 duplexes totaling 38 residential units to be





located at 334 Central Street. Traffic volumes for this development were estimated using Institute of Transportation Engineers (ITE)<sup>2</sup> data and added to the future condition networks.

### **Planned Roadway Improvements**

The Town of Hudson and NHDOT were contacted in order to determine if there are any planned roadway improvement projects expected to be completed within the study area in the ten-year planning horizon. Based on these discussions, no roadway improvement projects are planned within the study area beyond general maintenance.

### **No-Build Traffic Volumes**

The 2024 Opening Year No-Build peak-hour traffic-volume networks were developed by applying the 1.0 percent per year compounded annual background traffic growth rate to the 2022 Baseline peak-hour traffic volumes. The resulting 2024 Opening Year No-Build weekday evening and Saturday midday peak-hour traffic-volume networks are shown on Figure 4. The 2034 Design Year No-Build peak-hour traffic-volume networks were developed by applying the 1.0 percent per year compounded annual background traffic growth rate to the 2022 Baseline peak-hour traffic volumes. The resulting 2034 Design Year No-Build weekday evening and Saturday midday peak-hour traffic-volume networks are shown on Figure 5.

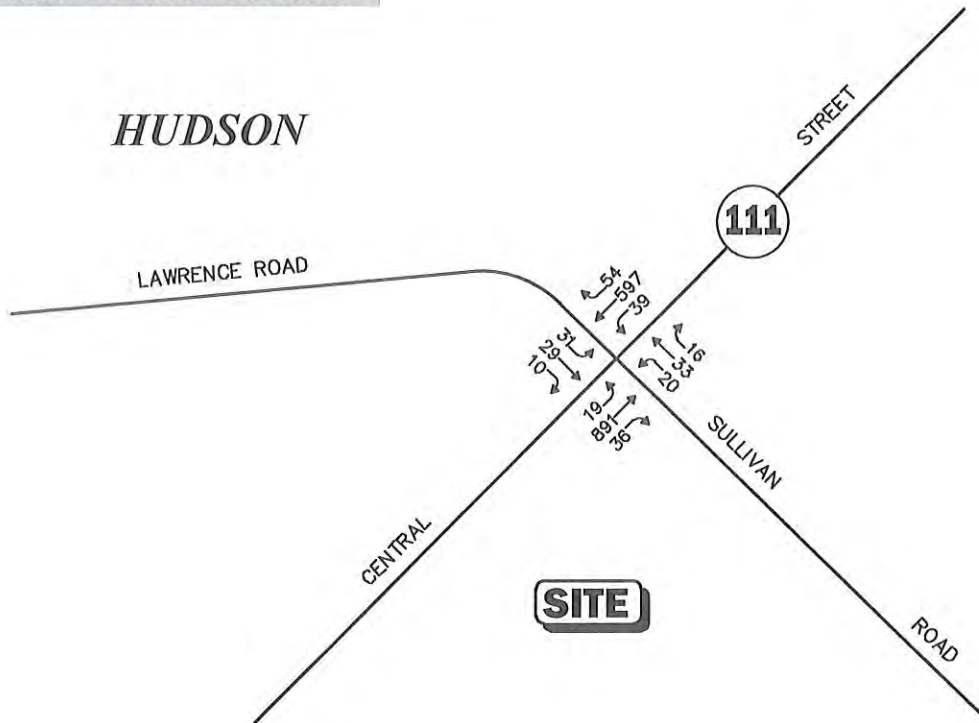
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<sup>2</sup>*Trip Generation*, 11<sup>th</sup> Edition; Institute of Transportation Engineers; Washington, DC; 2021.

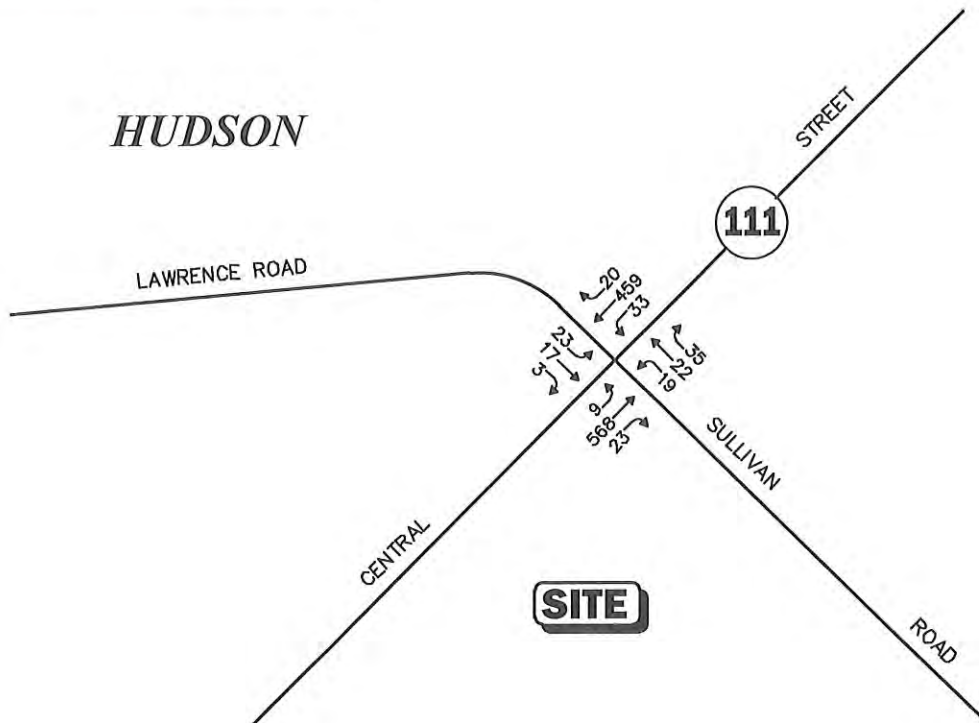




**WEEKDAY EVENING PEAK HOUR**



**SATURDAY MIDDAY PEAK HOUR**



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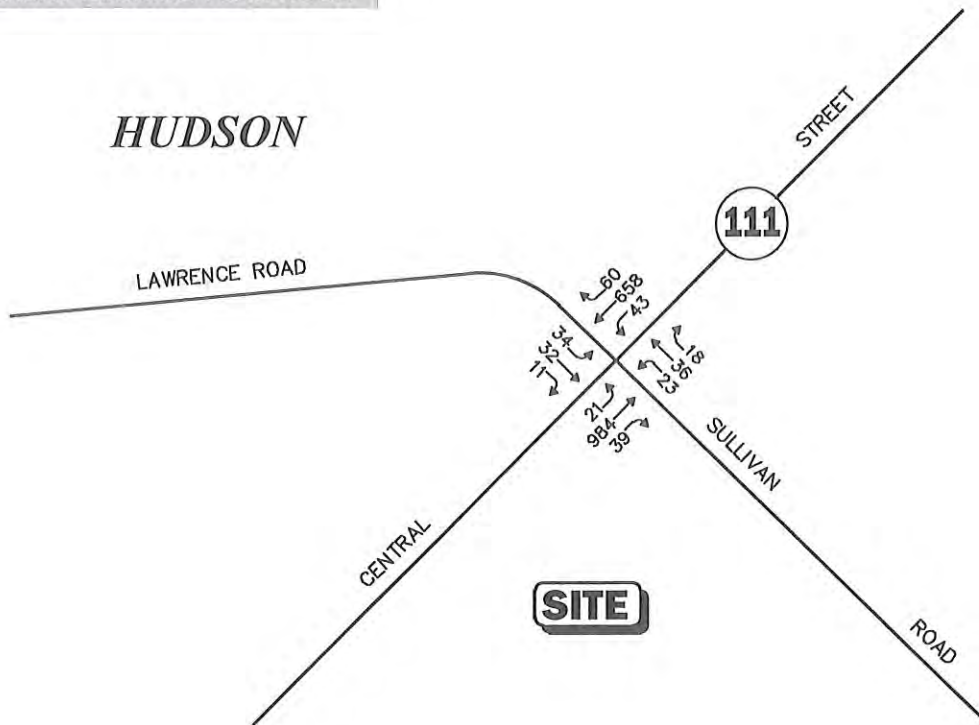


**Figure 4**

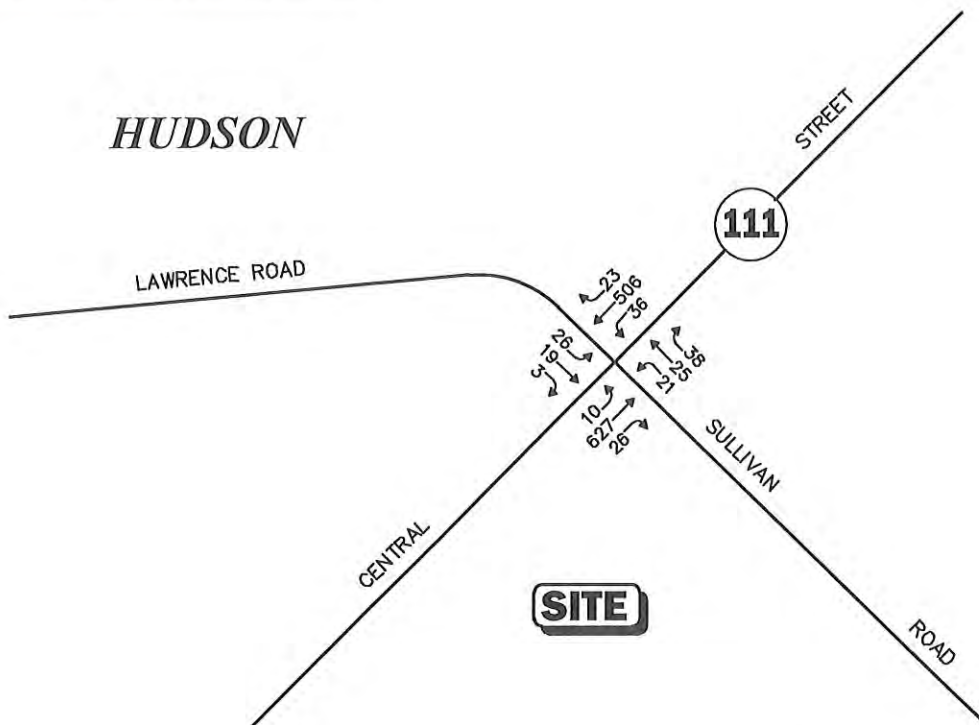
**2024 Opening-Year No-Build Peak-Hour Traffic Volumes**

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**WEEKDAY EVENING PEAK HOUR**



**SATURDAY MIDDAY PEAK HOUR**



Not To Scale



**Figure 5**

**2034 Design-Year No-Build Peak-Hour Traffic Volumes**

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### Project-Generated Traffic

The Project entails constructing a lumber yard containing 4,800 sf of retail space, 2,700 sf of office space, and 48,000 sf of warehouse/storage space. In order to develop the traffic characteristics of the proposed Project, trip-generation statistics published by the ITE in their publication *Trip Generation*<sup>3</sup> for Land Use Code (LUC) 812, *Building Materials and Lumber Store* and LUC 150, *Warehousing* were used. A summary of the expected vehicle-trip generation is provided in Table 4.

**Table 4**  
**PROJECT TRIP-GENERATION SUMMARY<sup>a</sup>**

Time Period/ Directional Distribution	Retail/Office <sup>a</sup>	Warehouse <sup>b</sup>	Total
Weekday Daily	128	82	210
<i>Weekday Evening Peak Hour:</i>			
Entering	8	3	11
Exiting	9	6	15
Total	17	9	26
Saturday Daily	388	8	396
<i>Saturday Midday Peak Hour:</i>			
Entering	37	1	38
Exiting	35	1	36
Total	72	2	74

<sup>a</sup>Based on ITE LUC 812, *Building Materials and Lumber Store*; 7,500 sf.

<sup>b</sup>Based on ITE LUC 150, *Warehousing*; 48,000 sf.

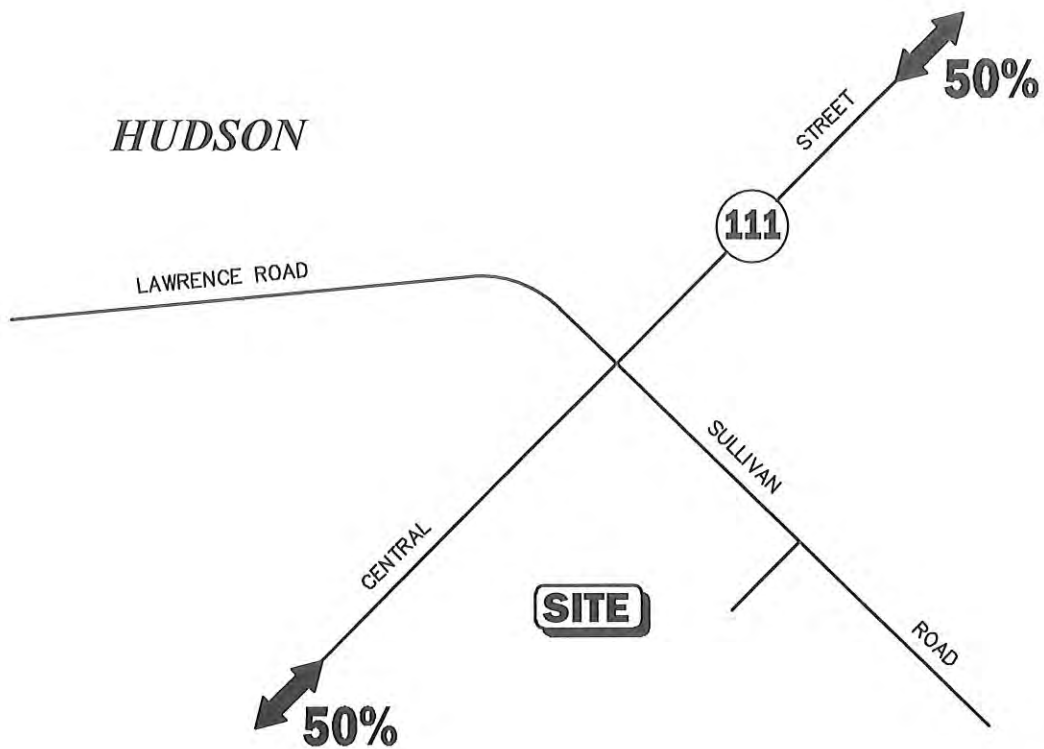
As can be seen in Table 4, the Project is expected to generate 210 vehicle trips on an average weekday (two-way, 24-hour volume), with 26 vehicle trips (11 entering and 15 exiting) expected during the weekday evening peak hour. On Saturday, the Project is expected to generate 396 vehicle trips with 74 vehicle trips (38 entering and 36 exiting) expected during the Saturday midday peak hour.

### Trip Distribution and Assignment

The directional distribution of the site-generated trips to and from the Project was determined based on a review of existing travel patterns at the study area intersection. The trip distribution for the Project is summarized in Table 5 and graphically depicted on Figure 6. The weekday evening and Saturday midday peak-hour traffic volumes networks are shown on Figure 7.

<sup>3</sup>Ibid 2.





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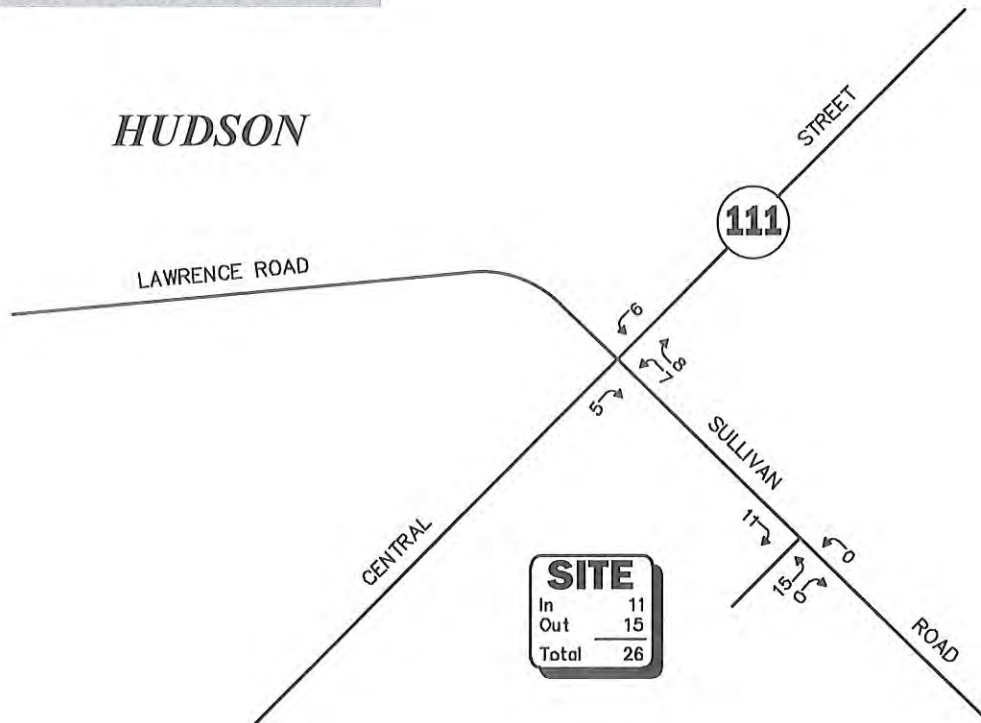
Figure 6

Trip Distribution Map

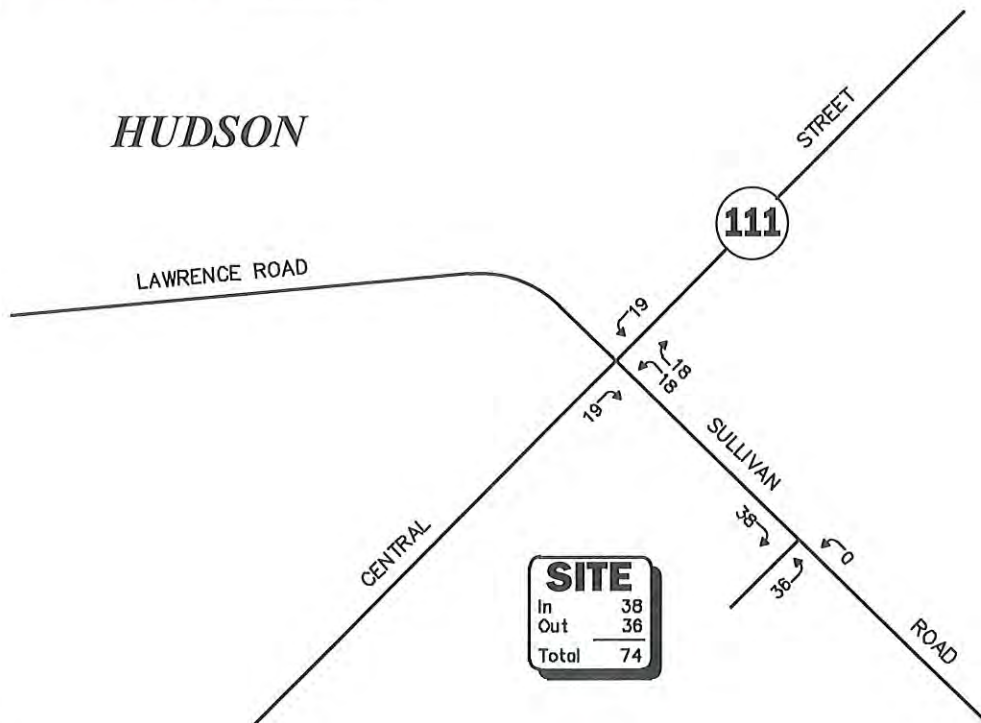




**WEEKDAY EVENING PEAK HOUR**



**SATURDAY MIDDAY PEAK HOUR**



Not To Scale **Figure 7**



**Project-Generated Peak-Hour Traffic Volumes**

**Table 5**  
**TRIP-DISTRIBUTION SUMMARY**

Roadway	Direction (To/From)	Percent (To/From)
Central Street	East	50
Central Street	West	50
TOTAL		100

**Future Traffic Volumes – Build Condition**

The 2024 Opening Year Build condition networks consist of the 2024 Opening Year No-Build traffic volumes with the anticipated Project-generated traffic added to them. The 2024 Opening Year Build weekday evening and Saturday midday peak-hour traffic-volume networks are graphically depicted on Figure 8.

The 2034 Design Year Build condition networks consist of the 2034 Design Year No-Build traffic volumes with the anticipated Project-generated traffic added to them. The 2034 Design Year Build weekday evening and Saturday midday peak-hour traffic-volume networks are graphically depicted on Figure 9.

A summary of peak-hour projected traffic-volume increases external to the study area that is the subject of this assessment is shown in Table 6. These volumes are based on the expected increases from the Project.

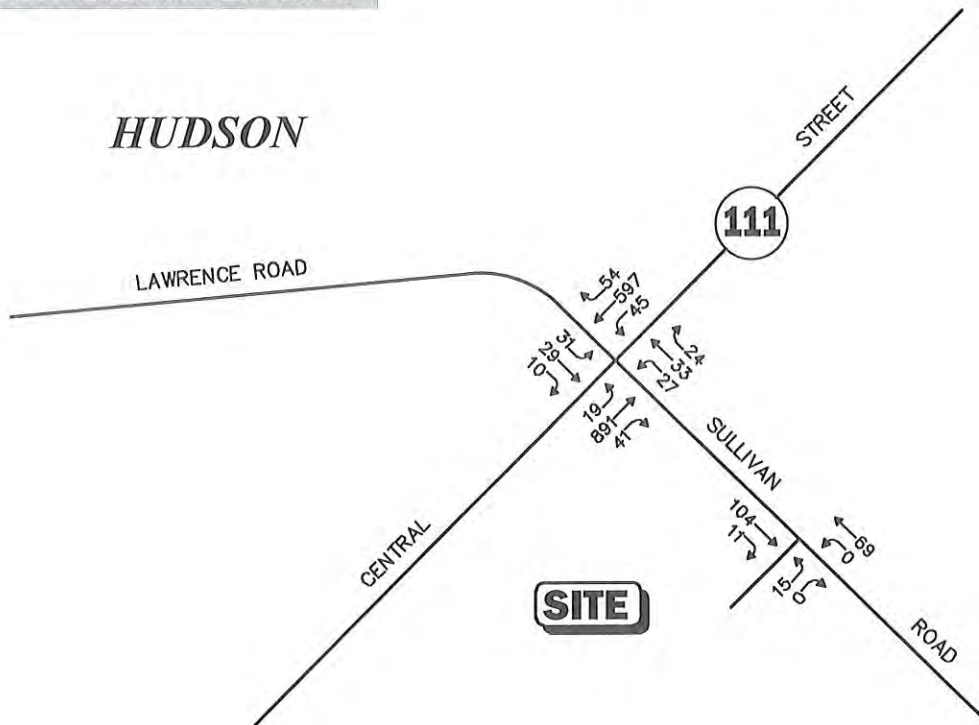
**Table 6**  
**PEAK-HOUR TRAFFIC-VOLUME INCREASES**

Location/Peak Hour	2024/2034 No-Build	2024/2034 Build	Traffic-Volume Increase Over No-Build	Percent Increase Over No-Build
<i>Central Street, east Sullivan Road:</i>				
Weekday Evening	1,628/1,797	1,642/1,811	14/14	0.9/0.8
Saturday Midday	1,138/1,256	1,175/1,293	37/37	3.3/2.9
<i>Central Street, west of Sullivan Road:</i>				
Weekday Evening	1,573/1,736	1,585/1,748	12/12	0.8/0.7
Saturday Midday	1,081/1,193	1,118/1,230	37/37	3.4/3.1

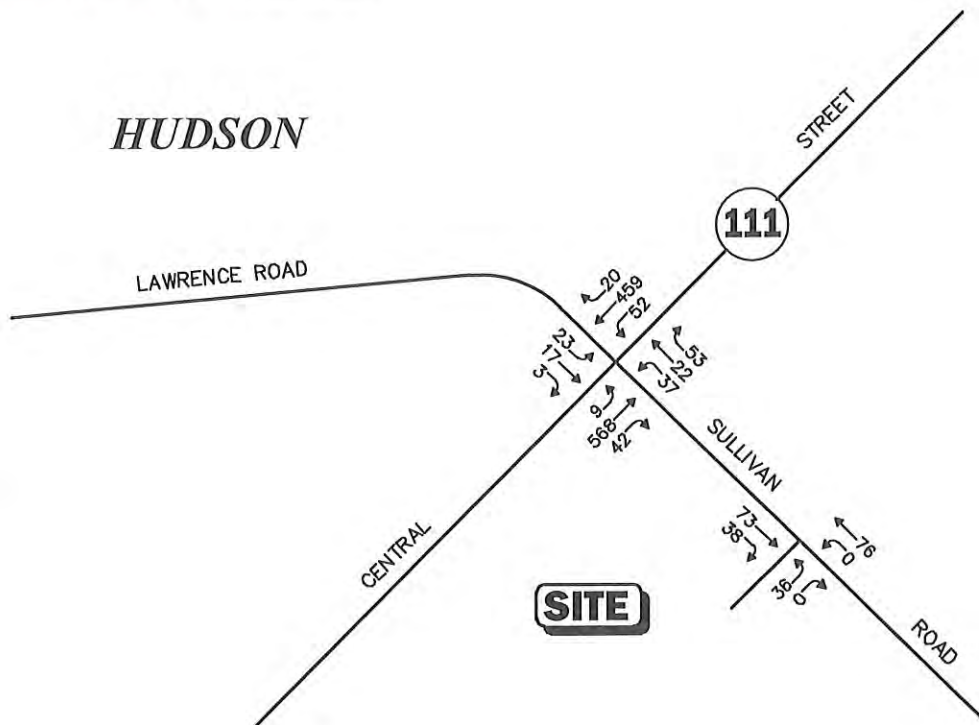
As shown in Table 6, Project-related traffic-volume increases external to the study area relative to 2029 No-Build conditions are anticipated to range from 12 to 37 vehicles or 0.7 to 3.4 percent during the peak periods.



**WEEKDAY EVENING PEAK HOUR**



**SATURDAY MIDDAY PEAK HOUR**



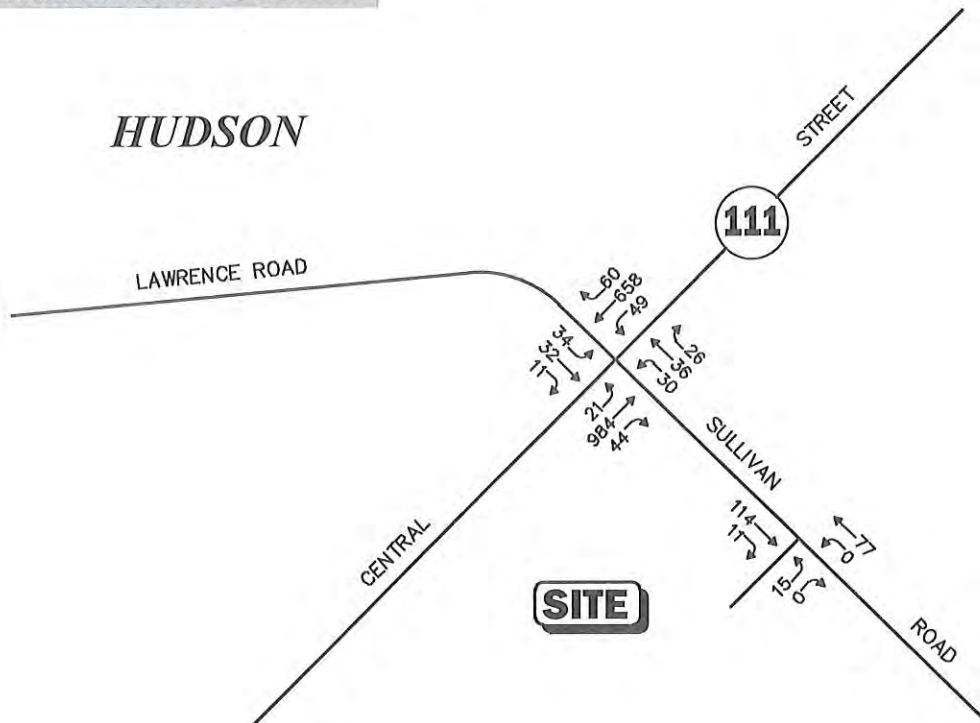
Not To Scale **Figure 8**



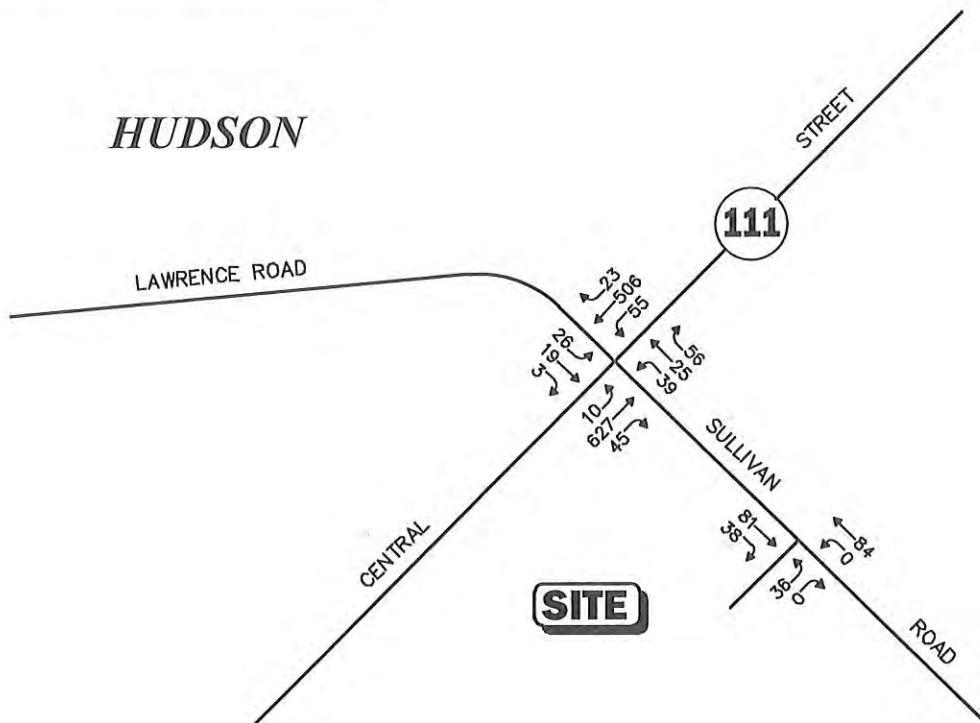
**2024 Opening-Year Build Peak-Hour Traffic Volumes**

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**WEEKDAY EVENING PEAK HOUR**



**SATURDAY MIDDAY PEAK HOUR**



Not To Scale



**Figure 9**

**2034 Design-Year Build Peak-Hour Traffic Volumes**



## TRAFFIC OPERATIONS ANALYSIS

Measuring existing and future traffic volumes quantifies traffic flow within the study area. To assess quality of flow, roadway capacity and vehicle queue analyses were conducted under Existing, No-Build, and Build traffic-volume conditions. Capacity analyses provide an indication of how well the roadway facilities serve the traffic demands placed upon them, with vehicle queue analyses providing a secondary measure of the operational characteristics of an intersection or section of roadway under study.

A primary result of capacity analyses is the assignment of level of service to traffic facilities under various traffic-flow conditions.<sup>4</sup> The concept of level of service is defined as a qualitative measure describing operational conditions within a traffic stream and their perception by motorists and/or passengers. A level-of-service definition provides an index to quality of traffic flow in terms of such factors as speed, travel time, freedom to maneuver, traffic interruptions, comfort, convenience, and safety.

Six levels of service are defined for each type of facility. They are given letter designations from A to F, with level-of-service (LOS) A representing the best-operating conditions and LOS F representing congested or constrained operating conditions.

Since the level of service of a traffic facility is a function of the traffic flows placed upon it, such a facility may operate at a wide range of levels of service, depending on the time of day, day of week, or period of year.

### Unsignalized Intersections

The six levels of service for unsignalized intersections may be described as follows:

- *LOS A* represents a condition with little or no control delay to minor street traffic.
- *LOS B* represents a condition with short control delays to minor street traffic.
- *LOS C* represents a condition with average control delays to minor street traffic.
- *LOS D* represents a condition with long control delays to minor street traffic.
- *LOS E* represents operating conditions at or near capacity level, with very long control delays to minor street traffic.
- *LOS F* represents a condition where minor street demand volume exceeds capacity of an approach lane, with extreme control delays resulting.

The levels of service of unsignalized intersections are determined by application of a procedure described in the *Highway Capacity Manual 6<sup>th</sup> Edition*.<sup>5</sup> Level of service is measured in terms of average control delay. Mathematically, control delay is a function of the capacity and degree of saturation of the lane group and/or approach under study and is a quantification of motorist delay associated with traffic control devices such as traffic signals and STOP signs. Control delay includes the effects of initial deceleration delay approaching a STOP sign, stopped delay, queue move-up time, and final acceleration delay from a stopped condition. Definitions for level of service at unsignalized intersections are also given in the *Highway*

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<sup>4</sup>The capacity analysis methodology is based on the concepts and procedures presented in the *Highway Capacity Manual 6<sup>th</sup> Edition*; Transportation Research Board; Washington, DC; 2016.

<sup>5</sup>*Highway Capacity Manual*; Transportation Research Board; Washington, DC; 2016.



*Capacity Manual 6<sup>th</sup> Edition*. Table 7 summarizes the relationship between level of service and average control delay for two-way STOP-controlled and all-way STOP-controlled intersections.

**Table 7  
LEVEL-OF-SERVICE CRITERIA  
FOR UNSIGNALIZED INTERSECTIONS<sup>a</sup>**

Level-of-Service by Volume-to-Capacity Ratio		Average Control Delay (Seconds Per Vehicle)
v/c ≤ 1.0	v/c > 1.0	
A	F	≤10.0
B	F	10.1 to 15.0
C	F	15.1 to 25.0
D	F	25.1 to 35.0
E	F	35.1 to 50.0
F	F	>50.0

<sup>a</sup>Source: *Highway Capacity Manual 6<sup>th</sup> Edition*; Transportation Research Board; Washington, DC; 2016; page 20-6.

**Analysis Results**

Level-of-service analyses were conducted for 2022 Baseline, 2024 Opening Year No-Build, 2034 Design Year No-Build, 2024 Opening Year Build, and 2034 Design Year Build conditions for the study area intersections. The results of the intersection capacity analysis within the study area are described below, with a tabular summary provided in Table 8.

**Central Street at Sullivan Road/Lawrence Road**

Under 2022 Baseline conditions, during the weekday evening peak hour, the Central Street movements operate at LOS A and the side street movements operate at LOS F. During the Saturday midday peak hour, the Central Street movements operate at LOS A and the side street movements operate at LOS E or better. Under 2024 Opening Year No-Build conditions, during the weekday evening peak hour, the Central Street movements operate at LOS B or better and the side street movements operate at LOS F. During the Saturday midday peak hour, the Central Street movements operate at LOS A and the side street movements operate at LOS E or better. Under 2034 Design Year No-Build conditions, during the weekday evening peak hour, the Central Street movements operate at LOS B or better and the side street movements operate at LOS F. During the Saturday midday peak hour, the Central Street movements operate at LOS A and the side street movements operate at LOS F or better. No change to LOS occurs as a result of the Project traffic under 2024 Opening Year Build or 2034 Design Year Build conditions except for the Sullivan Road approach which goes from LOS D to LOS E and LOS E to LOS F. Vehicle queue lengths are anticipated to increase by less than 3 vehicles for all movements under Build conditions compared to No-Build conditions indicating the Project will result in minimal impact at the intersection.

**Sullivan Road at Site Driveway**

Under 2024 Opening Year Build and 2034 Design Year Build conditions the Project site driveway operates at LOS A.







## CONCLUSIONS

VAI has completed a Traffic Assessment of the potential impacts on the surrounding transportation infrastructure of a proposed lumber yard located on the southeast corner of the intersection of Central Street (Route 111) with Sullivan Road/Lawrence Road in Hudson, New Hampshire. We have the following conclusions:

- The study area intersection experienced 2.67 crashes per year over the three-year review period. The majority of these crashes are angle collisions, that occurred in the daylight, on dry roadways, in clear weather, and caused property damage only. No fatalities were reported over the three-year period reviewed.
- The sight distance at the proposed site driveway intersection with Sullivan Road was found to exceed the recommended values for both SSD and ISD in both directions, based on the posted speed limit of 30 mph.
- The Project is expected to generate 210 vehicle trips on an average weekday (two-way, 24-hour volume), with 26 vehicle trips (11 entering and 15 exiting) expected during the weekday evening peak hour. On Saturday, the Project is expected to generate 396 vehicle trips with 74 vehicle trips (38 entering and 36 exiting) expected during the Saturday midday peak hour.
- The analysis has indicated that the Project will generally result in minimal impact on motorist delays and vehicle queue lengths at the study intersection.

## RECOMMENDATIONS

A transportation improvement program has been developed that is designed to provide safe and efficient access to the Project and address any deficiencies identified at the study area locations. The following improvements have been recommended as a part of this evaluation:

### Project Access

Access to the Project site will be provided via a new driveway onto Sullivan Road. The following recommendations are offered with respect to the design and operation of the Project site driveways:

- The driveway should be placed under STOP-sign (*Manual on Uniform Traffic Control Devices* (MUTCD)<sup>6</sup> R1-1) control, with a painted STOP-bar included.
- All signs and other pavement markings to be installed within the Project site shall conform to the applicable standards of the current MUTCD.
- Signs and landscaping adjacent to the Project site driveways should be designed and maintained so as not to restrict lines of sight.
- Snow windrows within sight triangle areas of the Project site driveway should be promptly removed where such accumulations would impede sight lines.

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<sup>6</sup>*Manual on Uniform Traffic Control Devices (MUTCD)*; Federal Highway Administration; Washington, D.C.; 2009.





As documented in this study, Project-related traffic increases will not result in significant increases in overall traffic volumes or traffic delays within the study area. The site driveway will provide efficient access to and from the development. In general, Project-related traffic can be adequately accommodated within the existing infrastructure with minimal impact on the traffic operations within the study area.

cc: File



## APPENDIX

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TRAFFIC COUNT DATA  
COVID-19 ADJUSTMENT DATA  
SEASONAL ADJUSTMENT DATA  
GROWTH RATE DATA  
TRIP GENERATION DATA  
CAPACITY ANALYSIS

TRAFFIC COUNT DATA

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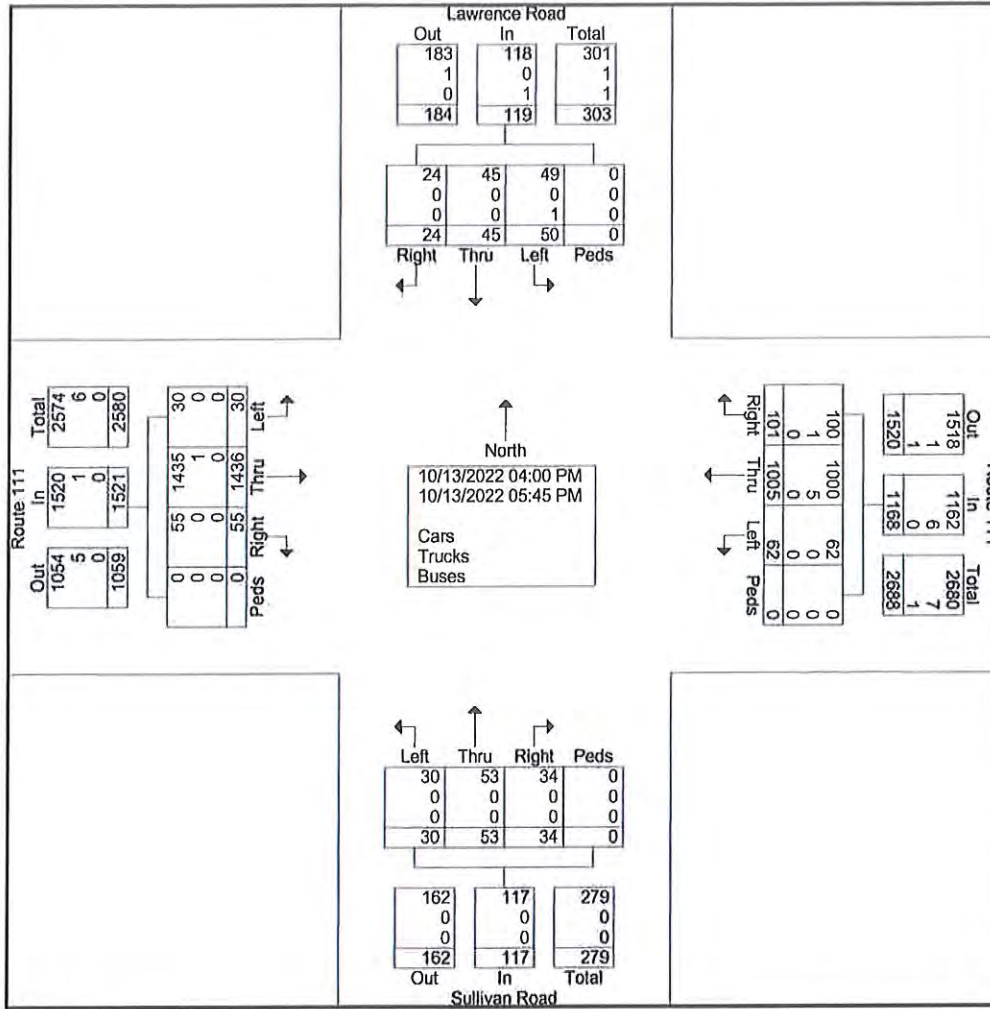




# Vanasse & Associates

Route 111 at Sullivan Rd / Lawrence Rd  
 Hudson, NH  
 Weather : Drizzle

File Name : 951701pm  
 Site Code : 00951701  
 Start Date : 10/13/2022  
 Page No : 2

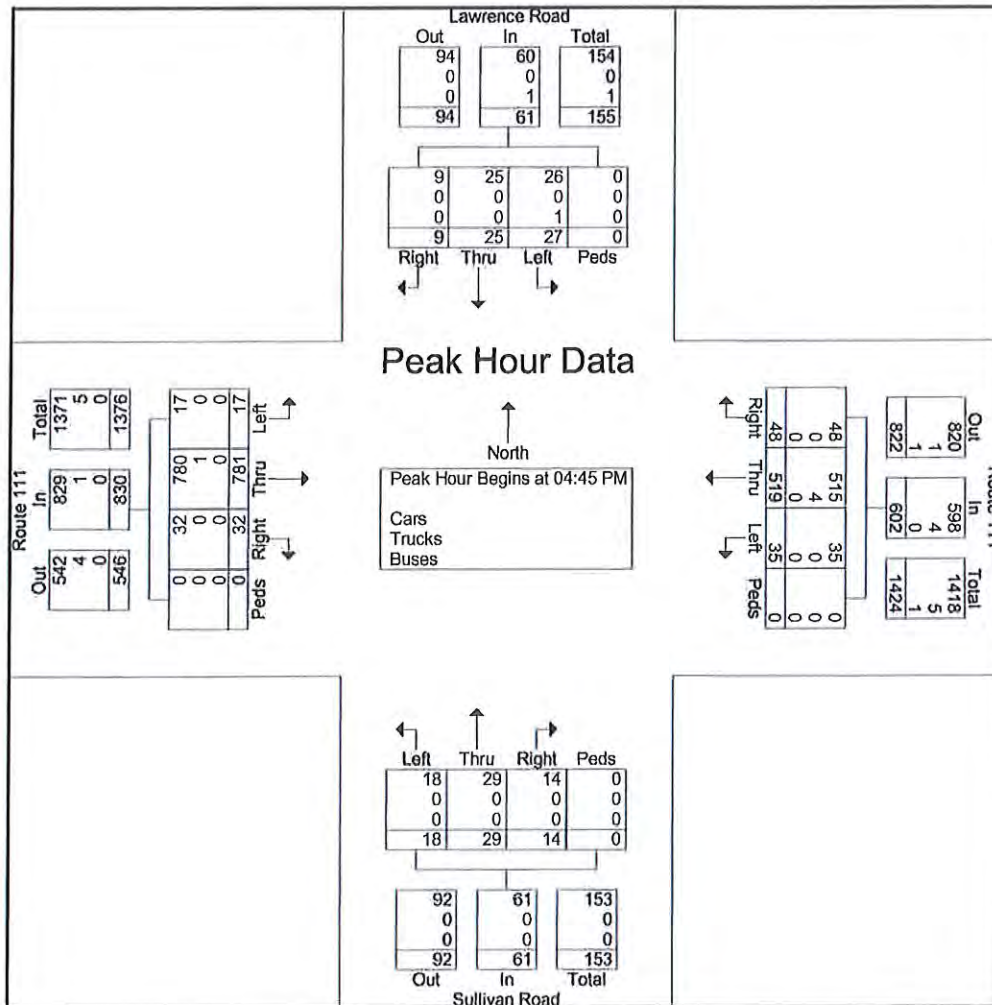


# Vanasse & Associates

Route 111 at Sullivan Rd / Lawrence Rd  
 Hudson, NH  
 Weather : Drizzle

File Name : 951701pm  
 Site Code : 00951701  
 Start Date : 10/13/2022  
 Page No : 3

Start Time	Lawrence Road From North					Route 111 From East					Sullivan Road From South					Route 111 From West					Int. Total
	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:45 PM																					
04:45 PM	2	6	8	0	16	4	135	13	0	152	4	13	3	0	20	9	183	2	0	194	382
05:00 PM	1	9	5	0	15	18	124	6	0	148	3	6	8	0	17	5	213	3	0	221	401
05:15 PM	6	5	7	0	18	16	135	8	0	159	2	4	2	0	8	8	203	2	0	213	398
05:30 PM	0	5	7	0	12	10	125	8	0	143	5	6	5	0	16	10	182	10	0	202	373
Total Volume	9	25	27	0	61	48	519	35	0	602	14	29	18	0	61	32	781	17	0	830	1554
% App. Total	14.8	41	44.3	0		8	86.2	5.8	0		23	47.5	29.5	0		3.9	94.1	2	0		
PHF	.375	.694	.844	.000	.847	.667	.961	.673	.000	.947	.700	.558	.563	.000	.763	.800	.917	.425	.000	.939	.969
Cars	9	25	26	0	60	48	515	35	0	598	14	29	18	0	61	32	780	17	0	829	1548
% Cars	100	100	96.3	0	98.4	100	99.2	100	0	99.3	100	100	100	0	100	100	99.9	100	0	99.9	99.6
Trucks	0	0	0	0	0	0	4	0	0	4	0	0	0	0	0	0	1	0	0	1	5
% Trucks	0	0	0	0	0	0	0.8	0	0	0.7	0	0	0	0	0	0	0.1	0	0	0.1	0.3
Buses	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
% Buses	0	0	3.7	0	1.6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1



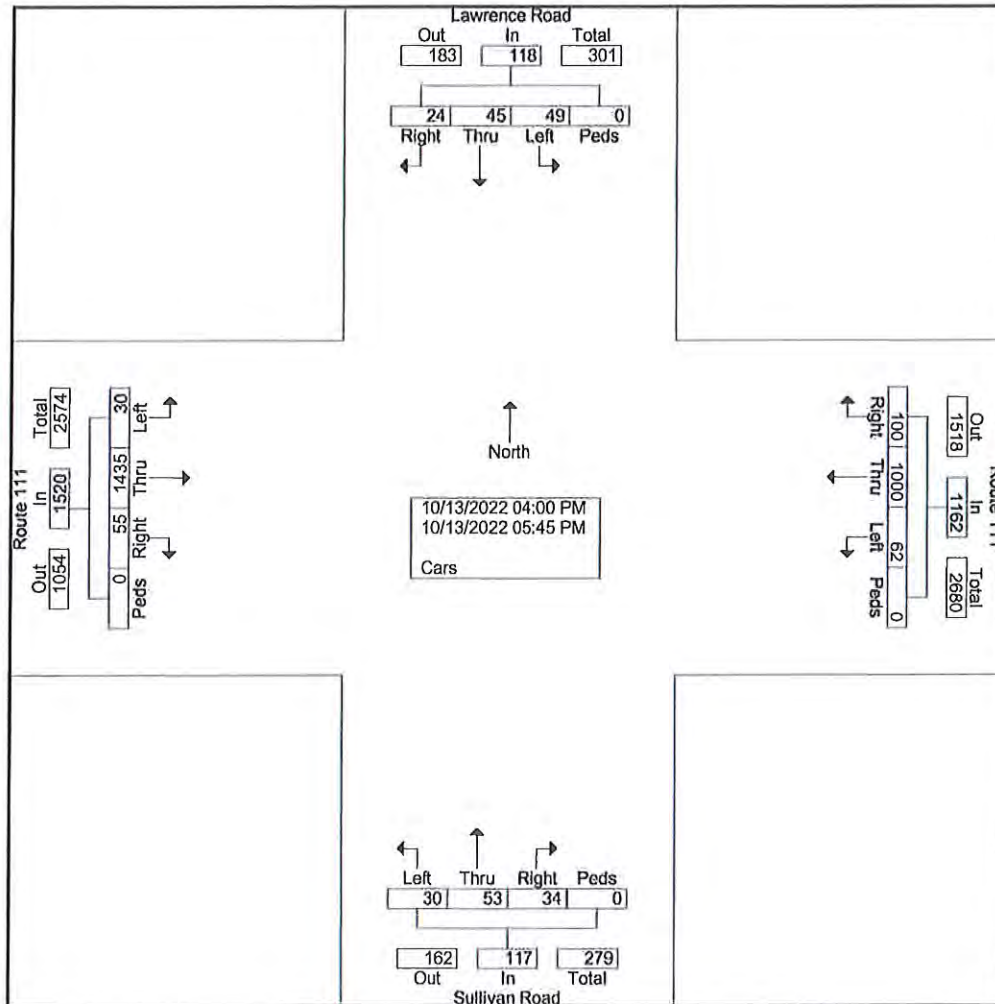
# Vanasse & Associates

Route 111 at Sullivan Rd / Lawrence Rd  
 Hudson, NH  
 Weather : Drizzle

File Name : 951701pm  
 Site Code : 00951701  
 Start Date : 10/13/2022  
 Page No : 1

Groups Printed- Cars

Start Time	Lawrence Road From North					Route 111 From East					Sullivan Road From South					Route 111 From West					Int. Total
	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	
04:00 PM	3	6	5	0	14	10	111	7	0	128	8	7	3	0	18	4	174	1	0	179	339
04:15 PM	3	6	6	0	15	14	139	8	0	161	5	8	2	0	15	8	154	2	0	164	355
04:30 PM	1	2	5	0	8	18	118	3	0	139	5	5	1	0	11	6	178	5	0	189	347
04:45 PM	2	6	8	0	16	4	134	13	0	151	4	13	3	0	20	9	183	2	0	194	381
<b>Total</b>	<b>9</b>	<b>20</b>	<b>24</b>	<b>0</b>	<b>53</b>	<b>46</b>	<b>502</b>	<b>31</b>	<b>0</b>	<b>579</b>	<b>22</b>	<b>33</b>	<b>9</b>	<b>0</b>	<b>64</b>	<b>27</b>	<b>689</b>	<b>10</b>	<b>0</b>	<b>726</b>	<b>1422</b>
05:00 PM	1	9	5	0	15	18	124	6	0	148	3	6	8	0	17	5	212	3	0	220	400
05:15 PM	6	5	6	0	17	16	133	8	0	157	2	4	2	0	8	8	203	2	0	213	395
05:30 PM	0	5	7	0	12	10	124	8	0	142	5	6	5	0	16	10	182	10	0	202	372
05:45 PM	8	6	7	0	21	10	117	9	0	136	2	4	6	0	12	5	149	5	0	159	328
<b>Total</b>	<b>15</b>	<b>25</b>	<b>25</b>	<b>0</b>	<b>65</b>	<b>54</b>	<b>498</b>	<b>31</b>	<b>0</b>	<b>583</b>	<b>12</b>	<b>20</b>	<b>21</b>	<b>0</b>	<b>53</b>	<b>28</b>	<b>746</b>	<b>20</b>	<b>0</b>	<b>794</b>	<b>1495</b>
<b>Grand Total</b>	<b>24</b>	<b>45</b>	<b>49</b>	<b>0</b>	<b>118</b>	<b>100</b>	<b>1000</b>	<b>62</b>	<b>0</b>	<b>1162</b>	<b>34</b>	<b>53</b>	<b>30</b>	<b>0</b>	<b>117</b>	<b>55</b>	<b>1435</b>	<b>30</b>	<b>0</b>	<b>1520</b>	<b>2917</b>
<b>Apprch %</b>	<b>20.3</b>	<b>38.1</b>	<b>41.5</b>	<b>0</b>		<b>8.6</b>	<b>86.1</b>	<b>5.3</b>	<b>0</b>		<b>29.1</b>	<b>45.3</b>	<b>25.6</b>	<b>0</b>		<b>3.6</b>	<b>94.4</b>	<b>2</b>	<b>0</b>		
<b>Total %</b>	<b>0.8</b>	<b>1.5</b>	<b>1.7</b>	<b>0</b>	<b>4</b>	<b>3.4</b>	<b>34.3</b>	<b>2.1</b>	<b>0</b>	<b>39.8</b>	<b>1.2</b>	<b>1.8</b>	<b>1</b>	<b>0</b>	<b>4</b>	<b>1.9</b>	<b>49.2</b>	<b>1</b>	<b>0</b>	<b>52.1</b>	



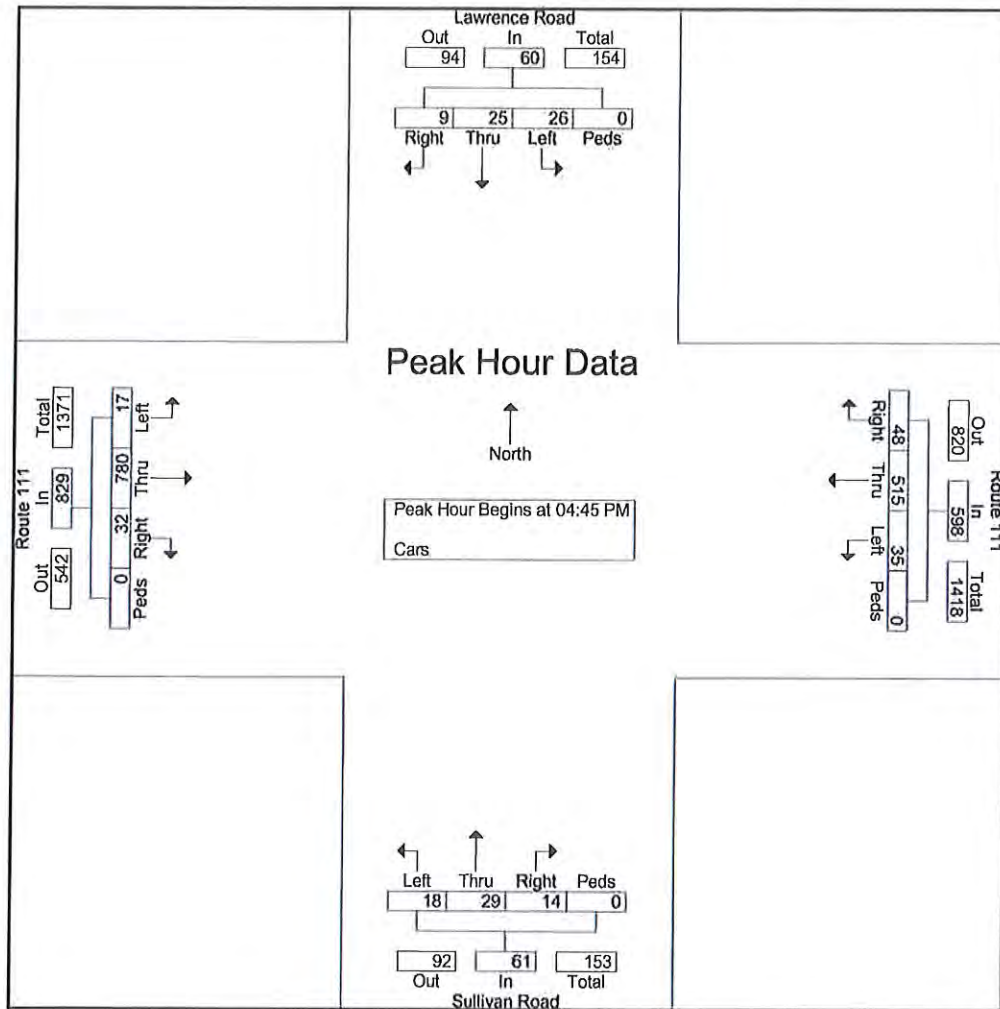


# Vanasse & Associates

Route 111 at Sullivan Rd / Lawrence Rd  
 Hudson, NH  
 Weather : Drizzle

File Name : 951701pm  
 Site Code : 00951701  
 Start Date : 10/13/2022  
 Page No : 2

Start Time	Lawrence Road From North					Route 111 From East					Sullivan Road From South					Route 111 From West					Int. Total
	Right	Thru	Left	Peds	App Total	Right	Thru	Left	Peds	App Total	Right	Thru	Left	Peds	App Total	Right	Thru	Left	Peds	App Total	
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:45 PM																					
04:45 PM	2	6	8	0	16	4	134	13	0	151	4	13	3	0	20	9	183	2	0	194	381
05:00 PM	1	9	5	0	15	18	124	6	0	148	3	6	8	0	17	5	212	3	0	220	400
05:15 PM	6	5	6	0	17	16	133	8	0	157	2	4	2	0	8	8	203	2	0	213	395
05:30 PM	0	5	7	0	12	10	124	8	0	142	5	6	5	0	16	10	182	10	0	202	372
Total Volume	9	25	26	0	60	48	515	35	0	598	14	29	18	0	61	32	780	17	0	829	1548
% App. Total	15	41.7	43.3	0		8	86.1	5.9	0		23	47.5	29.5	0		3.9	94.1	2.1	0		
PHF	.375	.694	.813	.000	.882	.667	.961	.673	.000	.952	.700	.558	.563	.000	.763	.800	.920	.425	.000	.942	.968





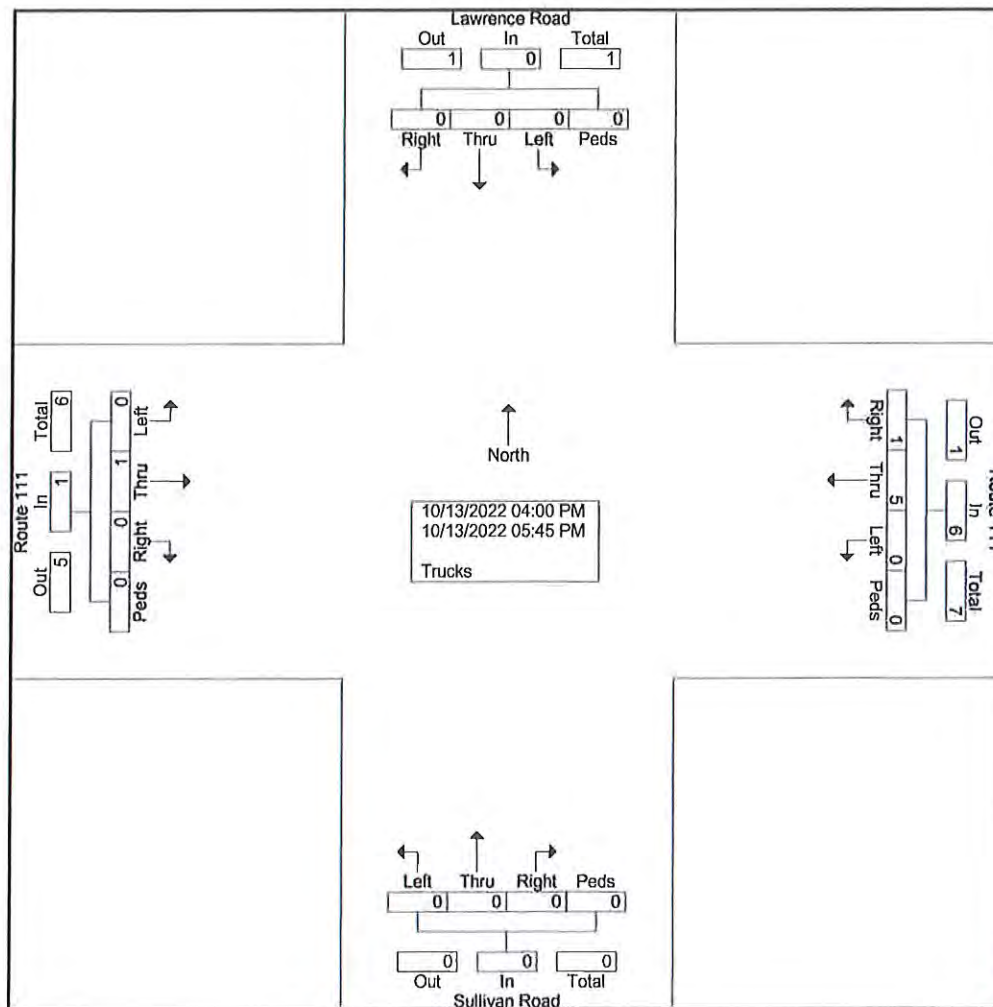
# Vanasse & Associates

Route 111 at Sullivan Rd / Lawrence Rd  
 Hudson, NH  
 Weather : Drizzle

File Name : 951701pm  
 Site Code : 00951701  
 Start Date : 10/13/2022  
 Page No : 1

Groups Printed- Trucks

Start Time	Lawrence Road From North					Route 111 From East					Sullivan Road From South					Route 111 From West					Int. Total
	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
04:30 PM	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0
04:45 PM	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	1	2	0	0	3	0	0	0	0	0	0	0	0	0	0	3
05:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1
05:15 PM	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	0	0	0	0	0	2
05:30 PM	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1
05:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	3	0	0	3	0	0	0	0	0	0	1	0	0	1	4
Grand Total	0	0	0	0	0	1	5	0	0	6	0	0	0	0	0	0	1	0	0	1	7
Apprch %	0	0	0	0		16.7	83.3	0	0		0	0	0	0		0	100	0	0		
Total %	0	0	0	0	0	14.3	71.4	0	0	85.7	0	0	0	0	0	0	14.3	0	0	14.3	

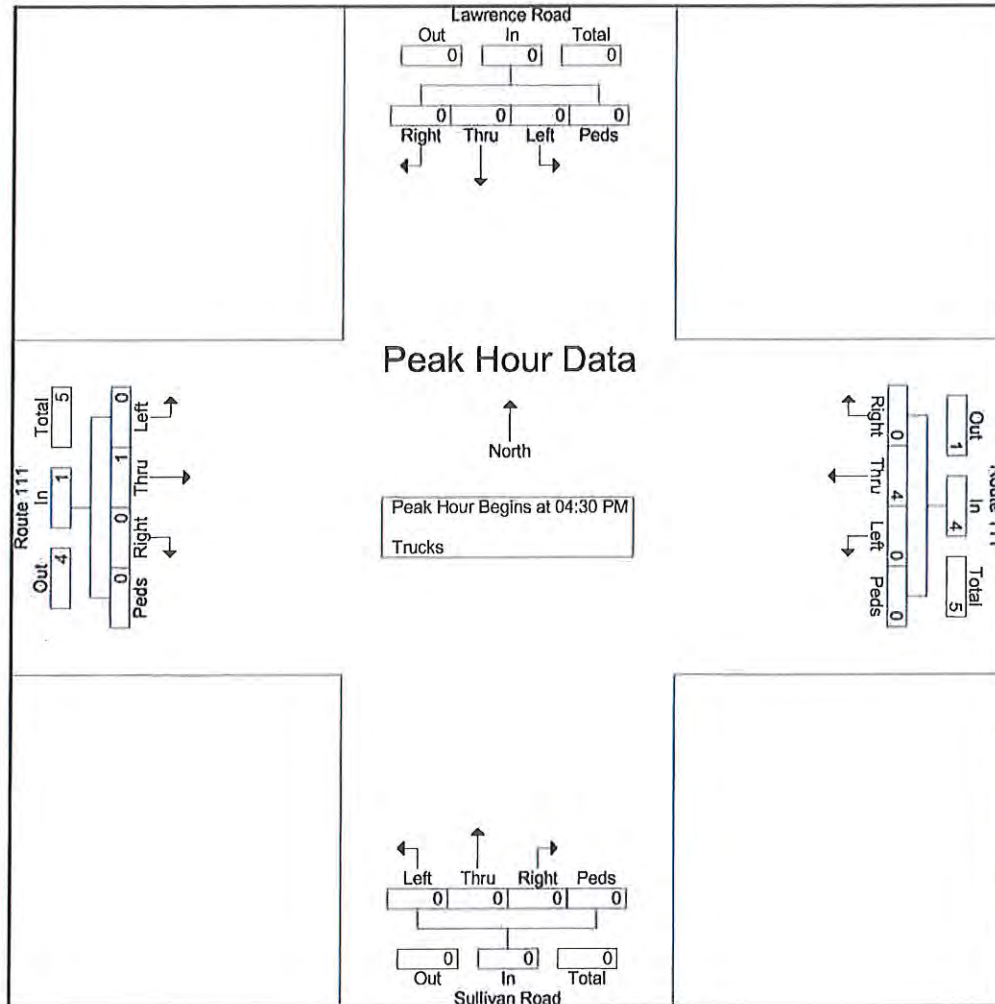


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Route 111 at Sullivan Rd / Lawrence Rd  
 Hudson, NH  
 Weather : Drizzle

File Name : 951701pm  
 Site Code : 00951701  
 Start Date : 10/13/2022  
 Page No : 2

Start Time	Lawrence Road From North					Route 111 From East					Sullivan Road From South					Route 111 From West					Int. Total	
	Right	Thru	Left	Peds	App Total	Right	Thru	Left	Peds	App Total	Right	Thru	Left	Peds	App Total	Right	Thru	Left	Peds	App Total		
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																						
Peak Hour for Entire Intersection Begins at 04:30 PM																						
04:30 PM	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
04:45 PM	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
05:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1
05:15 PM	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	0	0	0	0	0	0	2
Total Volume	0	0	0	0	0	0	4	0	0	4	0	0	0	0	0	0	1	0	0	0	1	5
% App. Total	0	0	0	0	0	0	100	0	0	100	0	0	0	0	0	0	100	0	0	0	100	100
PHF	.000	.000	.000	.000	.000	.000	.500	.000	.000	.500	.000	.000	.000	.000	.000	.000	.250	.000	.000	.250	.625	



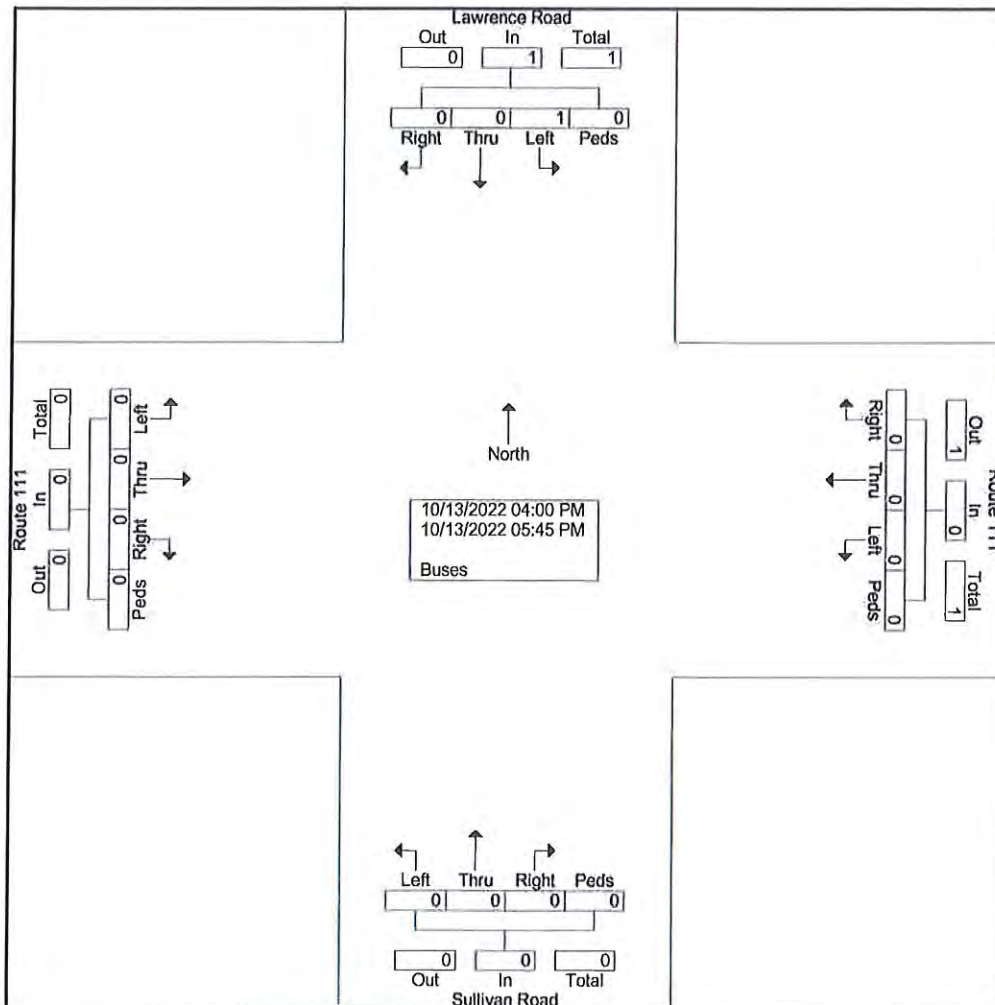
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Route 111 at Sullivan Rd / Lawrence Rd  
 Hudson, NH  
 Weather : Drizzle

File Name : 951701pm  
 Site Code : 00951701  
 Start Date : 10/13/2022  
 Page No : 1

### Groups Printed- Buses

Start Time	Lawrence Road From North					Route 111 From East					Sullivan Road From South					Route 111 From West					Int. Total	
	Right	Thru	Left	Peds	App Total	Right	Thru	Left	Peds	App Total	Right	Thru	Left	Peds	App Total	Right	Thru	Left	Peds	App Total		
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Total</b>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:15 PM	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
05:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Total</b>	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
<b>Grand Total</b>	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Apprch %	0	0	100	0		0	0	0	0		0	0	0	0		0	0	0	0		0	
Total %	0	0	100	0	100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0



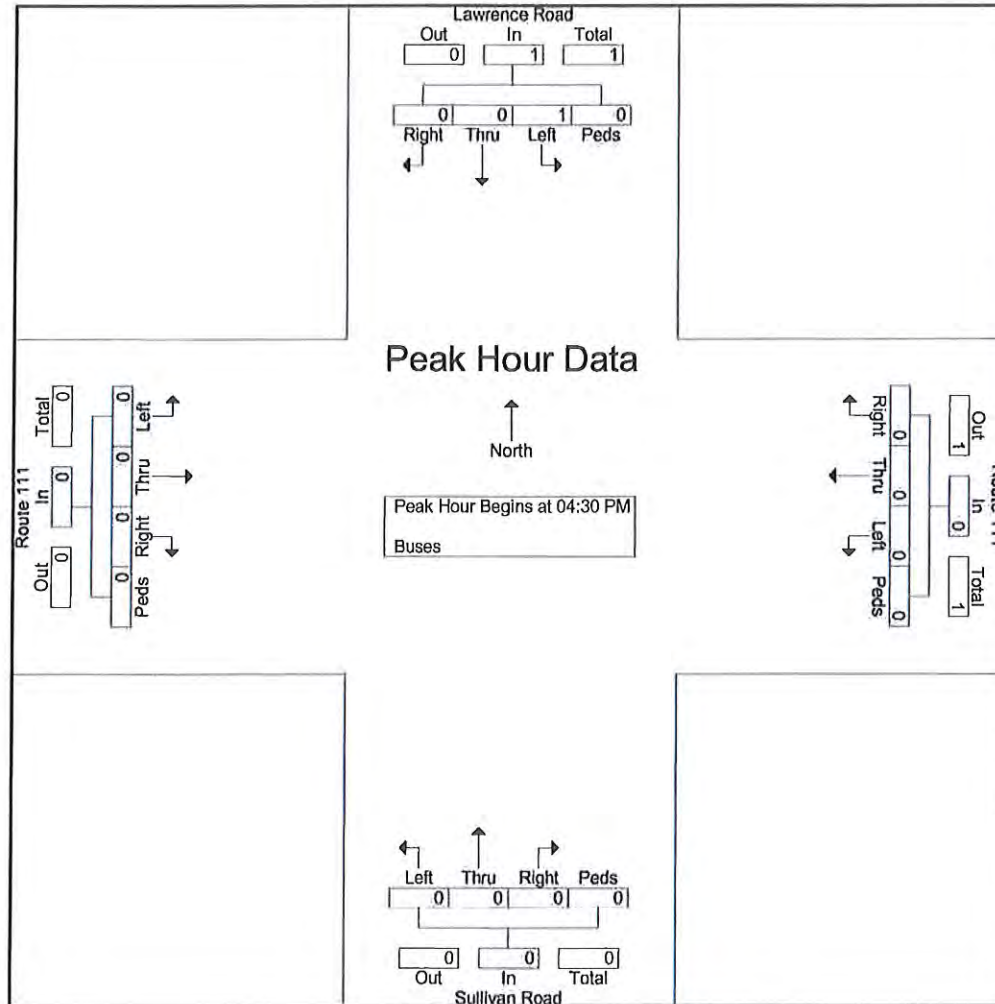


# Vanasse & Associates

Route 111 at Sullivan Rd / Lawrence Rd  
 Hudson, NH  
 Weather : Drizzle

File Name : 951701pm  
 Site Code : 00951701  
 Start Date : 10/13/2022  
 Page No : 2

Start Time	Lawrence Road From North					Route 111 From East					Sullivan Road From South					Route 111 From West					Int. Total	
	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total		
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																						
Peak Hour for Entire Intersection Begins at 04:30 PM																						
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:15 PM	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% App. Total	0	0	100	0		0	0	0	0		0	0	0	0		0	0	0	0		0	
PHF	.000	.000	.250	.000	.250	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.250





# Vanasse & Associates

Route 111 at Sullivan Rd / Lawrence Rd  
 Hudson, NH  
 Weather : Clear

File Name : 951701sa  
 Site Code : 00951701  
 Start Date : 10/15/2022  
 Page No : 1

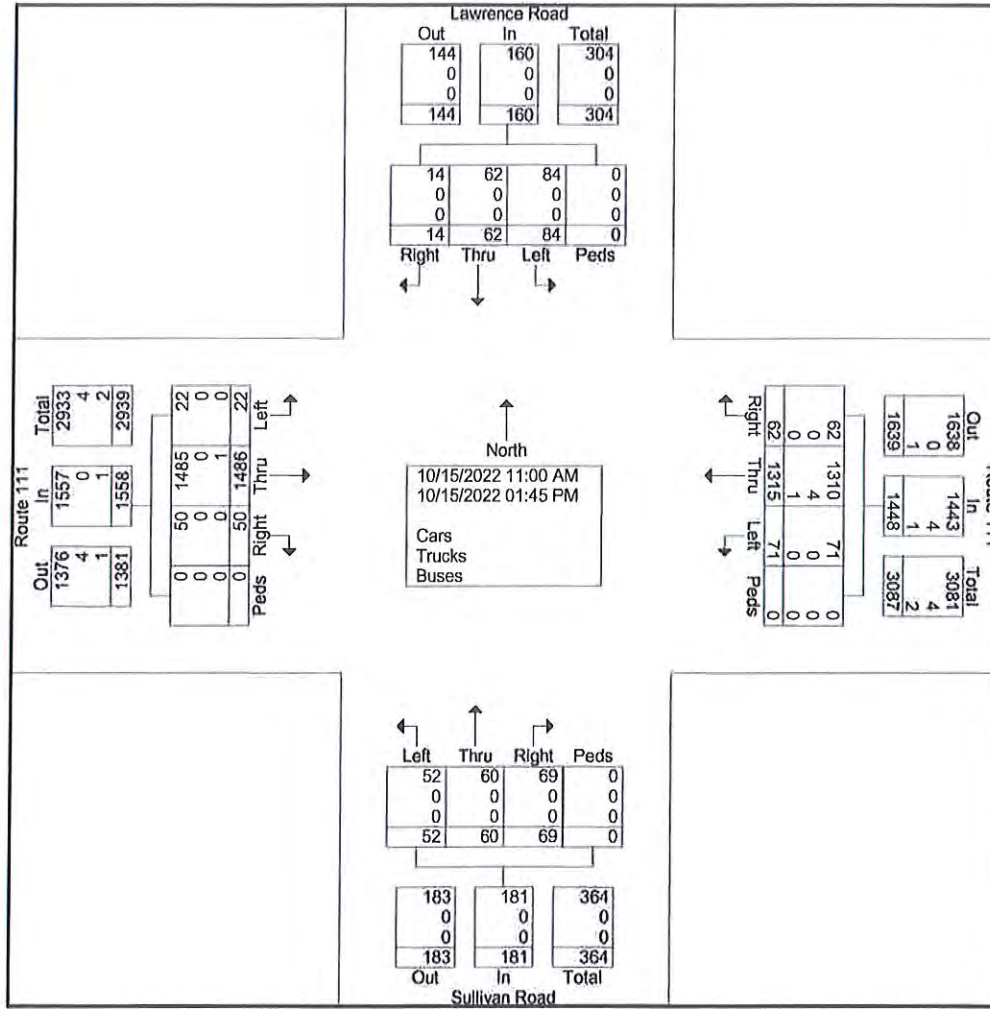
**Groups Printed- Cars - Trucks - Buses**

Start Time	Lawrence Road From North					Route 111 From East					Sullivan Road From South					Route 111 From West					Int. Total
	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	
11:00 AM	2	9	7	0	18	4	112	8	0	124	4	4	2	0	10	1	120	2	0	123	275
11:15 AM	1	4	13	0	18	6	113	1	0	120	7	4	2	0	13	6	118	4	0	128	279
11:30 AM	0	7	8	0	15	3	116	3	0	122	8	2	4	0	14	5	138	2	0	145	296
11:45 AM	1	2	8	0	11	5	105	3	0	113	6	6	6	0	18	3	130	1	0	134	276
<b>Total</b>	<b>4</b>	<b>22</b>	<b>36</b>	<b>0</b>	<b>62</b>	<b>18</b>	<b>446</b>	<b>15</b>	<b>0</b>	<b>479</b>	<b>25</b>	<b>16</b>	<b>14</b>	<b>0</b>	<b>55</b>	<b>15</b>	<b>506</b>	<b>9</b>	<b>0</b>	<b>530</b>	<b>1126</b>
12:00 PM	2	3	6	0	11	4	113	5	0	122	2	7	3	0	12	5	109	1	0	115	260
12:15 PM	1	4	5	0	10	6	115	10	0	131	2	3	4	0	9	4	105	1	0	110	260
12:30 PM	2	9	6	0	17	7	116	6	0	129	6	6	6	0	18	2	107	0	0	109	273
12:45 PM	2	8	9	0	19	8	100	4	0	112	1	7	7	0	15	2	129	2	0	133	279
<b>Total</b>	<b>7</b>	<b>24</b>	<b>26</b>	<b>0</b>	<b>57</b>	<b>25</b>	<b>444</b>	<b>25</b>	<b>0</b>	<b>494</b>	<b>11</b>	<b>23</b>	<b>20</b>	<b>0</b>	<b>54</b>	<b>13</b>	<b>450</b>	<b>4</b>	<b>0</b>	<b>467</b>	<b>1072</b>
01:00 PM	1	4	6	0	11	8	103	8	0	119	5	4	5	0	14	6	120	1	0	127	271
01:15 PM	1	3	7	0	11	2	113	5	0	120	9	6	0	0	15	2	156	4	0	162	308
01:30 PM	0	6	4	0	10	3	103	8	0	114	13	3	6	0	22	8	131	0	0	139	285
01:45 PM	1	3	5	0	9	6	106	10	0	122	6	8	7	0	21	6	123	4	0	133	285
<b>Total</b>	<b>3</b>	<b>16</b>	<b>22</b>	<b>0</b>	<b>41</b>	<b>19</b>	<b>425</b>	<b>31</b>	<b>0</b>	<b>475</b>	<b>33</b>	<b>21</b>	<b>18</b>	<b>0</b>	<b>72</b>	<b>22</b>	<b>530</b>	<b>9</b>	<b>0</b>	<b>561</b>	<b>1149</b>
<b>Grand Total</b>	<b>14</b>	<b>62</b>	<b>84</b>	<b>0</b>	<b>160</b>	<b>62</b>	<b>1315</b>	<b>71</b>	<b>0</b>	<b>1448</b>	<b>69</b>	<b>60</b>	<b>52</b>	<b>0</b>	<b>181</b>	<b>50</b>	<b>1486</b>	<b>22</b>	<b>0</b>	<b>1558</b>	<b>3347</b>
<b>Apprch %</b>	<b>8.8</b>	<b>38.8</b>	<b>52.5</b>	<b>0</b>		<b>4.3</b>	<b>90.8</b>	<b>4.9</b>	<b>0</b>		<b>38.1</b>	<b>33.1</b>	<b>28.7</b>	<b>0</b>		<b>3.2</b>	<b>95.4</b>	<b>1.4</b>	<b>0</b>		
<b>Total %</b>	<b>0.4</b>	<b>1.9</b>	<b>2.5</b>	<b>0</b>	<b>4.8</b>	<b>1.9</b>	<b>39.3</b>	<b>2.1</b>	<b>0</b>	<b>43.3</b>	<b>2.1</b>	<b>1.8</b>	<b>1.6</b>	<b>0</b>	<b>5.4</b>	<b>1.5</b>	<b>44.4</b>	<b>0.7</b>	<b>0</b>	<b>46.5</b>	
<b>Cars</b>	<b>14</b>	<b>62</b>	<b>84</b>	<b>0</b>	<b>160</b>	<b>62</b>	<b>1310</b>	<b>71</b>	<b>0</b>	<b>1448</b>	<b>69</b>	<b>60</b>	<b>52</b>	<b>0</b>	<b>181</b>	<b>50</b>	<b>1485</b>	<b>22</b>	<b>0</b>	<b>1558</b>	<b>3347</b>
<b>% Cars</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>0</b>	<b>100</b>	<b>100</b>	<b>99.6</b>	<b>100</b>	<b>0</b>	<b>99.7</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>0</b>	<b>100</b>	<b>100</b>	<b>99.9</b>	<b>100</b>	<b>0</b>	<b>99.9</b>	<b>99.8</b>
<b>Trucks</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>4</b>	<b>0</b>	<b>0</b>	<b>4</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>4</b>
<b>% Trucks</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0.3</b>	<b>0</b>	<b>0</b>	<b>0.3</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0.1</b>
<b>Buses</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>2</b>
<b>% Buses</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0.1</b>	<b>0</b>	<b>0</b>	<b>0.1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0.1</b>	<b>0</b>	<b>0</b>	<b>0.1</b>	<b>0.1</b>

# Vanasse & Associates

Route 111 at Sullivan Rd / Lawrence Rd  
 Hudson, NH  
 Weather : Clear

File Name : 951701sa  
 Site Code : 00951701  
 Start Date : 10/15/2022  
 Page No : 2

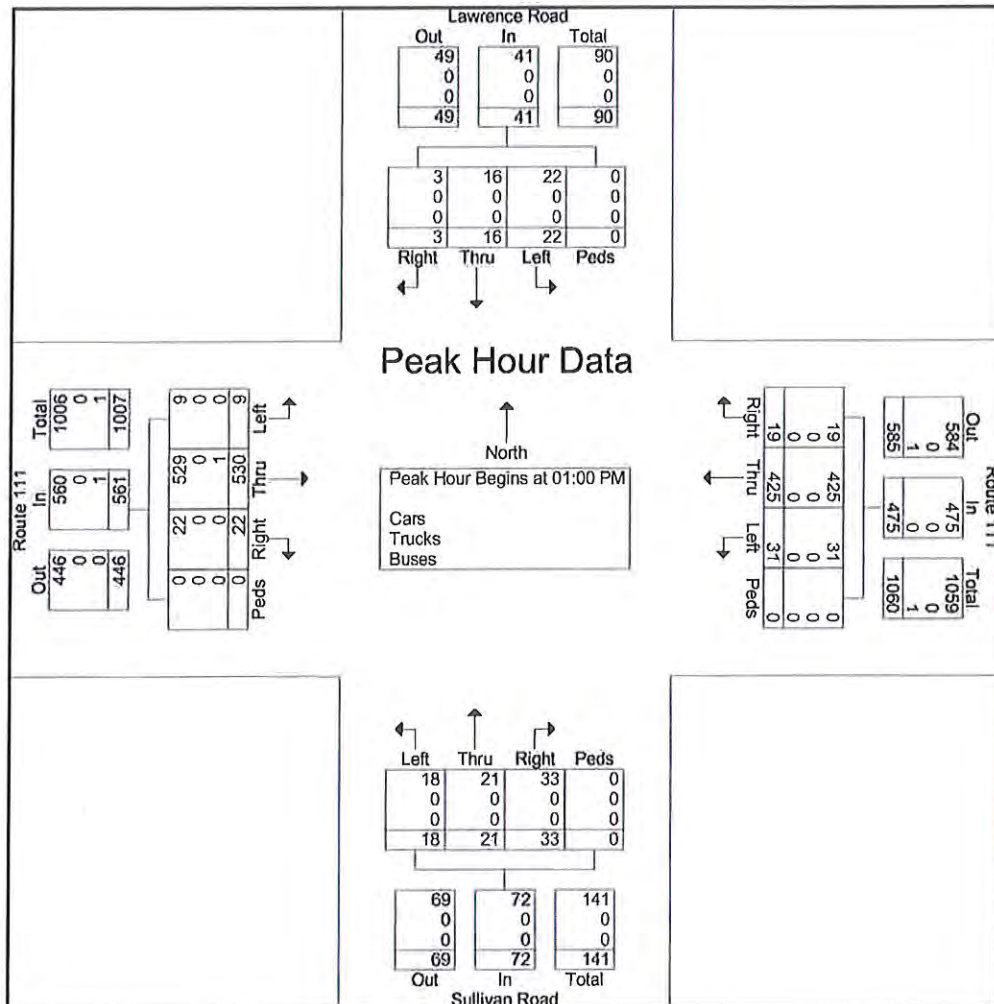


# Vanasse & Associates

Route 111 at Sullivan Rd / Lawrence Rd  
 Hudson, NH  
 Weather : Clear

File Name : 951701sa  
 Site Code : 00951701  
 Start Date : 10/15/2022  
 Page No : 3

Start Time	Lawrence Road From North					Route 111 From East					Sullivan Road From South					Route 111 From West					Int. Total
	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	
Peak Hour Analysis From 11:00 AM to 01:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 01:00 PM																					
01:00 PM	1	4	6	0	11	8	103	8	0	119	5	4	5	0	14	6	120	1	0	127	271
01:15 PM	1	3	7	0	11	2	113	5	0	120	9	6	0	0	15	2	156	4	0	162	308
01:30 PM	0	6	4	0	10	3	103	8	0	114	13	3	6	0	22	8	131	0	0	139	285
01:45 PM	1	3	5	0	9	6	106	10	0	122	6	8	7	0	21	6	123	4	0	133	285
Total Volume	3	16	22	0	41	19	425	31	0	475	33	21	18	0	72	22	530	9	0	561	1149
% App. Total	7.3	39	53.7	0		4	89.5	6.5	0		45.8	29.2	25	0		3.9	94.5	1.6	0		
PHF	.750	.667	.786	.000	.932	.594	.940	.775	.000	.973	.635	.656	.643	.000	.818	.688	.849	.563	.000	.866	.933
Cars	3	16	22	0	41	19	425	31	0	475	33	21	18	0	72	22	529	9	0	560	1148
% Cars	100	100	100	0	100	100	100	100	0	100	100	100	100	0	100	100	99.8	100	0	99.8	99.9
Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Buses	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1
% Buses	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	0	0.2	0.1





# Vanasse & Associates

Route 111 at Sullivan Rd / Lawrence Rd  
 Hudson, NH  
 Weather : Clear

File Name : 951701sa  
 Site Code : 00951701  
 Start Date : 10/15/2022  
 Page No : 1

**Groups Printed- Cars**

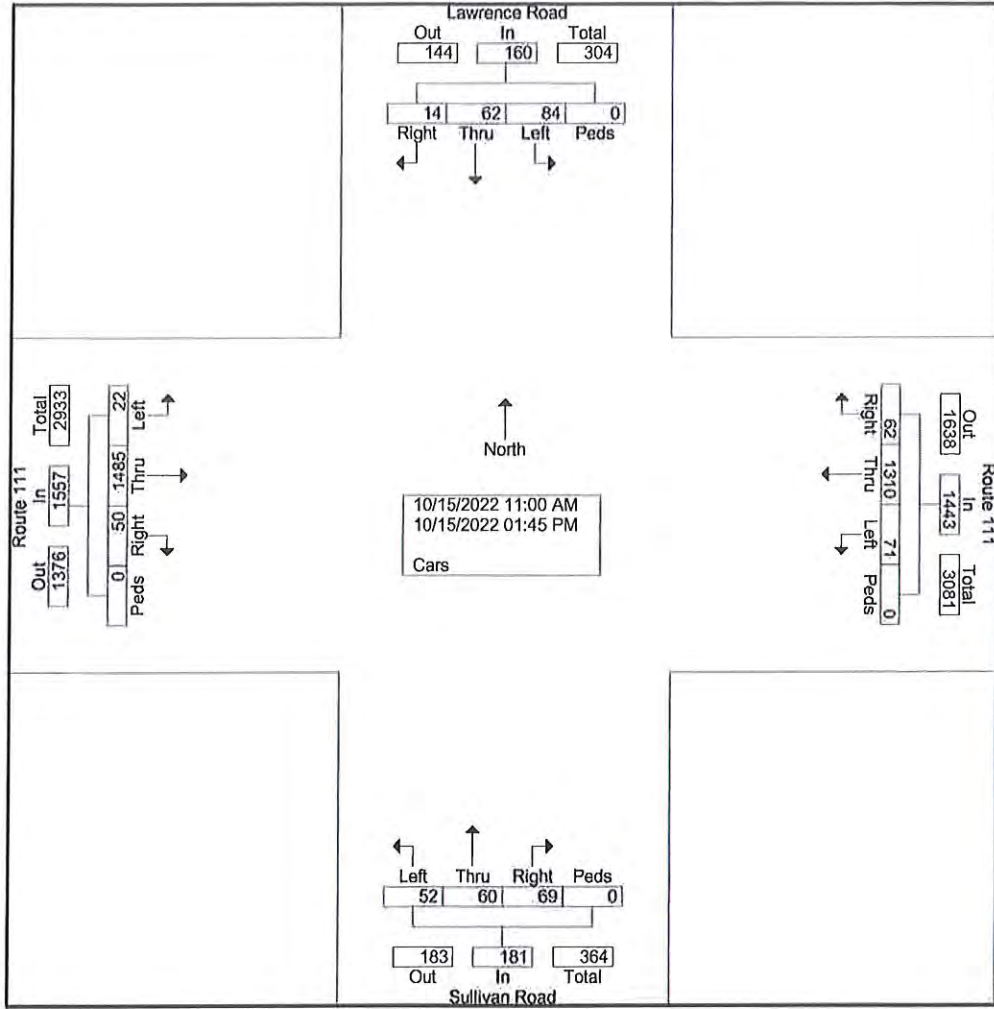
Start Time	Lawrence Road From North					Route 111 From East					Sullivan Road From South					Route 111 From West					Int. Total
	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	
11:00 AM	2	9	7	0	18	4	110	8	0	122	4	4	2	0	10	1	120	2	0	123	273
11:15 AM	1	4	13	0	18	6	113	1	0	120	7	4	2	0	13	6	118	4	0	128	279
11:30 AM	0	7	8	0	15	3	115	3	0	121	8	2	4	0	14	5	138	2	0	145	295
11:45 AM	1	2	8	0	11	5	105	3	0	113	6	6	6	0	18	3	130	1	0	134	276
<b>Total</b>	<b>4</b>	<b>22</b>	<b>36</b>	<b>0</b>	<b>62</b>	<b>18</b>	<b>443</b>	<b>15</b>	<b>0</b>	<b>476</b>	<b>25</b>	<b>16</b>	<b>14</b>	<b>0</b>	<b>55</b>	<b>15</b>	<b>506</b>	<b>9</b>	<b>0</b>	<b>530</b>	<b>1123</b>
12:00 PM	2	3	6	0	11	4	113	5	0	122	2	7	3	0	12	5	109	1	0	115	260
12:15 PM	1	4	5	0	10	6	113	10	0	129	2	3	4	0	9	4	105	1	0	110	258
12:30 PM	2	9	6	0	17	7	116	6	0	129	6	6	6	0	18	2	107	0	0	109	273
12:45 PM	2	8	9	0	19	8	100	4	0	112	1	7	7	0	15	2	129	2	0	133	279
<b>Total</b>	<b>7</b>	<b>24</b>	<b>26</b>	<b>0</b>	<b>57</b>	<b>25</b>	<b>442</b>	<b>25</b>	<b>0</b>	<b>492</b>	<b>11</b>	<b>23</b>	<b>20</b>	<b>0</b>	<b>54</b>	<b>13</b>	<b>450</b>	<b>4</b>	<b>0</b>	<b>467</b>	<b>1070</b>
01:00 PM	1	4	6	0	11	8	103	8	0	119	5	4	5	0	14	6	120	1	0	127	271
01:15 PM	1	3	7	0	11	2	113	5	0	120	9	6	0	0	15	2	156	4	0	162	308
01:30 PM	0	6	4	0	10	3	103	8	0	114	13	3	6	0	22	8	130	0	0	138	284
01:45 PM	1	3	5	0	9	6	106	10	0	122	6	8	7	0	21	6	123	4	0	133	285
<b>Total</b>	<b>3</b>	<b>16</b>	<b>22</b>	<b>0</b>	<b>41</b>	<b>19</b>	<b>425</b>	<b>31</b>	<b>0</b>	<b>475</b>	<b>33</b>	<b>21</b>	<b>18</b>	<b>0</b>	<b>72</b>	<b>22</b>	<b>529</b>	<b>9</b>	<b>0</b>	<b>560</b>	<b>1148</b>
<b>Grand Total</b>	<b>14</b>	<b>62</b>	<b>84</b>	<b>0</b>	<b>160</b>	<b>62</b>	<b>1310</b>	<b>71</b>	<b>0</b>	<b>1443</b>	<b>69</b>	<b>60</b>	<b>52</b>	<b>0</b>	<b>181</b>	<b>50</b>	<b>1485</b>	<b>22</b>	<b>0</b>	<b>1557</b>	<b>3341</b>
<b>Apprch %</b>	<b>8.8</b>	<b>38.8</b>	<b>52.5</b>	<b>0</b>		<b>4.3</b>	<b>90.8</b>	<b>4.9</b>	<b>0</b>		<b>38.1</b>	<b>33.1</b>	<b>28.7</b>	<b>0</b>		<b>3.2</b>	<b>95.4</b>	<b>1.4</b>	<b>0</b>		
<b>Total %</b>	<b>0.4</b>	<b>1.9</b>	<b>2.5</b>	<b>0</b>	<b>4.8</b>	<b>1.9</b>	<b>39.2</b>	<b>2.1</b>	<b>0</b>	<b>43.2</b>	<b>2.1</b>	<b>1.8</b>	<b>1.6</b>	<b>0</b>	<b>5.4</b>	<b>1.5</b>	<b>44.4</b>	<b>0.7</b>	<b>0</b>	<b>46.6</b>	



# Vanasse & Associates

Route 111 at Sullivan Rd / Lawrence Rd  
Hudson, NH  
Weather : Clear

File Name : 951701sa  
Site Code : 00951701  
Start Date : 10/15/2022  
Page No : 2

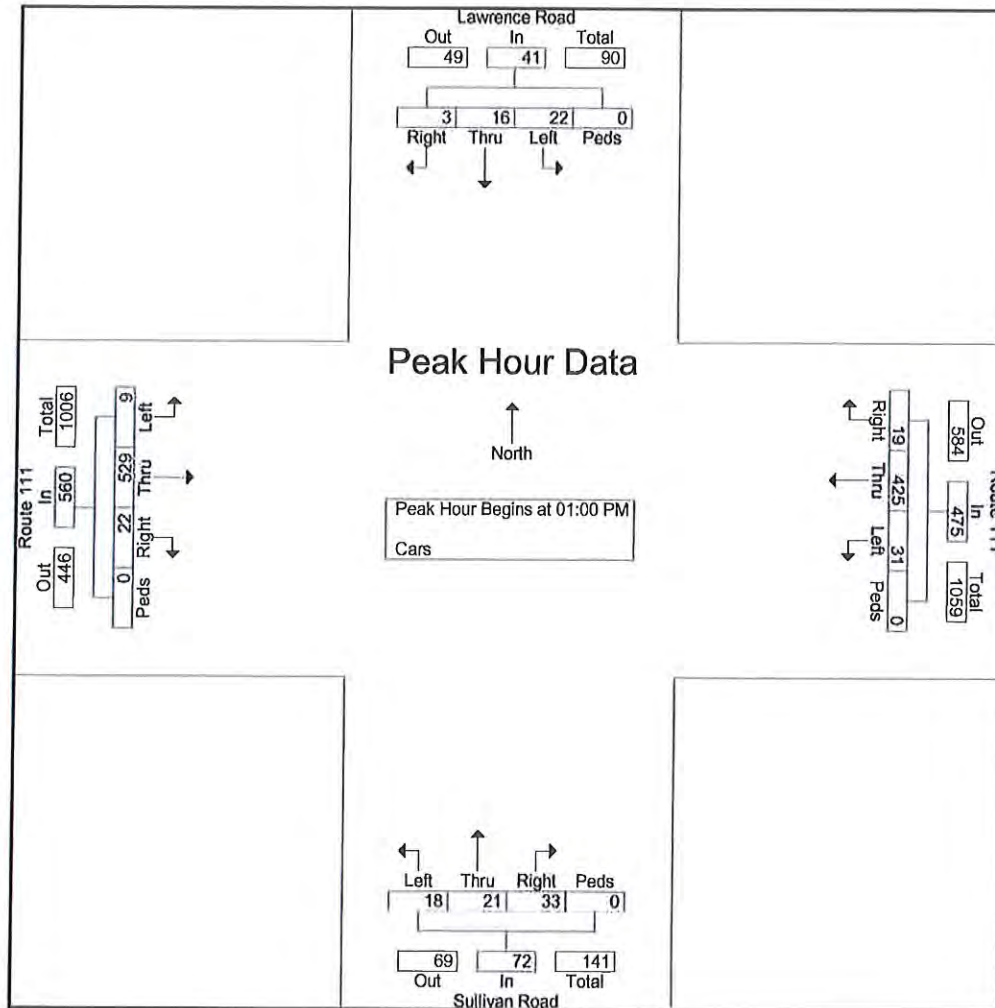


# Vanasse & Associates

Route 111 at Sullivan Rd / Lawrence Rd  
 Hudson, NH  
 Weather : Clear

File Name : 951701sa  
 Site Code : 00951701  
 Start Date : 10/15/2022  
 Page No : 3

Start Time	Lawrence Road From North					Route 111 From East					Sullivan Road From South					Route 111 From West					Int. Total
	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	
Peak Hour Analysis From 11:00 AM to 01:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 01:00 PM																					
01:00 PM	1	4	6	0	11	8	103	8	0	119	5	4	5	0	14	6	120	1	0	127	271
01:15 PM	1	3	7	0	11	2	113	5	0	120	9	6	0	0	15	2	156	4	0	162	308
01:30 PM	0	6	4	0	10	3	103	8	0	114	13	3	6	0	22	8	130	0	0	138	284
01:45 PM	1	3	5	0	9	6	106	10	0	122	6	8	7	0	21	6	123	4	0	133	285
Total Volume	3	16	22	0	41	19	425	31	0	475	33	21	18	0	72	22	529	9	0	560	1148
% App. Total	7.3	39	53.7	0		4	89.5	6.5	0		45.8	29.2	25	0		3.9	94.5	1.6	0		
PHF	.750	.667	.786	.000	.932	.594	.940	.775	.000	.973	.635	.656	.643	.000	.818	.688	.848	.563	.000	.864	.932



# Vanasse & Associates

Route 111 at Sullivan Rd / Lawrence Rd  
 Hudson, NH  
 Weather : Clear

File Name : 951701sa  
 Site Code : 00951701  
 Start Date : 10/15/2022  
 Page No : 1

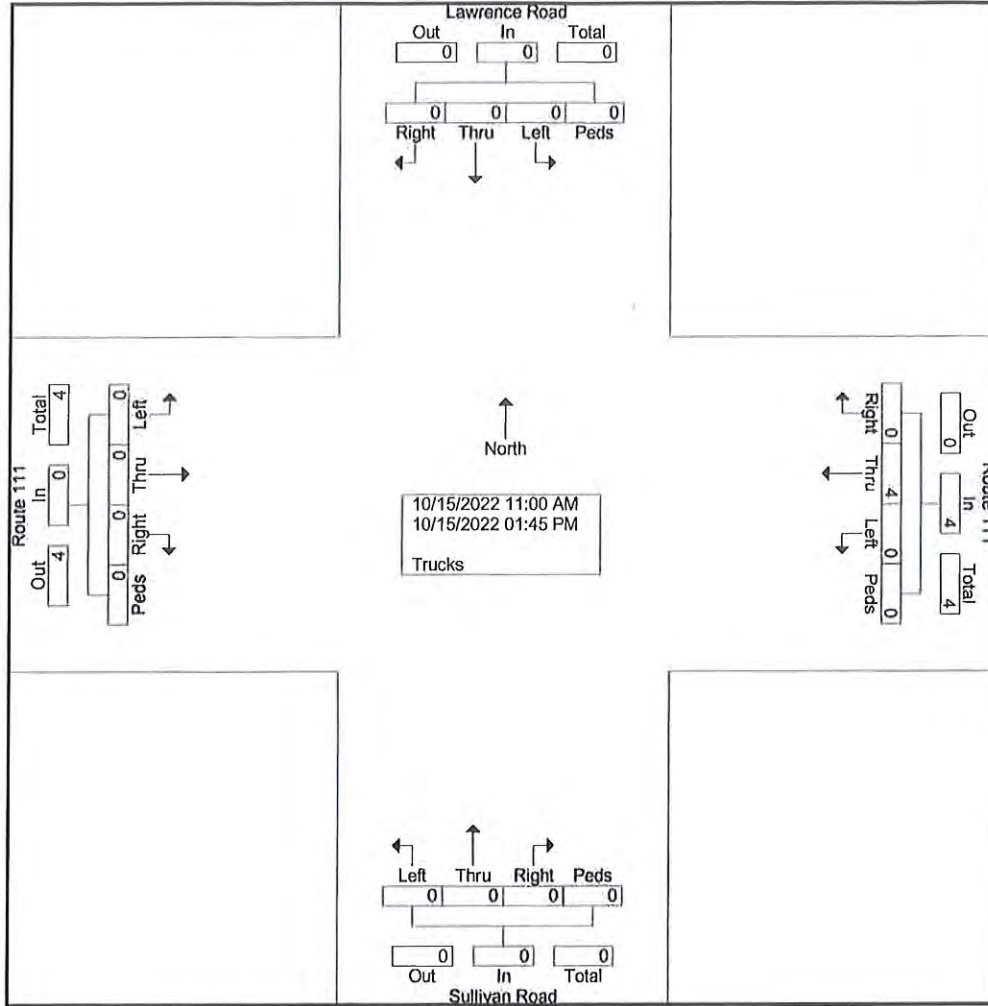
**Groups Printed- Trucks**

Start Time	Lawrence Road From North					Route 111 From East					Sullivan Road From South					Route 111 From West					Inl. Total
	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	
11:00 AM	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1
11:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:30 AM	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1
11:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Total</b>	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	0	0	0	0	0	2
12:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:15 PM	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	0	0	0	0	0	2
12:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Total</b>	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	0	0	0	0	0	2
01:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Total</b>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Grand Total</b>	0	0	0	0	0	0	4	0	0	4	0	0	0	0	0	0	0	0	0	0	4
<b>Apprch %</b>	0	0	0	0	0	0	100	0	0	100	0	0	0	0	0	0	0	0	0	0	
<b>Total %</b>	0	0	0	0	0	0	100	0	0	100	0	0	0	0	0	0	0	0	0	0	

# Vanasse & Associates

Route 111 at Sullivan Rd / Lawrence Rd  
Hudson, NH  
Weather : Clear

File Name : 951701sa  
Site Code : 00951701  
Start Date : 10/15/2022  
Page No : 2



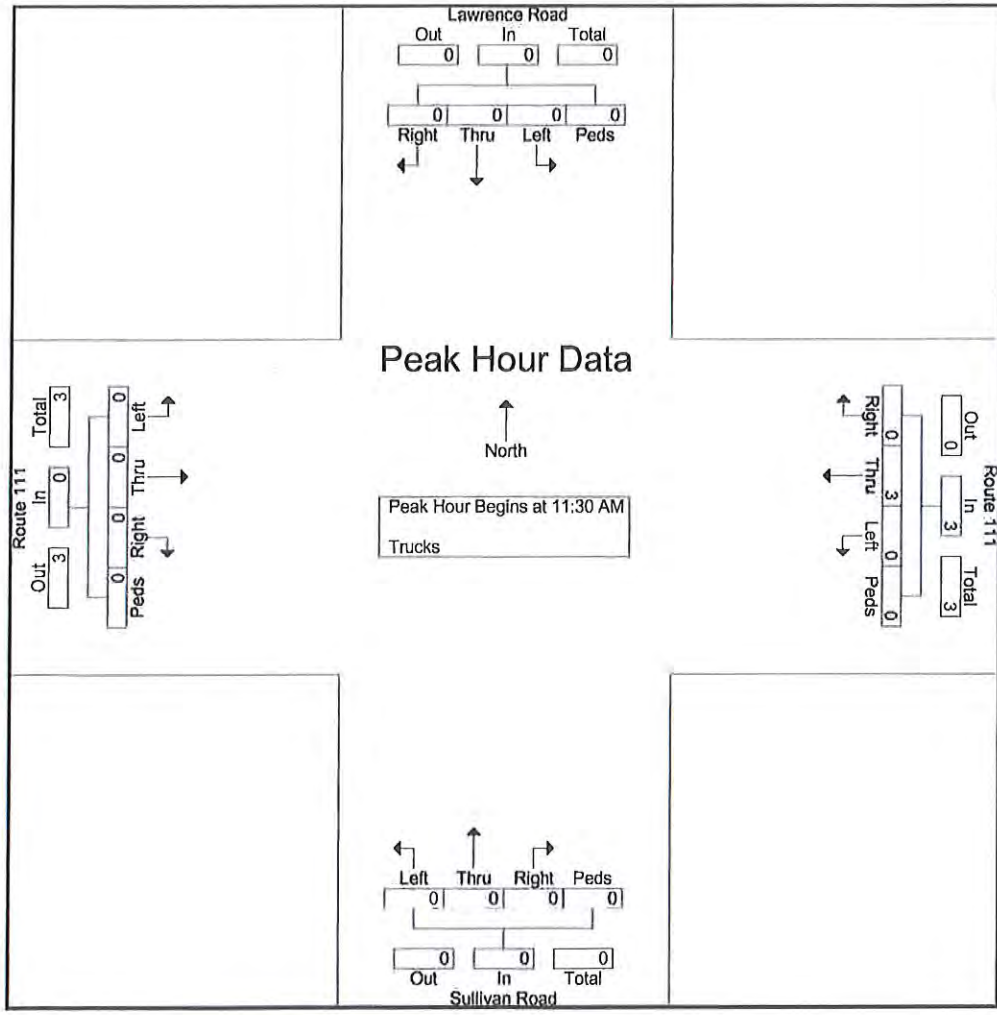


# Vanasse & Associates

Route 111 at Sullivan Rd / Lawrence Rd  
 Hudson, NH  
 Weather : Clear

File Name : 951701sa  
 Site Code : 00951701  
 Start Date : 10/15/2022  
 Page No : 3

Start Time	Lawrence Road From North					Route 111 From East					Sullivan Road From South					Route 111 From West					Int. Total	
	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total		
Peak Hour Analysis From 11:00 AM to 01:45 PM - Peak 1 of 1																						
Peak Hour for Entire Intersection Begins at 11:30 AM																						
11:30 AM	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
11:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:15 PM	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	0	0	0	0	0	0	2
Total Volume	0	0	0	0	0	0	3	0	0	3	0	0	0	0	0	0	0	0	0	0	0	3
% App. Total	0	0	0	0	0	0	100	0	0	3	0	0	0	0	0	0	0	0	0	0	0	3
PHF	.000	.000	.000	.000	.000	.000	.375	.000	.000	.375	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.375



# Vanasse & Associates

Route 111 at Sullivan Rd / Lawrence Rd  
 Hudson, NH  
 Weather : Clear

File Name : 951701sa  
 Site Code : 00951701  
 Start Date : 10/15/2022  
 Page No : 1

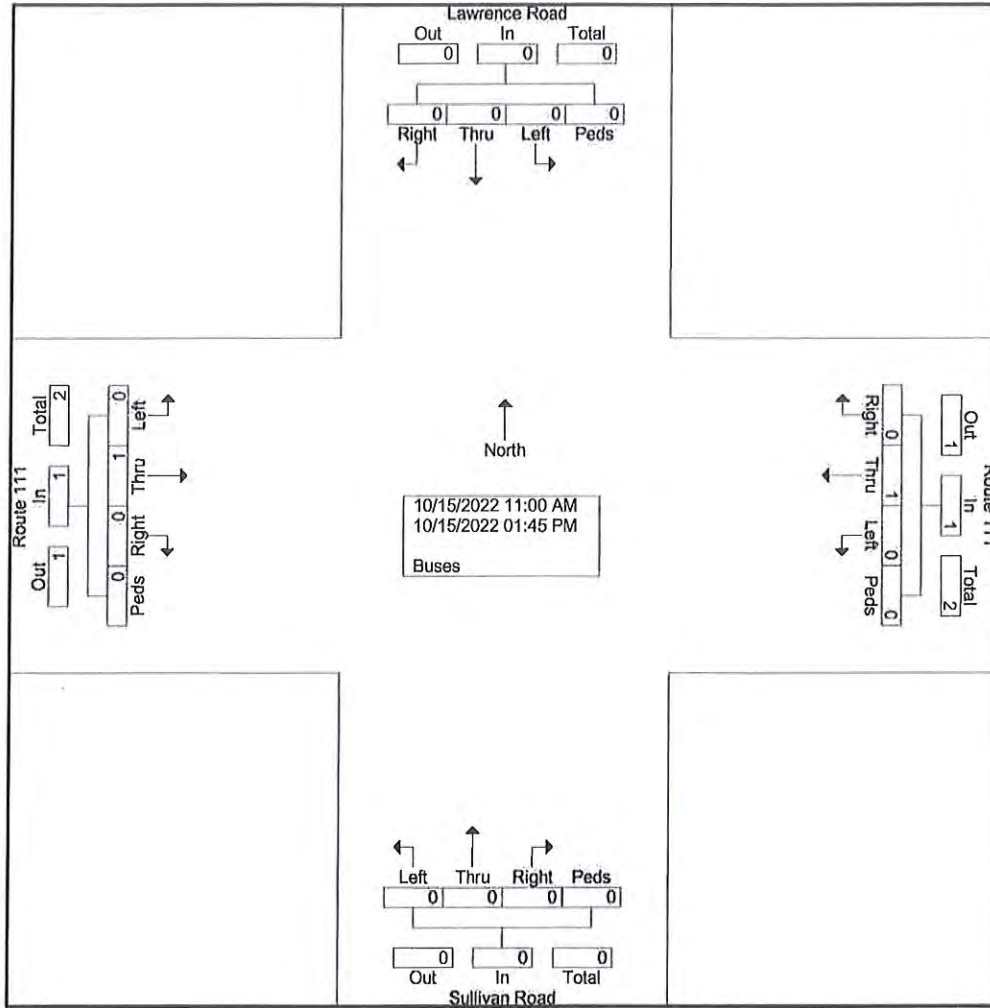
Groups Printed- Buses

Start Time	Lawrence Road From North					Route 111 From East					Sullivan Road From South					Route 111 From West					Int. Total
	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	
11:00 AM	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1
11:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Total</b>	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1
12:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Total</b>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
01:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Total</b>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1
<b>Grand Total</b>	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	1	0	0	1	2
<b>Apprch %</b>	0	0	0	0	0	0	100	0	0	50	0	0	0	0	0	0	100	0	0	50	
<b>Total %</b>	0	0	0	0	0	0	50	0	0	50	0	0	0	0	0	0	50	0	0	50	

# Vanasse & Associates

Route 111 at Sullivan Rd / Lawrence Rd  
Hudson, NH  
Weather : Clear

File Name : 951701sa  
Site Code : 00951701  
Start Date : 10/15/2022  
Page No : 2

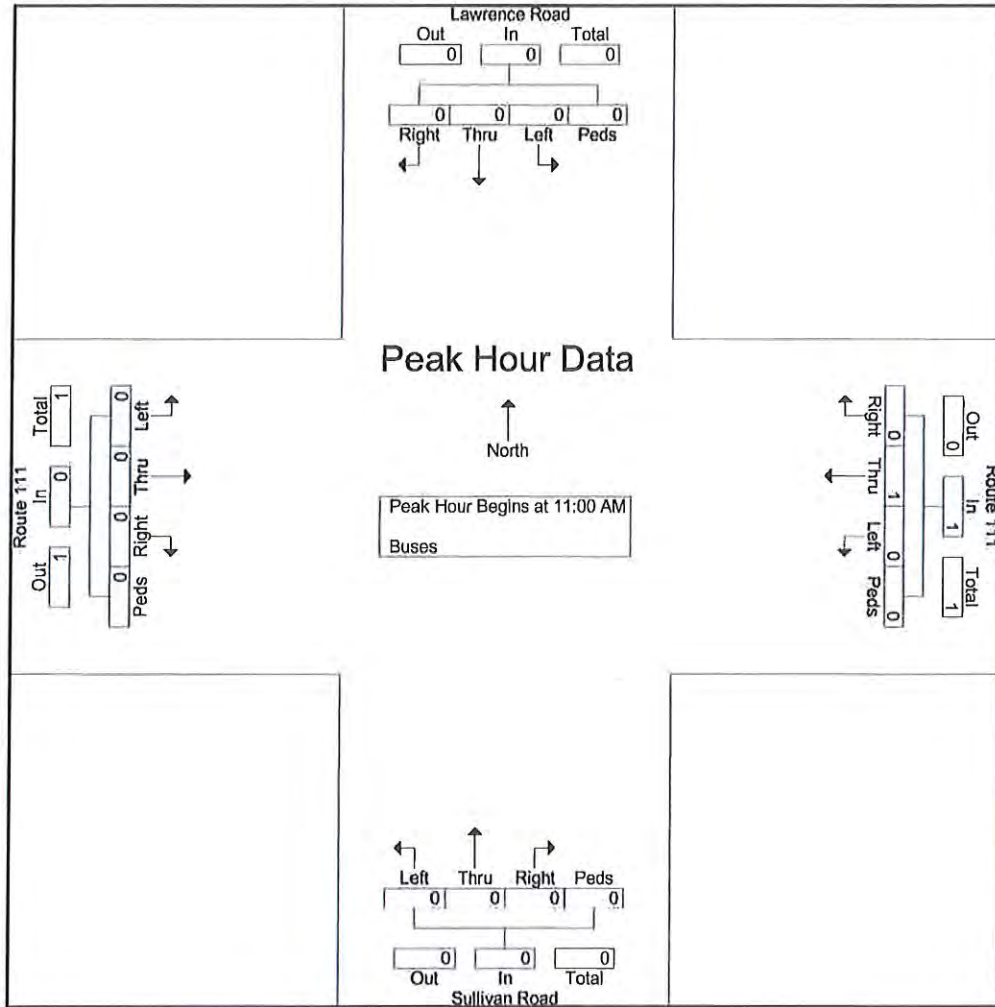


# Vanasse & Associates

Route 111 at Sullivan Rd / Lawrence Rd  
 Hudson, NH  
 Weather : Clear

File Name : 951701sa  
 Site Code : 00951701  
 Start Date : 10/15/2022  
 Page No : 3

Start Time	Lawrence Road From North					Route 111 From East					Sullivan Road From South					Route 111 From West					Int. Total	
	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total		
Peak Hour Analysis From 11:00 AM to 01:45 PM - Peak 1 of 1																						
Peak Hour for Entire Intersection Begins at 11:00 AM																						
11:00 AM	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
11:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
% App. Total	0	0	0	0	0	0	100	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
PHF	.000	.000	.000	.000	.000	.000	.250	.000	.000	.250	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.250





COVID-19 ADJUSTMENT DATA

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## New Hampshire DOT 02297001: Monthly Hourly Volume for October 2021

Location ID:	02297001	Seasonal Factor Group:	04	QC Status
County:	HILLSBOROUGH	Daily Factor Group:		
Functional Class	4	Axle Factor Group:	E	
Location:	Daniel Webster Hwy	Growth Factor Group:		
				TOTAL
0:00				
1	70	45	34	208
2	45	34	46	395
3	44	34	29	269
4	53	44	29	169
5	39	28	36	484
6	60	43	37	265
7	47	24	34	224
8	69	32	37	209
9	82	32	24	282
10	40	36	38	519
11	45	47	37	396
12	46	48	33	425
13	57	37	30	318
14	34	29	28	200
15	51	27	40	302
16	67	25	30	198
17	58	43	43	285
18	69	37	30	155
19	38	27	27	173
20	69	36	38	200
21	46	32	40	335
22	49	32	34	322
23	58	51	41	212
24	70	45	34	419
25	45	34	29	320
26	53	44	29	535
27	39	28	36	370
28	60	43	37	278
29	47	24	34	154
30	69	32	37	166
31	82	32	24	319
32	40	36	38	480
33	45	47	37	294
34	46	48	33	163
35	57	37	30	334
36	34	29	28	483
37	51	27	40	505
38	67	25	30	303
39	58	43	43	461
40	69	37	30	753
41	38	27	27	1053
42	69	36	38	1471
43	46	32	40	1442
44	49	32	34	1424.5
45	58	51	41	1498.7
46	70	45	34	1452.8
47	45	34	29	1438.7
48	53	44	29	1477
49	39	28	36	1177
50	60	43	37	1081.8
51	47	24	34	1060
52	69	32	37	930
53	82	32	24	924
54	40	36	38	1066
55	45	47	37	1082
56	46	48	33	1219
57	57	37	30	1403
58	34	29	28	1574
59	51	27	40	1487
60	67	25	30	1417
61	58	43	43	1405
62	69	37	30	1472
63	38	27	27	1639
64	69	36	38	1360
65	46	32	40	1375
66	49	32	34	1404
67	58	51	41	1479
68	70	45	34	1442
69	45	34	29	1424.5
70	53	44	29	1498.7
71	39	28	36	1177
72	60	43	37	1081.8
73	47	24	34	1060
74	69	32	37	930
75	82	32	24	924
76	40	36	38	1066
77	45	47	37	1082
78	46	48	33	1219
79	57	37	30	1403
80	34	29	28	1574
81	51	27	40	1487
82	67	25	30	1417
83	58	43	43	1405
84	69	37	30	1472
85	38	27	27	1639
86	69	36	38	1360
87	46	32	40	1375
88	49	32	34	1404
89	58	51	41	1479
90	70	45	34	1442
91	45	34	29	1424.5
92	53	44	29	1498.7
93	39	28	36	1177
94	60	43	37	1081.8
95	47	24	34	1060
96	69	32	37	930
97	82	32	24	924
98	40	36	38	1066
99	45	47	37	1082
100	46	48	33	1219
101	57	37	30	1403
102	34	29	28	1574
103	51	27	40	1487
104	67	25	30	1417
105	58	43	43	1405
106	69	37	30	1472
107	38	27	27	1639
108	69	36	38	1360
109	46	32	40	1375
110	49	32	34	1404
111	58	51	41	1479
112	70	45	34	1442
113	45	34	29	1424.5
114	53	44	29	1498.7
115	39	28	36	1177
116	60	43	37	1081.8
117	47	24	34	1060
118	69	32	37	930
119	82	32	24	924
120	40	36	38	1066
121	45	47	37	1082
122	46	48	33	1219
123	57	37	30	1403
124	34	29	28	1574
125	51	27	40	1487
126	67	25	30	1417
127	58	43	43	1405
128	69	37	30	1472
129	38	27	27	1639
130	69	36	38	1360
131	46	32	40	1375
132	49	32	34	1404
133	58	51	41	1479
134	70	45	34	1442
135	45	34	29	1424.5
136	53	44	29	1498.7
137	39	28	36	1177
138	60	43	37	1081.8
139	47	24	34	1060
140	69	32	37	930
141	82	32	24	924
142	40	36	38	1066
143	45	47	37	1082
144	46	48	33	1219
145	57	37	30	1403
146	34	29	28	1574
147	51	27	40	1487
148	67	25	30	1417
149	58	43	43	1405
150	69	37	30	1472
151	38	27	27	1639
152	69	36	38	1360
153	46	32	40	1375
154	49	32	34	1404
155	58	51	41	1479
156	70	45	34	1442
157	45	34	29	1424.5
158	53	44	29	1498.7
159	39	28	36	1177
160	60	43	37	1081.8
161	47	24	34	1060
162	69	32	37	930
163	82	32	24	924
164	40	36	38	1066
165	45	47	37	1082
166	46	48	33	1219
167	57	37	30	1403
168	34	29	28	1574
169	51	27	40	1487
170	67	25	30	1417
171	58	43	43	1405
172	69	37	30	1472
173	38	27	27	1639
174	69	36	38	1360
175	46	32	40	1375
176	49	32	34	1404
177	58	51	41	1479
178	70	45	34	1442
179	45	34	29	1424.5
180	53	44	29	1498.7
181	39	28	36	1177
182	60	43	37	1081.8
183	47	24	34	1060
184	69	32	37	930
185	82	32	24	924
186	40	36	38	1066
187	45	47	37	1082
188	46	48	33	1219
189	57	37	30	1403
190	34	29	28	1574
191	51	27	40	1487
192	67	25	30	1417
193	58	43	43	1405
194	69	37	30	1472
195	38	27	27	1639
196	69	36	38	1360
197	46	32	40	1375
198	49	32	34	1404
199	58	51	41	1479
200	70	45	34	1442
201	45	34	29	1424.5
202	53	44	29	1498.7
203	39	28	36	1177
204	60	43	37	1081.8
205	47	24	34	1060
206	69	32	37	930
207	82	32	24	924
208	40	36	38	1066
209	45	47	37	1082
210	46	48	33	1219
211	57	37	30	1403
212	34	29	28	1574
213	51	27	40	1487
214	67	25	30	1417
215	58	43	43	1405
216	69	37	30	1472
217	38	27	27	1639
218	69	36	38	1360
219	46	32	40	1375
220	49	32	34	1404
221	58	51	41	1479
222	70	45	34	1442
223	45	34	29	1424.5
224	53	44	29	1498.7
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226	60	43	37	1081.8
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231	45	47	37	1082
232	46	48	33	1219
233	57	37	30	1403
234	34	29	28	1574
235	51	27	40	1487
236	67	25	30	1417
237	58	43	43	1405
238	69	37	30	1472
239	38	27	27	1639
240	69	36	38	1360
241	46	32	40	1375
242	49	32	34	1404
243	58	51	41	1479
244	70	45	34	1442
245	45	34	29	1424.5
246	53	44	29	1498.7
247	39	28	36	1177
248	60	43	37	1081.8
249	47	24	34	1060
250	69	32	37	930
251	82	32	24	924
252	40	36	38	1066
253	45	47	37	1082
254	46	48	33	1219
255	57	37	30	1403
256	34	29	28	1574
257	51	27	40	1487
258	67	25	30	1417
259	58	43	43	1405
260	69	37	30	1472
261	38	27	27	1639
262	69	36	38	1360
263	46	32	40	1375
264	49	32	34	1404
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267	45	34	29	1424.5
268	53	44	29	1498.7
269	39	28	36	1177
270	60	43	37	1081.8
271	47	24	34	1060
272	69	32	37	930
273	82	32	24	924
274	40	36	38	1066
275	45	47	37	1082
276	46	48	33	1219
277	57	37	30	1403
278	34	29	28	1574
279	51	27	40	1487
280	67	25		





	Daily	PM Peak	SAT Daily	SAT Peak
October 2019	17103	1515.717	14189.75	1139.167
Grown to October 2022	17621.24	1561.645	14619.71	1173.685
October 2021	16344.24	1438.667	14206.2	1158.933
October 2022	16507.68	1453.053	14348.26	1170.523
Change	1.067457	1.074734	1.018919	1.002701
<b>Use</b>	<b>1.07</b>	<b>1.07</b>	<b>1.02</b>	<b>1.00</b>

SEASONAL ADJUSTMENT DATA

---

## Year 2019 Monthly Data

Town: Merrimack  
 Station: 02297001  
 Location: US 3 (Daniel Webster Hwy) north of Hilton Dr  
 Group: 4

<u>Month</u>	<u>ADT</u>	<u>Adjustment to Average</u>	<u>Adjustment to Peak</u>
January	14,657	1.06	1.13
February	14,813	1.05	1.11
March	15,269	1.02	1.08
April	15,936	0.98	1.04
May	16,260	0.96	1.01
June	16,500	0.94	1.00
July	15,658	0.99	1.05
August	16,269	0.96	1.01
September	15,847	0.98	1.04
October	15,942	0.98	1.04
November	15,222	1.02	1.08
December	14,257	1.09	1.16

AAADT: 15,553  
 Peak Month: 16,500



GROWTH RATE DATA

---

## Massachusetts Highway Department Annual Growth Rate

Location ID:	82229035	Seasonal Factor Group:	4
County:		Daily Factor Group:	
Functional Class	Other Principal Arterial	Axle Factor Group:	4
Location:	Central Street east of Hamblett Avenue	Growth Factor Group:	E

Year	AADT
2017	16494
2011	15000

A = 2017/2011                      1.0996

B = A<sup>(1/6)</sup>                            1.0160

<b>Average Annual Growth Rate</b>	<b>1.60</b>
---------------------------------------	-------------

## Massachusetts Highway Department Annual Growth Rate

Location ID:	82229042	Seasonal Factor Group:	4
County:		Daily Factor Group:	
Functional Class	Other Principal Arterial	Axle Factor Group:	4
Location:	Burnham Road north of Central Street	Growth Factor Group:	E

Year	AADT
2019	11717
2013	12000

A = 2019/2013                      0.9764

B =  $A^{1/6}$                               0.9960

<b>Average Annual Growth Rate</b>	<b>-0.40</b>
---------------------------------------	--------------

## Massachusetts Highway Department Annual Growth Rate

Location ID:	82229059	Seasonal Factor Group:	4
County:		Daily Factor Group:	
Functional Class	Other Principal Arterial	Axle Factor Group:	4
Location:	Haverhill Road at Windham Town Line	Growth Factor Group:	E

Year	AADT
2018	15065
2009	14000

A = 2018/2009                      1.0761

B = A<sup>(1/9)</sup>                            1.0082

<b>Average Annual Growth Rate</b>	<b>0.82</b>
---------------------------------------	-------------



## Massachusetts Highway Department Annual Growth Rate

Location ID:	82229063	Seasonal Factor Group:	4
County:		Daily Factor Group:	
Functional Class	Local	Axle Factor Group:	4
Location:	Bridle Riadge Road east of Sullivan Road	Growth Factor Group:	E

Year	AADT
2018	1588
2009	1500

A = 2018/2009                      1.0587

B = A<sup>{1/9}</sup>                              1.0064

<b>Average Annual Growth Rate</b>	<b>0.64</b>
---------------------------------------	-------------

## Massachusetts Highway Department Annual Growth Rate

Location ID:	82229071	Seasonal Factor Group:	4
County:		Daily Factor Group:	
Functional Class	Other Principal Arterial	Axle Factor Group:	4
Location:	Central Street west of Kimball Hill Road	Growth Factor Group:	E

Year	AADT
2017	21227
2011	19000

A = 2017/2011                      1.1172

B =  $A^{1/6}$                               1.0186

<b>Average Annual Growth Rate</b>	<b>1.86</b>
---------------------------------------	-------------

Station	Average Annual Growth
82229059	0.82
82229063	0.64
82229035	1.60
82229071	1.86
82229042	-0.40
Average	0.90

TRIP GENERATION DATA

---



**Institute of Transportation Engineers (ITE)**  
**Trip Generation, 11th Edition**  
**Land Use Code (LUC) 150 - Warehousing**

Average Vehicle Trips Ends vs: 1000 Sq. Feet Gross Floor Area  
 Independent Variable (X): 48

**AVERAGE WEEKDAY DAILY**

$T = 1.71 * (X)$   
 $T = 1.71 * 48$   
 $T = 82.08$   
 $T = 82$  vehicle trips  
 with 50% ( 41 vpd) entering and 50% ( 41 vpd) exiting.

**WEEKDAY MORNING PEAK HOUR OF ADJACENT STREET TRAFFIC**

$T = 0.17 * (X)$   
 $T = 0.17 * 48$   
 $T = 8.16$   
 $T = 8$  vehicle trips  
 with 77% ( 6 vph) entering and 23% ( 2 vph) exiting.

**WEEKDAY EVENING PEAK HOUR OF ADJACENT STREET TRAFFIC**

$T = 0.18 * (X)$   
 $T = 0.18 * 48$   
 $T = 8.64$   
 $T = 9$  vehicle trips  
 with 28% ( 3 vph) entering and 73% ( 6 vph) exiting.

**SATURDAY DAILY**

$T = 0.15 * (X)$   
 $T = 0.15 * 48$   
 $T = 7.20$   
 $T = 8$  vehicle trips  
 with 50% ( 4 vpd) entering and 50% ( 4 vpd) exiting.

**SATURDAY MIDDAY PEAK HOUR OF GENERATOR**

$T = 0.05 * (X)$   
 $T = 0.05 * 48$   
 $T = 2.40$   
 $T = 2$  vehicle trips  
 with 64% ( 1 vph) entering and 36% ( 1 vph) exiting.

**Institute of Transportation Engineers (ITE)**  
**Trip Generation, 11 th Edition**  
**Land Use Code (LUC) 812 - Building Materials and Lumber Store**

Average Vehicle Trips Ends vs: 1,000 Square Feet Gross Floor Area  
 Independent Variable (X): 7.500

**AVERAGE WEEKDAY DAILY**

$T = 17.05 * (X)$   
 $T = 17.05 * 7.500$   
 $T = 127.88$   
 $T = 128$  vehicle trips  
 with 50% ( 64 vpd) entering and 50% ( 64 vpd) exiting.

**WEEKDAY MORNING PEAK HOUR OF ADJACENT STREET TRAFFIC**

$T = 1.59 * (X)$   
 $T = 1.59 * 7.500$   
 $T = 11.93$   
 $T = 12$  vehicle trips  
 with 62% ( 7 vph) entering and 38% ( 5 vph) exiting.

**WEEKDAY EVENING PEAK HOUR OF ADJACENT STREET TRAFFIC**

$T = 2.25 * (X)$   
 $T = 2.25 * 0.000$   
 $T = 16.88$   
 $T = 17$  vehicle trips  
 with 46% ( 8 vph) entering and 54% ( 9 vph) exiting.

**SATURDAY DAILY**

$T = 51.61 * (X)$   
 $T = 51.61 * 7.500$   
 $T = 387.08$   
 $T = 388$  vehicle trips  
 with 50% ( 194 vpd) entering and 50% ( 194 vpd) exiting.

**SATURDAY MIDDAY PEAK HOUR OF GENERATOR**

$T = 9.58 * (X)$   
 $T = 9.58 * 7.500$   
 $T = 71.85$   
 $T = 72$  vehicle trips  
 with 51% ( 37 vph) entering and 49% ( 35 vph) exiting.

	LUC 812 7,500 sf	LUC 150 48,000 sf	Total
Weekday Daily	128	82	210
Weekday Evening Peak Hour			
In	8	3	11
Out	9	6	15
Total	17	9	26
Saturday Daily	388	8	396
Saturday Midday Peak Hour			
In	37	1	38
Out	35	1	36
Total	72	2	74

CAPACITY ANALYSIS

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Central Street at Sullivan Road/Lawrence Road  
Sullivan Road at Site Driveway



Central Street at Sullivan Road/Lawrence Road

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Intersection												
Int Delay, s/veh	27.8											
Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↔			↔		↑	↑		↑	↑	
Traffic Vol, veh/h	30	28	10	20	32	16	19	869	35	38	577	53
Future Vol, veh/h	30	28	10	20	32	16	19	869	35	38	577	53
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	450	-	-	450	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	85	85	85	76	76	76	94	94	94	95	95	95
Heavy Vehicles, %	0	0	0	0	0	0	0	1	0	0	1	0
Mvmt Flow	35	33	12	26	42	21	20	924	37	40	607	56

Major/Minor	Minor2		Minor1			Major1			Major2			
Conflicting Flow All	1729	1716	635	1721	1726	943	663	0	0	961	0	0
Stage 1	715	715	-	983	983	-	-	-	-	-	-	-
Stage 2	1014	1001	-	738	743	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	70	91	482	71	90	321	935	-	-	724	-	-
Stage 1	425	438	-	302	329	-	-	-	-	-	-	-
Stage 2	290	323	-	413	425	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	37	84	482	46	83	321	935	-	-	724	-	-
Mov Cap-2 Maneuver	37	84	-	46	83	-	-	-	-	-	-	-
Stage 1	416	414	-	296	322	-	-	-	-	-	-	-
Stage 2	231	316	-	350	402	-	-	-	-	-	-	-

Approach	SE	NW	NE	SW
HCM Control Delay, s\$	366.4	242.1	0.2	0.6
HCM LOS	F	F		

Minor Lane/Major Mvmt	NEL	NET	NERNWLn1	SELn1	SWL	SWT	SWR
Capacity (veh/h)	935	-	-	78	58	724	-
HCM Lane V/C Ratio	0.022	-	-	1.147	1.379	0.055	-
HCM Control Delay (s)	8.9	-	-	242.1\$	366.4	10.3	-
HCM Lane LOS	A	-	-	F	F	B	-
HCM 95th %tile Q(veh)	0.1	-	-	6.6	7	0.2	-

Notes  
 ~: Volume exceeds capacity    \$: Delay exceeds 300s    +: Computation Not Defined    \*: All major volume in platoon



**Intersection**

Int Delay, s/veh 3.9

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↔			↔		↑	↑		↑	↑	
Traffic Vol, veh/h	23	17	3	19	22	34	9	551	23	32	442	20
Future Vol, veh/h	23	17	3	19	22	34	9	551	23	32	442	20
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	450	-	-	450	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	82	82	82	87	87	87	97	97	97
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	25	18	3	23	27	41	10	633	26	33	456	21

Major/Minor	Minor2		Minor1		Major1			Major2				
Conflicting Flow All	1233	1212	467	1209	1209	646	477	0	0	659	0	0
Stage 1	533	533	-	666	666	-	-	-	-	-	-	-
Stage 2	700	679	-	543	543	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	155	184	600	161	184	475	1096	-	-	939	-	-
Stage 1	534	528	-	452	460	-	-	-	-	-	-	-
Stage 2	433	454	-	528	523	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	121	176	600	142	176	475	1096	-	-	939	-	-
Mov Cap-2 Maneuver	121	176	-	142	176	-	-	-	-	-	-	-
Stage 1	529	510	-	448	456	-	-	-	-	-	-	-
Stage 2	369	450	-	489	505	-	-	-	-	-	-	-

Approach	SE	NW	NE	SW
HCM Control Delay, s	40.3	31.2	0.1	0.6
HCM LOS	E	D		

Minor Lane/Major Mvmt	NEL	NET	NERNWLn1	SELn1	SWL	SWT	SWR
Capacity (veh/h)	1096	-	-	227	147	939	-
HCM Lane V/C Ratio	0.009	-	-	0.403	0.315	0.035	-
HCM Control Delay (s)	8.3	-	-	31.2	40.3	9	-
HCM Lane LOS	A	-	-	D	E	A	-
HCM 95th %tile Q(veh)	0	-	-	1.8	1.3	0.1	-



HCM 6th TWSC

2024 Opening Year No-Build Weekday Evening Peak Hour

3: Central Street & Sullivan Road /Lawrence Road

10/25/2022

Intersection												
Int Delay, s/veh	25.2											
Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↔			↔		↔	↔		↔	↔	
Traffic Vol, veh/h	31	29	10	20	33	16	19	891	36	39	597	54
Future Vol, veh/h	31	29	10	20	33	16	19	891	36	39	597	54
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	450	-	-	450	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	94	94	94	95	95	95
Heavy Vehicles, %	0	0	0	0	0	0	0	1	0	0	1	0
Mvmt Flow	34	32	11	22	37	18	20	948	38	41	628	57

Major/Minor	Minor2		Minor1		Major1			Major2				
Conflicting Flow All	1774	1765	657	1767	1774	967	685	0	0	986	0	0
Stage 1	739	739	-	1007	1007	-	-	-	-	-	-	-
Stage 2	1035	1026	-	760	767	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	65	85	468	66	84	311	918	-	-	709	-	-
Stage 1	412	427	-	293	321	-	-	-	-	-	-	-
Stage 2	282	315	-	401	414	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	36	78	468	41	77	311	918	-	-	709	-	-
Mov Cap-2 Maneuver	36	78	-	41	77	-	-	-	-	-	-	-
Stage 1	403	402	-	287	314	-	-	-	-	-	-	-
Stage 2	230	308	-	339	390	-	-	-	-	-	-	-

Approach	SE	NW	NE	SW
HCM Control Delay, s	375.5	231.7	0.2	0.6
HCM LOS	F	F		

Minor Lane/Major Mvmt	NEL	NET	NERNWLn1	SELn1	SWL	SWT	SWR
Capacity (veh/h)	918	-	-	71	56	709	-
HCM Lane V/C Ratio	0.022	-	-	1.08	1.389	0.058	-
HCM Control Delay (s)	9	-	-	231.7	375.5	10.4	-
HCM Lane LOS	A	-	-	F	F	B	-
HCM 95th %tile Q(veh)	0.1	-	-	5.7	6.9	0.2	-

Notes  
 ~: Volume exceeds capacity    \$: Delay exceeds 300s    +: Computation Not Defined    \*: All major volume in platoon



HCM 6th TWSC

2024 Opening Year No-Build Saturday Midday Peak Hour

3: Central Street & Sullivan Road /Lawrence Road

10/25/2022

Intersection												
Int Delay, s/veh	3.7											
Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↔			↔		↑	↑		↑	↑	
Traffic Vol, veh/h	23	17	3	19	22	35	9	568	23	33	459	20
Future Vol, veh/h	23	17	3	19	22	35	9	568	23	33	459	20
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	450	-	-	450	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	90	90	90	90	90	90	97	97	97
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	25	18	3	21	24	39	10	631	26	34	473	21

Major/Minor	Minor2		Minor1		Major1			Major2				
Conflicting Flow All	1248	1229	484	1226	1226	644	494	0	0	657	0	0
Stage 1	552	552	-	664	664	-	-	-	-	-	-	-
Stage 2	696	677	-	562	562	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	152	179	587	157	180	476	1080	-	-	940	-	-
Stage 1	522	518	-	453	461	-	-	-	-	-	-	-
Stage 2	435	455	-	515	513	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	120	171	587	138	172	476	1080	-	-	940	-	-
Mov Cap-2 Maneuver	120	171	-	138	172	-	-	-	-	-	-	-
Stage 1	517	499	-	449	457	-	-	-	-	-	-	-
Stage 2	375	451	-	476	495	-	-	-	-	-	-	-

Approach	SE	NW	NE	SW
HCM Control Delay, s	41	30.5	0.1	0.6
HCM LOS	E	D		

Minor Lane/Major Mvmt	NEL	NET	NERNWLn1	SELn1	SWL	SWT	SWR
Capacity (veh/h)	1080	-	-	224	145	940	-
HCM Lane V/C Ratio	0.009	-	-	0.377	0.319	0.036	-
HCM Control Delay (s)	8.4	-	-	30.5	41	9	-
HCM Lane LOS	A	-	-	D	E	A	-
HCM 95th %tile Q(veh)	0	-	-	1.7	1.3	0.1	-



HCM 6th TWSC

2024 Opening Year Build Weekday Evening Peak Hour

3: Central Street & Sullivan Road /Lawrence Road

10/25/2022

Intersection												
Int Delay, s/veh	33.9											
Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↔			↔		↑	↑		↑	↑	
Traffic Vol, veh/h	31	29	10	27	33	24	19	891	41	45	597	54
Future Vol, veh/h	31	29	10	27	33	24	19	891	41	45	597	54
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	450	-	-	450	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	94	94	94	95	95	95
Heavy Vehicles, %	0	0	0	0	0	0	0	1	0	0	1	0
Mvmt Flow	34	32	11	30	37	27	20	948	44	47	628	57

Major/Minor	Minor2		Minor1			Major1			Major2			
Conflicting Flow All	1793	1783	657	1782	1789	970	685	0	0	992	0	0
Stage 1	751	751	-	1010	1010	-	-	-	-	-	-	-
Stage 2	1042	1032	-	772	779	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	63	83	468	64	82	310	918	-	-	705	-	-
Stage 1	406	421	-	292	320	-	-	-	-	-	-	-
Stage 2	280	313	-	395	409	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	~ 33	76	468	39	75	310	918	-	-	705	-	-
Mov Cap-2 Maneuver	~ 33	76	-	39	75	-	-	-	-	-	-	-
Stage 1	397	393	-	286	313	-	-	-	-	-	-	-
Stage 2	221	306	-	330	382	-	-	-	-	-	-	-

Approach	SE	NW	NE	SW
HCM Control Delay, s\$	428.7	\$ 331.6	0.2	0.7
HCM LOS	F	F		

Minor Lane/Major Mvmt	NEL	NET	NERNWLn1	SELn1	SWL	SWT	SWR
Capacity (veh/h)	918	-	-	69	52	705	-
HCM Lane V/C Ratio	0.022	-	-	1.353	1.496	0.067	-
HCM Control Delay (s)	9	-	-	\$ 331.6	\$ 428.7	10.5	-
HCM Lane LOS	A	-	-	F	F	B	-
HCM 95th %tile Q(veh)	0.1	-	-	7.6	7.2	0.2	-

Notes  
 ~: Volume exceeds capacity    \$: Delay exceeds 300s    +: Computation Not Defined    \*: All major volume in platoon



HCM 6th TWSC

2024 Opening Year Build Saturday Midday Peak Hour

3: Central Street & Sullivan Road /Lawrence Road

10/25/2022

Intersection												
Int Delay, s/veh	6.2											
Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↔			↔		↑	↑		↑	↑	
Traffic Vol, veh/h	23	17	3	37	22	53	9	568	42	52	459	20
Future Vol, veh/h	23	17	3	37	22	53	9	568	42	52	459	20
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	450	-	-	450	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	90	90	90	90	90	90	97	97	97
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	25	18	3	41	24	59	10	631	47	54	473	21

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	1308	1290	484	1277	1277	655	494	0	0	678	0	0
Stage 1	592	592	-	675	675	-	-	-	-	-	-	-
Stage 2	716	698	-	602	602	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	138	165	587	145	168	470	1080	-	-	923	-	-
Stage 1	496	497	-	447	456	-	-	-	-	-	-	-
Stage 2	424	445	-	490	492	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	101	154	587	125	157	470	1080	-	-	923	-	-
Mov Cap-2 Maneuver	101	154	-	125	157	-	-	-	-	-	-	-
Stage 1	492	468	-	443	452	-	-	-	-	-	-	-
Stage 2	348	441	-	441	463	-	-	-	-	-	-	-

Approach	SE		NW		NE		SW	
HCM Control Delay, s	49.8		46.9		0.1		0.9	
HCM LOS	E		E					

Minor Lane/Major Mvmt	NEL	NET	NERNWLn1	SELn1	SWL	SWT	SWR
Capacity (veh/h)	1080	-	-	204	125	923	-
HCM Lane V/C Ratio	0.009	-	-	0.61	0.37	0.058	-
HCM Control Delay (s)	8.4	-	-	46.9	49.8	9.1	-
HCM Lane LOS	A	-	-	E	E	A	-
HCM 95th %tile Q(veh)	0	-	-	3.5	1.5	0.2	-



**Intersection**

Int Delay, s/veh 68.7

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↔			↔		↑	↑		↑	↑	
Traffic Vol, veh/h	34	32	11	23	36	18	21	984	39	43	658	60
Future Vol, veh/h	34	32	11	23	36	18	21	984	39	43	658	60
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	450	-	-	450	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	94	94	94	95	95	95
Heavy Vehicles, %	0	0	0	0	0	0	0	1	0	0	1	0
Mvmt Flow	38	36	12	26	40	20	22	1047	41	45	693	63

Major/Minor	Minor2		Minor1		Major1			Major2				
Conflicting Flow All	1957	1947	725	1951	1958	1068	756	0	0	1088	0	0
Stage 1	815	815	-	1112	1112	-	-	-	-	-	-	-
Stage 2	1142	1132	-	839	846	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	48	65	428	49	64	272	864	-	-	649	-	-
Stage 1	374	394	-	256	287	-	-	-	-	-	-	-
Stage 2	246	281	-	363	381	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	~ 18	59	428	~ 23	58	272	864	-	-	649	-	-
Mov Cap-2 Maneuver	~ 18	59	-	~ 23	58	-	-	-	-	-	-	-
Stage 1	365	367	-	250	280	-	-	-	-	-	-	-
Stage 2	190	274	-	296	355	-	-	-	-	-	-	-

Approach	SE	NW	NE	SW
HCM Control Delay, \$	1065.7	\$ 597.6	0.2	0.6
HCM LOS	F	F		

Minor Lane/Major Mvmt	NEL	NET	NERNWLn1	SELn1	SWL	SWT	SWR
Capacity (veh/h)	864	-	-	46	31	649	-
HCM Lane V/C Ratio	0.026	-	-	1.86	2.76	0.07	-
HCM Control Delay (s)	9.3	-	-	\$ 597.6	\$ 1065.7	11	-
HCM Lane LOS	A	-	-	F	F	B	-
HCM 95th %tile Q(veh)	0.1	-	-	8.7	10	0.2	-

Notes  
 ~: Volume exceeds capacity    \$: Delay exceeds 300s    +: Computation Not Defined    \*: All major volume in platoon



HCM 6th TWSC

2034 Design Year No-Build Saturday Midday Peak Hour

3: Central Street & Sullivan Road /Lawrence Road

10/25/2022

**Intersection**

Int Delay, s/veh 5.2

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↔			↔		↔	↔		↔	↔	
Traffic Vol, veh/h	26	19	3	21	25	38	10	627	26	36	506	23
Future Vol, veh/h	26	19	3	21	25	38	10	627	26	36	506	23
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	450	-	-	450	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	90	90	90	90	90	90	97	97	97
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	28	20	3	23	28	42	11	697	29	37	522	24

Major/Minor	Minor2		Minor1			Major1		Major2				
Conflicting Flow All	1377	1356	534	1354	1354	712	546	0	0	726	0	0
Stage 1	608	608	-	734	734	-	-	-	-	-	-	-
Stage 2	769	748	-	620	620	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	123	151	550	128	151	436	1033	-	-	886	-	-
Stage 1	486	489	-	415	429	-	-	-	-	-	-	-
Stage 2	397	423	-	479	483	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	91	143	550	109	143	436	1033	-	-	886	-	-
Mov Cap-2 Maneuver	91	143	-	109	143	-	-	-	-	-	-	-
Stage 1	481	468	-	410	424	-	-	-	-	-	-	-
Stage 2	331	418	-	436	463	-	-	-	-	-	-	-

Approach	SE	NW	NE	SW
HCM Control Delay, s	61.2	42.8	0.1	0.6
HCM LOS	F	E		

Minor Lane/Major Mvmt	NEL	NET	NERNWLn1	SELn1	SWL	SWT	SWR
Capacity (veh/h)	1033	-	-	185	113	886	-
HCM Lane V/C Ratio	0.011	-	-	0.505	0.457	0.042	-
HCM Control Delay (s)	8.5	-	-	42.8	61.2	9.2	-
HCM Lane LOS	A	-	-	E	F	A	-
HCM 95th %tile Q(veh)	0	-	-	2.5	2	0.1	-



HCM 6th TWSC

2034 Design Year Build Weekday Evening Peak Hour

3: Central Street & Sullivan Road /Lawrence Road

10/25/2022

**Intersection**

Int Delay, s/veh 88.7

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↔			↔		↔	↔		↔	↔	
Traffic Vol, veh/h	34	32	11	30	36	26	21	984	44	49	658	60
Future Vol, veh/h	34	32	11	30	36	26	21	984	44	49	658	60
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	450	-	-	450	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	94	94	94	95	95	95
Heavy Vehicles, %	0	0	0	0	0	0	0	1	0	0	1	0
Mvmt Flow	38	36	12	33	40	29	22	1047	47	52	693	63

Major/Minor	Minor2		Minor1		Major1			Major2				
Conflicting Flow All	1978	1967	725	1968	1975	1071	756	0	0	1094	0	0
Stage 1	829	829	-	1115	1115	-	-	-	-	-	-	-
Stage 2	1149	1138	-	853	860	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	47	64	428	48	63	271	864	-	-	645	-	-
Stage 1	368	388	-	255	286	-	-	-	-	-	-	-
Stage 2	244	279	-	357	376	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	~ 16	57	428	~ 22	56	271	864	-	-	645	-	-
Mov Cap-2 Maneuver	~ 16	57	-	~ 22	56	-	-	-	-	-	-	-
Stage 1	359	357	-	249	279	-	-	-	-	-	-	-
Stage 2	182	272	-	287	346	-	-	-	-	-	-	-

Approach	SE	NW	NE	SW
HCM Control Delay, \$	1221.1	\$ 801.9	0.2	0.7
HCM LOS	F	F		

Minor Lane/Major Mvmt	NEL	NET	NERNWLn1	SELn1	SWL	SWT	SWR
Capacity (veh/h)	864	-	-	44	28	645	-
HCM Lane V/C Ratio	0.026	-	-	2.323	3.056	0.08	-
HCM Control Delay (s)	9.3	-	-	\$ 801.9	\$ 1221.1	11.1	-
HCM Lane LOS	A	-	-	F	F	B	-
HCM 95th %tile Q(veh)	0.1	-	-	10.8	10.3	0.3	-

Notes  
 ~: Volume exceeds capacity    \$: Delay exceeds 300s    +: Computation Not Defined    \*: All major volume in platoon



Intersection												
Int Delay, s/veh	10											
Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↕			↕		↕	↕		↕	↕	
Traffic Vol, veh/h	26	19	3	39	25	56	10	627	46	55	506	23
Future Vol, veh/h	26	19	3	39	25	56	10	627	46	55	506	23
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	450	-	-	450	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	90	90	90	90	90	90	97	97	97
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	28	20	3	43	28	62	11	697	51	57	522	24

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	1438	1418	534	1405	1405	723	546	0	0	748	0	0
Stage 1	648	648	-	745	745	-	-	-	-	-	-	-
Stage 2	790	770	-	660	660	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	112	138	550	118	141	430	1033	-	-	870	-	-
Stage 1	462	469	-	409	424	-	-	-	-	-	-	-
Stage 2	386	413	-	455	463	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	76	128	550	97	130	430	1033	-	-	870	-	-
Mov Cap-2 Maneuver	76	128	-	97	130	-	-	-	-	-	-	-
Stage 1	457	438	-	405	419	-	-	-	-	-	-	-
Stage 2	305	408	-	403	432	-	-	-	-	-	-	-

Approach	SE	NW	NE	SW
HCM Control Delay, s	78.2	81.4	0.1	0.9
HCM LOS	F	F		

Minor Lane/Major Mvmt	NEL	NET	NERNWLn1	SELn1	SWL	SWT	SWR
Capacity (veh/h)	1033	-	-	166	97	870	-
HCM Lane V/C Ratio	0.011	-	-	0.803	0.532	0.065	-
HCM Control Delay (s)	8.5	-	-	81.4	78.2	9.4	-
HCM Lane LOS	A	-	-	F	F	A	-
HCM 95th %tile Q(veh)	0	-	-	5.3	2.4	0.2	-

Sullivan Road at Site Driveway

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**Intersection**

Int Delay, s/veh 0.7

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations	↑			↑	↑	
Traffic Vol, veh/h	104	11	0	69	15	0
Future Vol, veh/h	104	11	0	69	15	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	116	12	0	77	17	0

**Major/Minor**

	Major1	Major2	Minor1		
Conflicting Flow All	0	0	128	0	199
Stage 1	-	-	-	-	122
Stage 2	-	-	-	-	77
Critical Hdwy	-	-	4.1	-	6.4
Critical Hdwy Stg 1	-	-	-	-	5.4
Critical Hdwy Stg 2	-	-	-	-	5.4
Follow-up Hdwy	-	-	2.2	-	3.5
Pot Cap-1 Maneuver	-	-	1470	-	794
Stage 1	-	-	-	-	908
Stage 2	-	-	-	-	951
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1470	-	794
Mov Cap-2 Maneuver	-	-	-	-	794
Stage 1	-	-	-	-	908
Stage 2	-	-	-	-	951

**Approach**

	SE	NW	NE
HCM Control Delay, s	0	0	9.6
HCM LOS			A

**Minor Lane/Major Mvmt**

	NELn1	NWL	NWT	SET	SER
Capacity (veh/h)	794	1470	-	-	-
HCM Lane V/C Ratio	0.021	-	-	-	-
HCM Control Delay (s)	9.6	0	-	-	-
HCM Lane LOS	A	A	-	-	-
HCM 95th %tile Q(veh)	0.1	0	-	-	-



**Intersection**

Int Delay, s/veh 1.6

**Movement** SET SER NWL NWT NEL NER

Lane Configurations	↑			↑	↑	
Traffic Vol, veh/h	73	38	0	76	36	0
Future Vol, veh/h	73	38	0	76	36	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	81	42	0	84	40	0

**Major/Minor** Major1 Major2 Minor1

Conflicting Flow All	0	0	123	0	186	102
Stage 1	-	-	-	-	102	-
Stage 2	-	-	-	-	84	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1477	-	808	959
Stage 1	-	-	-	-	927	-
Stage 2	-	-	-	-	944	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1477	-	808	959
Mov Cap-2 Maneuver	-	-	-	-	808	-
Stage 1	-	-	-	-	927	-
Stage 2	-	-	-	-	944	-

**Approach** SE NW NE

HCM Control Delay, s	0	0	9.7
HCM LOS			A

**Minor Lane/Major Mvmt** NELn1 NWL NWT SET SER

Capacity (veh/h)	808	1477	-	-	-
HCM Lane V/C Ratio	0.05	-	-	-	-
HCM Control Delay (s)	9.7	0	-	-	-
HCM Lane LOS	A	A	-	-	-
HCM 95th %tile Q(veh)	0.2	0	-	-	-



**Intersection**

Int Delay, s/veh 0.7

**Movement** SET SER NWL NWT NEL NER

Lane Configurations	↑			↑	↑	
Traffic Vol, veh/h	114	11	0	77	15	0
Future Vol, veh/h	114	11	0	77	15	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	127	12	0	86	17	0

**Major/Minor** Major1 Major2 Minor1

Conflicting Flow All	0	0	139	0	219	133
Stage 1	-	-	-	-	133	-
Stage 2	-	-	-	-	86	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1457	-	774	922
Stage 1	-	-	-	-	898	-
Stage 2	-	-	-	-	942	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1457	-	774	922
Mov Cap-2 Maneuver	-	-	-	-	774	-
Stage 1	-	-	-	-	898	-
Stage 2	-	-	-	-	942	-

**Approach** SE NW NE

HCM Control Delay, s 0 0 9.8  
HCM LOS A

**Minor Lane/Major Mvmt** NELn1 NWL NWT SET SER

Capacity (veh/h)	774	1457	-	-	-
HCM Lane V/C Ratio	0.022	-	-	-	-
HCM Control Delay (s)	9.8	0	-	-	-
HCM Lane LOS	A	A	-	-	-
HCM 95th %tile Q(veh)	0.1	0	-	-	-



Intersection						
Int Delay, s/veh	1.5					
Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	81	38	0	84	36	0
Future Vol, veh/h	81	38	0	84	36	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	90	42	0	93	40	0

Major/Minor	Major1	Major2	Minor1			
Conflicting Flow All	0	0	132	0	204	111
Stage 1	-	-	-	-	111	-
Stage 2	-	-	-	-	93	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1466	-	789	948
Stage 1	-	-	-	-	919	-
Stage 2	-	-	-	-	936	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1466	-	789	948
Mov Cap-2 Maneuver	-	-	-	-	789	-
Stage 1	-	-	-	-	919	-
Stage 2	-	-	-	-	936	-

Approach	SE	NW	NE
HCM Control Delay, s	0	0	9.8
HCM LOS			A

Minor Lane/Major Mvmt	NELn1	NWL	NWT	SET	SER
Capacity (veh/h)	789	1466	-	-	-
HCM Lane V/C Ratio	0.051	-	-	-	-
HCM Control Delay (s)	9.8	0	-	-	-
HCM Lane LOS	A	A	-	-	-
HCM 95th %tile Q(veh)	0.2	0	-	-	-



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Fire Protection Engineers Licensed in MA, VT, NH, and ME  
603.305.2680

**DATE:** 19 September 2022

**REVIEWER:** Alison C. Brackett, PE

**PROJECT:** **Sprinkler and Fire Flow Requirements for 84 Lumber**  
Central Street and Sullivan Road  
Hudson, NH

**CONTACT:** Jim Zaunick, 84 Lumber  
[Jim.Zaunick@84lumber.com](mailto:Jim.Zaunick@84lumber.com)

The analysis performed in this report provides sprinkler requirements and calculations related to the fire flows required for manual firefighting purposes for a new development at the above location. For this project, five (5) Type IIB structures will be constructed for the purpose of retail lumber sales and storage (no wood processing) that will be located outside the municipal water district within the Town of Hudson. Site plans show a single entry (24-ft wide) off of Sullivan Road. The five buildings are as follows (and situated as proposed in the attached site plan provided by Mr. Zaunick):

- Retail building (bldg. #1) – 7,500-sqft
- Lumber storage (bldg. #2) – 9,600-sqft
- Drive through lumber storage (bldg. #3) – 9,600-sqft
- Lumber storage shed (bldg. #4) – 9,600-sqft
- Lumber storage shed (bldg. #5) – 9,600-sqft

Buildings #1 and #2 are separated from one another by ~ 28-ft. In addition to the storage buildings, six (6) outside “load staging” areas are depicted on the site plan. A parking area is shown, and the limits of the Phase I paved areas are depicted.

#### Code Review for Sprinkler and Fire Flow Requirements

Sprinkler Requirements: The retail building will be classified as mixed-use with Mercantile (M) and Business (B) uses present, while all other structures will be classified as S-1 (storage). Our review is limited to the storage of wood products only and does not consider plastics or flammable/combustible liquid storage. Sprinklers are required by the Building and Fire Codes when any one of the following conditions are true:

- [IBC 930.2.7 and NFPA 1:13.3.2.23.1(2)] A Group M fire area exceeds 12,000-sqft (not true)
- [IBC 930.2.9(1)] A Group S-1 fire area exceeds 12,000-sqft (not true)
- [IBC 930.2.7(4)] A Group S-1 fire area used for the storage of commercial motor vehicles where the fire area exceeds 5,000-sqft. Therefore, *parking of delivery trucks for more than product transfer within the drive-through building will require the building to be sprinklered.*
- [NFPA 1: 13.3.2.27.1] New storage occupancies containing areas greater than 2,500-sqft for the high-piled storage of combustibles. High piled storage is defined as “Solid-piled, palletized, rack storage, bin box, and shelf storage in excess of 12 ft”. Therefore, *storing lumber above 12-ft in areas greater than 2,500-sqft will require the building to be sprinklered.*



- [NFPA 1: Chapter 18] Where adequately dimensioned FD access is not available to within 150-ft of all points on a building, sprinklers are required. FD access is required to be a minimum of 20-ft wide with a minimum vertical clearance of 13'6". Therefore, *if load staging and other yard storage impedes fire department access such that 20-ft wide access lane is greater than 150-ft from any point on the building, sprinklers will be required. Red FD access areas have been added to the attached site plan. As you can see, some of the proposed staging areas impinge upon the access lanes and should be relocated.*

Key Protection Note: While the overall size of the proposed buildings does not trigger a sprinkler requirement per the Building or Fire Codes, the possible use of such buildings or the available FD access conditions could.

Fire Flow requirements: The required fire flow calculations outlined in NFPA 1142 (as referenced by NFPA 1) result in a minimum total water supply requirement of 56,700-gallons for the proposed project (see calculations that follow). Cisterns/dry hydrants shall be located no closer than 100-ft from any building at a location approved by the AHJ. If using a dry hydrant, it shall be designed and constructed to provide a minimum flow of 1,000-gpm at draft. Lift should be as low as possible (not more than 10-ft). [NFPA 1142: 8.3.3] A minimum of 3-ft of clear, unobstructed space (including vegetation) shall be provided around the water access, and the access shall be arranged to allow the fire department pump to connect using not more than 20-ft of hard suction hose. [NFPA 1142: 8.4] No parking shall be permitted within 20-ft of the water access. [NFPA 1142: 8.4.5] Please submit proposed location of fire flow water storage to the Hudson FD for approval.

Other points to consider:

- The Authority Having Jurisdiction (AHJ) is permitted to specify how the volume of water is provided, giving consideration to local conditions and need. In other words, the required total volume could be provided through cisterns entirely, or through a combination of cisterns, other nearby drafting sources, or water carried on tanker trucks or through rural water supplies to the scene.
- The AHJ is also permitted to increase the stored amount per any of the conditions outlined in NFPA 1142 Section 4.1.3 (includes factors such as extended FD response distance, potential for delayed discovery of fire (no fire alarm system), limited access, etc.).
- The Town of Hudson FD should approve the provided turning provisions to determine whether they meet the requirement of the longest truck in the fleet.
- We assume that the paved road surface will meet the requirement of imposed loads from fire apparatus and will represent an all-weather driving surface in New England. [NFPA 1: 18.2.3.4.2] Assumes bituminous asphalt concrete over crushed gravel and gravel layer bases, please advise if this is not correct.

This concludes our review of sprinkler requirements and fire flow analysis. Please let me know if you have any other questions regarding this review.

Kind regards,  
 Alison C. Brackett, PE | Fire protection  
 Triangle Fire Consultants, LLC – Licensed in MA, NH, VT, and ME  
[Alison.brackett@gmail.com](mailto:Alison.brackett@gmail.com)



COMPLIANCE PATH FOR WATER SUPPLY FOR 84 LUMBER

Our review comes at the request of Mr. Zaunick (the Client), who has provided the following information for the project:

- Site Plan (1 sheet) dated 2/7/2022
- Architectural Plans (sheets A02, A03, A06, A07, A09, A10, A11, and A12) dated 8/18/2022 for Buildings #1 through #5

As you know, the construction of new buildings in the State of NH must comply with the currently adopted State Building and Fire Codes, which include:

- The 2015 edition of the International Building Code (IBC), with NH amendments
- The 2015 edition of NFPA 1, with NH amendments
- Local ordinances as adopted by the jurisdiction (Town of Hudson) – not considered in this report.

Relevant Building Characteristics

There will be five different buildings, and Buildings #2, #4, and #5 create the most fire flow demand (equally).

- Single story (9,600-ft<sup>2</sup>) with no basement
- Type IIB [II(000)] – Steel frame on concrete slab on grade
- Storage (S-1) uses present
- Exposing buildings within 50-ft of the new construction.

Water Supply Calculation

There are a number of methods currently used to calculate required water flow rates for buildings, and in general, they are based on decades-old criteria derived from actual fires. As rule of law in NH, NFPA 1 provides two different methods of calculating fire flow:

- Via Chapter 18, which “*shall apply to public and privately owned fire hydrant systems*” (municipal water supplies) [NFPA 1: 18.1.1.2] and
- Via Section 18.3.1.1 and Section 13.5.2 to NFPA 1142 Standard on Water Supplies for Suburban and Rural Firefighting where “*no adequate and reliable water supply exists for firefighting purposes*”.

Since the proposed construction will not have access to a municipal or other reliable water supply, the method of NFPA 1142 therefore is used to determine the minimum required water supply.

The minimum required water supply for manual firefighting purposes as calculated by this method is dependent upon the following factors:

- Size of fire area (volume):  $VS_{TOT}$  [aggregate floor area times height – midline of roof] : 201,600-ft<sup>3</sup>
- Occupancy and associated hazard level: The Occupancy Hazard Classification (OHC) should be 4 [NFPA 1142: 5.2.2] which is used for “*building materials supply storage*”.
- Type of construction: CC equal to **0.75** for Type II (steel-frame building)
- Exposures, if any (water supply times 1.5). For the purposes of calculating the minimum water supply requirement, a structure shall be considered an exposure hazard if it is 100-ft<sup>2</sup> or larger and is within 50-ft of the subject building. [NFPA 1142: 4.1.5] Based on the submitted documents, we note that Buildings #1 and #2 expose each other, as do Buildings #4 and #5, so the exposure factor of 1.5 applies.

Therefore, the minimum required water supply  $WS_{min}$  is calculated by [Eq. 4.2.1]:

$$WS_{min} = \frac{VS_{tot}}{OHC} (CC) \times 1.5$$

This calculation yields a total water supply requirement of **56,700-gallons**, giving consideration to building volume, use, construction type, and exposing buildings.



