

Ref: 7463

December 23, 2024

Ms. Alison Manugian  
Community Development Director  
Town of Dracut  
62 Arlington Street  
Dracut, MA 01826

Re: Response to Transportation Peer Review #2  
Proposed Multifamily Residential Development – Murphy's Farm (231 Wheeler Street)  
Dracut, Massachusetts

Dear Alison:

Vanasse & Associates, Inc. (VAI) is providing responses to the comments that were raised in the September 12, 2024 *Transportation Peer Review #2* memorandum prepared by VHB concerning their review of the July 3, 2024 *Response to Transportation Peer Review* letter (the “July 2024 RTC Letter”) and accompanying July 2024 *Transportation Impact Assessment Update* (the “July 2024 TIA Update”) that were prepared by VAI in support of the proposed multifamily residential development to be known as Murphy's Farm and located at 231 Wheeler Street in Dracut, Massachusetts (hereafter referred to as the “Project”). Listed below are the comments that were identified by VHB in the subject memorandum followed by our response on behalf of the Project proponent.

### **Study Area and Study Methodology**

**Comment 2:** *Based on the traffic analysis provided in the TIA, approximately 20% of the development related traffic oriented to/from the west would use Route 113 and 10% would use Wheeler Road. However, a review of the roadway connectivity in the area indicates that the potential exists for a higher percentage of site traffic to use Wheeler Road to travel west. Notwithstanding this observation, and since the signalized intersection of Broadway (Route 113) at Wheeler Road/Jones Avenue will carry approximately 30% of the site traffic, VHB recommends that the intersections of Route 113 at Wheeler Road/Jones Avenue and Wheeler Road at Parker Road be also included in the TIA to quantify any existing safety or capacity deficiencies at the locations, and whether the additional traffic Project will exacerbate the conditions, triggering the need for any remedial actions.*

**Response:** *The study area in the July 2024 TIA Update has been expanded to include the requested intersections and the trip distribution pattern has been refined to assign a portion of the westbound Project trips destined for Route 113 to Wheeler Road.*

**VHB Follow-Up:** *The study area was updated and includes the requested intersections. The intersections are included in the analyses in the revised TIA. Comment resolved.*

**Response:** **No response required.**

## Existing Traffic Volumes

**Comment 6:** *The Applicant should also discuss with the Town of Dracut any pedestrian accommodation needs in the area that could be addressed by the Project, especially on Elizabeth Drive, Wilshire Circle and Rinzee Road that will experience increased traffic from the development.*

**Response:** *The Project proponent will discuss with the Town of Dracut the need for additional pedestrian accommodations along the identified roadways in the context of the overall mitigation package for the Project. As defined in the July 2024 TIA Update, sidewalks are provided continuously along one side of these roadways and sidewalks will be provided within the Project site that will connect to the existing sidewalks along Elizabeth Drive and Poppy Lane.*

**VHB Follow-Up:** *The updated site plan shows proposed sidewalks that connect to Elizabeth Drive and Poppy Lane. The sidewalks, crosswalks, curb ramps and related signage should comply with all relevant regulations set forth by the Architectural Access Board, the Americans with Disabilities Act, and the Manual on Uniform Traffic Control Devices. Given the increased pedestrian activity that can be expected following the site development, the Applicant, as noted in the response, should discuss with the Town the need for improving existing pedestrian accommodations on Elizabeth Drive and Poppy Lane.*

**Response:** *The Applicant will discuss the need for improving existing pedestrian accommodations on Elizabeth Drive and Poppy Lane with the Town in the context of the overall mitigation program for the Project.*

## Motor Vehicle Crash Data

**Comment 7:** *The crash rates at the intersections of Route 113 at Wheeler Street and Route 110 at Wheeler Street were found to be slightly below the statewide and District 4 average crash rates for unsignalized intersections and experienced the fewest crashes during the year 2020. Due to the changes in traffic patterns related to COVID-19 during 2020, VHB recommends that the crash rates be recalculated using data for the five years between 2015 – 2019 to determine if the rates exceed the District 4 averages. If crash rates for any locations exceed the District 4 average crash rates, preparation of collision diagrams is recommended to identify any prevalent crash patterns and trends. As noted earlier, the intersection of Broadway (Route 110) at Wheeler Road and Jones Avenue and Wheeler Road at Parker Road should also be included in the updated evaluation.*

**Response:** *The July 2024 TIA Update includes a review of the motor vehicle crash history at the study area intersection (including the Route 113/Wheeler Road/Jones Avenue and Wheeler Road/Parker Road intersections) for the five-year review period 2015 through 2019, inclusive. Crash reports have been requested from the City of Methuen for the Route 110/Wheeler Street intersection and from the Town of Dracut for the Wheeler Road/Wilshire Circle/Paddock Lane intersection. Collision diagrams will be prepared for these intersections once the crash reports have been received. In the interim, specific safety related recommendations have been provided as a part of the July 2024 TIA update.*



**VHB Follow-Up:** *The revised TIA includes an updated crash evaluation for the years 2015-2019 as requested. Comment pending full resolution, subject to review of collision diagrams and associated commentary, when available.*

**Response:** Collision diagrams have been prepared for the Route 110/Wheeler Street (Figure CD1) and Wheeler Road/Wilshire Circle/Paddock Lane (Figure CD2) intersections based on motor vehicle crash data obtained from the Methuen and Dracut Police Departments for the 2015 through 2019 period.

As can be seen on Figure CD1, the majority of the motor vehicle crashes that occurred at the intersection involved a motorist traveling westbound on Route 113, with the primary collision pattern involving rear-end collisions with a motorist waiting to turn left onto Wheeler Street that resulted in property damage only. These crashes may be attributable to one or more of the following conditions: i) vehicle travel speeds that exceed roadway conditions; ii) sight line limitations for westbound motorists; and/or iii) driver error/inattentiveness. In order to enhance safety at the Route 113/Wheeler Street intersection, the Applicant will undertake the following improvements subject to receipt of all necessary rights, permits and approvals:

1. Install intersection ahead warning signs on the Route 113 approaches to the intersection to include a supplemental street name plaque and reflective yellow tape on the sign post; and
2. Selectively trim/remove existing trees and vegetation located within the sight triangle areas of the intersection within the public right-of-way.

Additionally and independent of the Project, the Applicant will work with the City of Methuen, MassDOT and the property owners adjacent to the intersection to establish sight line easements to allow for future vegetation maintenance to the extent necessary.

As can be seen in Figure CD2, one (1) motor vehicle crash was reported to have occurred in the vicinity of the Wheeler Road/Wilshire Circle/Paddock Lane intersection. The reported crash involved a motor vehicle striking a utility pole along the north side of Wheeler Street in the northeast quadrant of the intersection. This collision is not attributable to a specific roadway or intersection defect and is most likely attributable to driver error or inattentiveness.

## Trip Generation

**Comment 9:** *The TIA used trip generation estimates based on the Trip Generation Manual using LUC 215 – Single-Family Attached Housing. While the LUC assumption is consistent for the type of development proposed (townhouse style buildings, each with multiple units), it is noted that the Project is proposing a development that contain 100-percent 4 bedroom units (1,200 bed rooms) rather than a mix of bedroom types. As such, using the unit count as an independent variable, may underestimate the trip generation. VHB recommends that alternative trip generation estimates be considered, including but not limited to other comparable datasets with empirical data collected at developments with 100-percent 4-bedroom units, for analysis purposes. For*



*comparison, ITE LUC 210 (Single Family Detached Housing) would generate approximately 30-percent more daily traffic than the land use code used in the TIA.*

**Response:** *The development program for the Project has been reduced to 268 townhouse units that will include a conventional mix of bedroom types. The trip-generation calculations that are provided in the July 2024 TIA have been updated accordingly to reflect the reduced number of residential units and continue to use ITE LUC 215, Single-Family Attached Housing, to establish the traffic characteristics of the Project.*

**VHB Follow-Up:** *The revised TIA accounts for the reduced development program and the mix of bedroom counts for the residential units. ITE LUC 215 is appropriate for estimated trips for the project. Comment resolved.*

**Response:** **No response required.**

### **Trip Distribution**

**Comment 11:** *The usage of JTW data is the appropriate method to develop trip distribution patterns and is consistent with standard traffic engineering practice. Given the locations of the regional highways (I-93, I-495 and Route 3), it is recommended that the coverage of the trip distribution graphic be expanded to include the percentages of site traffic heading to/from the three regional highways, the corresponding trip assignments along the local roads that would be used to reach the highways.*

**Response:** *Figure 6A of the July 2024 TIA Update expands the trip distribution pattern for the Project to include the trip assignment and likely travel routes for vehicles oriented to/from Interstate 93 (I-93) and Interstate 495 (I-495). It is expected that motorists will use I-93, I-495, or both roadways to travel to/from Route 3.*

**VHB Follow-Up:** *Figure 6A shows the trip distribution patterns oriented toward the regional highway system. The graphic shows two routes to/from I-495 to the south and two routes to/from I-93 to the northeast. The trip distribution routing depicted on the graphic is reasonable. Comment resolved.*

**Response:** **No response required.**

**Comment 12:** *Based on the location of the Project and the layout of the roadway network, it is likely that a higher percentage of trips traveling to/from the west could use Wheeler Road, as it provides a shorter distance than using Route 113 between Wheeler Road and Wheeler Street for traveling west. Therefore, VHB recommends that a sensitivity analysis be provided that assigns a higher percentage of site trips along Wheeler Road to/from the west in comparison to Route 113. This sensitivity analysis should also incorporate VHB's Comment #9 related to trip generation.*

**Response:** *The trip distribution pattern for the Project that is presented in the July 2024 TIA Update has been revised to assign Project-generated trips traffic destined to/from Route 113 west of Wheeler Road to Wheeler Road.*

**VHB Follow-Up:** *The trip distribution patterns were updated as requested. The revised TIA shows 20 percent of the Project-generated traffic oriented to/from the west on Wheeler Road (previously 10 percent in the original TIA) and 10 percent to/from the west on Route 113 (previously 20 percent in the original TIA). The updated trip distribution patterns reflect a more realistic travel pattern for vehicles traveling to/from the west. Comment resolved.*

**Response:** **No response required.**

### Build Traffic Volumes

**Comment 13:** *The 2030 Build traffic volumes should be updated based on response to Comments 9 through 12.*

**Response:** *The 2031 Build traffic volumes presented in the July 2024 TIA Update incorporate the responses to previous comments.*

**VHB Follow-Up:** **Comment resolved.**

**Response:** **No response required.**

**Comment 14:** *The traffic volume networks indicate that the Project will result in a substantial increase traffic along Rinzee Road, Poppy Lane, Elizabeth Drive, and Wilshire Circle. These roadways currently operate as low-volume residential streets that terminate in cul-de-sacs that will experience fundamental changes in traffic patterns. A traffic volume summary table should be prepared to show the change in traffic volumes and percentage change in the peak traffic volumes on each of the study area local roads that connect to Route 113 and Route 110 based on the revised trip generation and distribution assumptions.*

**Response:** *Table 6 of the July 2024 TIA has been expanded to include the traffic volume increases associated with the Project along the local roadways that will provide access to the Project site. We note that traffic volume increases for the local roadways identified in Table 6 are not indicative of the ability or capacity of a specific roadway to safely or efficiently accommodate the predicted traffic volume increase.*

**VHB Follow-Up:** *Table 6 in the revised TIA indicates that Wilshire Circle, Rinzee Road, and Wheeler Street will experience the highest increases in traffic volumes and the highest percentage increases in traffic. For example, Rinzee Road which currently carries 9 to 16 vehicles per hour during the peak hours will experience an increase of 67 to 79 vehicles per hour (i.e., multifold increase in traffic). Similarly, Wilshire Circle will experience increases from 26 to 47 vehicles per hour, and Wheeler Street, south of Route 113 will experience increases of 68 to 79 vehicles per hour (36 to 51 percent increases). While the TIAS notes that sufficient operational capacity exists along these roadways to accommodate the additional traffic generated by the Project, the several orders of magnitude increase in traffic on the streets connecting the development have the potential to change how actively the roads would be used in the future, compared to the current conditions where they only serve approximately 25 single family homes along Wilshire Circle and Elizabeth Drive and approximately 20 single family homes along Rinzee Road and*

*Poppy Lane. The increased activity in turn would necessitate a review of the current roadway/traffic features to determine if any changes may be required. The Applicant should provide a discussion of potential changes along Rinzee Road, Poppy Lane, Wilshire Circle, and Elizabeth Drive, such as striping of the roadway center lines, shoulder lines, completing any gaps in sidewalks, need for any on-street parking restrictions to ensure that adequate right of way is available to process the traffic from the additional 268 residences. Comment pending resolution subject to the Applicant's review of the need for potential traffic related changes along the roadways that the Site will connect to, in the future.*

**Response:** Rinzee Road, Poppy Lane, Wilshire Circle, and Elizabeth Drive provide sufficient width (approximately 30-feet) to accommodate two-way traffic and occasional on-street parking that is and will continue to be indicative of low-volume residential roadways. The installation of centerline pavement markings along these roadways is not recommended given that the roadways will continue to be low volume roadways (less than 2,000 vehicles per day) in a slow speed residential neighborhood setting with on-street parking. A review of the alignment of these roadways also does not indicate that modifications are necessary to accommodate the predicted increase in traffic that may be associated with the Project. That being said, it is suggested that the following improvements be considered along these roadways to enhance safety and mobility:

1. Extend the existing sidewalk along the east side of Elizabeth Drive to Wilshire Circle, where a crosswalk with accompanying Americans with Disabilities Act (ADA) compliant wheelchair ramps should be installed;
2. Install a STOP-sign and marked STOP-line on the Elizabeth Drive approach to Wilshire Circle;
3. Install a STOP-sign and marked STOP-line on the Rinzee Road approach to Wheeler Street;
4. Reduce the width of the Rinzee Road/Poppy Lane intersection by reducing the corner radii;
5. Install a marked crosswalk with ADA compliant wheelchair ramps for crossing Rinzee Road at the Rinzee Road/Poppy Lane intersection; and
6. Install a STOP-sign and marked STOP-line on the Rinzee Road approach to Poppy Lane.

The mobility improvements will serve to connect the sidewalk infrastructure that is planned within the Project and provide a continuous pedestrian accommodation between Wheeler Road and Wheeler Street.

## Traffic Operations Analysis

**Comment 15:** *VHB review of the operations analysis indicates that it has been conducted in a manner consistent with standard engineering practice. VHB recommends that the traffic operational analysis be updated to reflect the revised trip generation and distribution assumptions based on previous comments.*



**Response:** *The traffic operations analyses that are presented in the July 2024 TIA have been revised to address the changes to the development program for the Project and the responses to the comments identified herein.*

**VHB Follow-Up:** *The operations analyses in the revised TIA are updated. The additional intersections of Route 113 at Wheeler Road and Jones Avenue and Wheeler Road at Parker Road are also included in the updated analyses. Comment resolved.*

**Response:** **No response required.**

**Comment 16:** *A preliminary traffic signal warrant analysis should be conducted at the intersection of Route 113 at Wheeler Street to determine how close the traffic volumes are to warranting traffic signal control, with and without the development related traffic.*

**Response:** *The July 2024 TIA Update includes a detailed Traffic Signal Warrants Analysis for the Route 113/Wheeler Street intersection.*

**VHB Follow-Up:** *The revised TIA provides a Traffic Signal Warrants Analysis for five scenarios: 2024 Existing, 2024 Build, 2024 Build, 2031 Build, 2024 Build with a right-turn reduction, and 2031 Build with a right-turn reduction. Based on the information presented in the revised TIA, a traffic signal is currently not warranted but may be warranted in the future with the addition of Project-related traffic. Traffic volumes for the 2024 Build and 2031 Build conditions were found to exceed the thresholds for Warrant 1 (8-hour vehicular volume), Warrant 2 (4-hour vehicular volume), and Warrant 3 (peak hour). The 2024 and 2031 Build traffic volumes with a 20 percent reduction for right-turns were found to exceed only the threshold for Warrant 2.*

*The Applicant indicated that they will provide funding to the City of Methuen to design and construct improvements at the intersection to include the widening of the Wheeler Street approach to accommodate exclusive left-turn and right-turn lanes. The Applicant is not proposing to signalize the intersection. VHB concurs with the conclusion that a signal is not the appropriate traffic control for this intersection at this time based on the Traffic Signal Warrants Analysis.*

*However, the intersection should be monitored after the construction and opening of the project to determine if there are additional improvements that should be implemented, including potential signalization. It is recommended that a post construction monitoring study be performed six months after 50% occupancy and at 100% occupancy of the development.*

*VHB notes that Route 113 at the intersection with Wheeler Street is under MassDOT jurisdiction and any improvements will require MassDOT review. It is recommended that the Applicant coordinate with the City of Methuen and MassDOT on implementing the improvements. Specifically, the Applicant should commit to undertaking the design and construction of the improvements prior to occupancy, rather than funding the construction of improvements by others.*

*Additionally, in the first review, a left-turn lane warrant analysis was requested for the intersection, which was not provided. Additional commentary related to the intersection of Route 113/Wheeler Street is provided in VHB's response to Comment 22 presented later in this document.*

**Response:** The Applicant will commit to conducting a post-development traffic monitoring program in order to: i) validate the trip estimates for the Project; and ii) evaluate if additional improvements appear to be necessary at the Route 113/Wheeler Street intersection. The monitoring program will include performing a 48-hour automatic traffic recorder count at the Project site roadway interfaces with Elizabeth Drive and Rinzee Road and a 12-hour (7:00 AM to 7:00 PM) turning movement count and vehicle classification count at the Route 113/Wheeler Street intersection in order to perform a Traffic Signal Warrants Analysis at the intersection. The monitoring program will be completed within six (6) months after the Project reaches 50 percent occupancy and within three (3) months after the Project reaches 100 percent occupancy. The results of the traffic monitoring program, including the Traffic Signal Warrants Analysis, will be summarized in a report to be provided to the Town of Dracut and City of Methuen.

As indicated in response to Comment 7, the Applicant has committed to undertaking specific safety-related improvements at the Route 113/Wheeler Street intersection subject to receipt of all necessary rights, permits and approvals, and independent of the Project, to working with the City of Methuen, MassDOT and the property owners adjacent to the intersection to establish sight line easements to allow for future vegetation maintenance to the extent necessary. In addition, the Applicant is willing to providing funding on a proportionate basis to the City of Methuen for the design and construction of capacity-related improvements (i.e., the construction of turn lanes and/or the installation of a traffic control signal, if warranted) based on the predicted increase in traffic that the Project represents at the intersection over No-Build conditions (i.e., a "fair-share" cost allocation).

A left-turn lane warrants analysis was conducted for the Route 113 westbound approach to Wheeler Street in accordance with the methodology and procedures outlined in *NCHRP Report 457*<sup>1</sup> published by the National Cooperative Highway Research Program (NCHRP). Determination of the need for a left-turn lane of adequate storage length is a function of the volume of left-turning vehicles at the intersection under study and the magnitude of opposing or conflicting traffic volumes along the roadway. Based on a review of these criteria under 2031 No-Build and 2031 Build conditions, provision of a left-turn lane on the Route 113 westbound approach to Wheeler Street *is warranted* under both 2031 No-Build and 2031 Build conditions. The detailed analysis of the left-turn lane criteria is attached.

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<sup>1</sup>*NCHRP Report 457 – Evaluating Intersection Improvement: An Engineering Study Guide*, National Cooperative Highway Research Program; 2001.

## Sight Distance Evaluation

**Comment 17:** *It is recommended that sight line sketches be prepared at the intersections of Wheeler Road at Wilshire Circle (both locations), Wheeler Street at Rinzee Road, and Wheeler Street at the proposed site driveway to identify the areas for which vegetation removal is required to meet the SSD and ISD requirements, to confirm that the vegetation clearing can be achieved within the public rights-of-way and that sight line easements on private properties will not be required. In addition to the horizontal geometry, the diagrams should also show the vertical geometries (profile views) of the sight lines in areas where the vertical geometry could pose a challenge. The Applicant should commit to any necessary vegetation removal at the time of construction, and to regularly maintaining clear sight triangles at the locations in perpetuity. The site design should ensure that signage, landscaping, snow windrows will not impede future sight lines at the site driveways.*

**Response:** *Sight triangle exhibits for the requested intersections have been prepared and are included in the July 2024 TIA Update. As illustrated thereon, the removal of trees and vegetation is not required to achieve the necessary sight lines for safe operation. We note that the proposed driveway that was to intersect Wheeler Street has been eliminated from the Project.*

**VHB Follow-Up:** *The revised TIA provides a sight distance evaluation for the requested locations. The evaluation was based on appropriate speeds for each roadway. Based on the diagrams provided, the sight lines at the intersection of Wheeler Road at Wilshire Circle (east location) cross over privately owned property. Sight lines at the intersection of Wheeler Street/Rinzee Road may also cross over private property. The Applicant should work with the Town of Dracut and the affected property owners to establish sight line easements in perpetuity to maintain adequate sight distances at the two intersections. These two locations will serve as main access points to/from the site and will experience much higher traffic volumes than the current conditions as a result of the project, which in turn necessitates a closer review of the adequacy of access/egress needs from the public roadway system.*

**Response:** *The Applicant will work with the Town of Dracut, the City of Methuen and the affected property owners to establish sight line easements to allow for sight line maintenance at these locations in perpetuity. We note that sight line easements should be established independent of the Project acknowledging the benefit to the Project as well.*

**Comment 18:** *Field observations by VHB indicated that the intersection of Wheeler Street at Wheeler Road could potentially have sight distance deficiencies for vehicles exiting Wheeler Road and for vehicles turning left from Wheeler Street northbound, primarily due to the horizontal curvature and vegetation along the west side of Wheeler Street, north of the intersection. Currently, a convex mirror, mounted opposite the Wheeler Road approach at the intersection, assists drivers traveling through the intersection. VHB recommends that graphical exhibits based on the 85th percentile speeds be prepared for the required ISD and SSD values in comparison the actual available measurements. The graphics should show the property line limits at the intersection. The review should also include potential measures to improve and sight lines and safety for traffic traveling through the intersection.*



**Response:** *A sight distance exhibit has been prepared for the Wheeler Street/Wheeler Road intersection and is included in the July 2024 TIA Update. Based on the survey data for the intersection, specific recommendations are provided in the July 2024 TIA Update to improve sight lines at intersection that will be implemented as a part of the Project subject to receipt of all necessary rights, permits and approvals.*

**VHB Follow-Up:** *The Applicant indicated that sight distance can be achieved at the intersection of Wheeler Street at Wheeler Road with the trimming of vegetation and regrading of an existing embankment. The Applicant should undertake sightline improvements at the intersection to provide the necessary sight distances, prior to occupancy.*

**Response:** **The Applicant will undertake the necessary improvements at the Wheeler Street/Wheeler Road intersection to improve sight lines prior to the issuance of Certificate of Occupancy for the Project subject to receipt of all necessary rights, permits and approvals.**

### **TIA Recommendations**

**Comment 19:** *The specific elements of the circulation related comments listed above should be incorporated into the site plans. Additional recommendations related to the site circulation design are provided in the next section.*

**Response:** *The recommendations provided in the July 2024 TIA Update will be added to the Site Plans and submitted by others under separate cover.*

**VHB Follow-Up:** *VHB will review the detailed site plan package when it becomes available. Since the plans are not available to review at this time, this comment is carried forward through the remaining comments and responses related to elements of the site design.*

**Response:** **Updated Site Plans will be provided by others under separate cover that will include the recommendations provided in the July 2024 TIA Update and as amended herein.**

**Comment 20:** *VHB recommends that the Applicant develop Transportation Demand Management (TDM) plan for the Site, including partnering with the Merrimack Valley Transportation Management Association (MVTMA) and exploring the potential for peak hour commuter shuttles for residents to the Lowell Commuter Rail station, to reduce the Project's overall traffic impact.*

**Response:** *The July 2024 TIA Update includes a comprehensive TDM program for the Project that includes joining the MVTMA. The Project proponent will discuss with the MVTMA opportunities to establish a peak-hour shuttle for residents of the Project that would be operated by the MVTMA, the Merrimack Valley Transit (MeVa) or the Lowell Regional Transit Authority (LRTA).*

**VHB Follow-Up:** *The revised TIA included a proposed TDM program for the Project. Some of the elements of the TDM program are related to the site design such as including pedestrian accommodations through the site, electric vehicle (EV) charging station,*

*and bicycle storage. Future site plan submissions should indicate the location and quantity of EV charging stations, bicycle storage facilities, and pedestrian facilities.*

**Response:** Updated Site Plans will be provided by others under separate cover that will include the location and quantity of EV charging station, bicycle storage facilities and pedestrian facilities.

### Off-Site Recommendations

*Comment 21:* *VHB agrees with the above measures and recommends that they be implemented by the Applicant as part of the Project.*

**Response:** No response required.

*Comment 22:* *In addition to the recommendations listed above from the TIA, VHB recommends that the following additional measures be reviewed and incorporated into the Project mitigation if warranted:*

- › *Review the need for a marked stop line on the Wheeler Street approach to Route 113.*
- › *Perform a left turn lane warrant analysis for the Route 113 westbound approach to Wheeler Street, with and without the Project generated traffic.*
- › *Determine if double-yellow longitudinal centerline pavement markings and traffic regulatory signage will be necessary along Wheeler Street, Wheeler Road, Wilshire Circle, Elizabeth Drive, Rinzee Road, and Poppy Lane to provide additional guidance for the added traffic on these roadways.*
- › *Review the need for a stop line and stop sign on the Elizabeth Drive approach to Wilshire Circle.*
- › *Review the need for intersection ahead (W2-2 and W16-9P) signage on the Wheeler Road northbound and southbound approaches to Rinzee Road.*
- › *Comment on the night time lighting/visibility conditions at the site access points along Wheeler Road and Wheeler Street.*

*Response:* *The transportation improvement program for the Project that is presented in the July 2024 TIA Update has been expanded to include a number of the suggested measures. We do not recommend the installation of centerline pavement markings along Wilshire Circle, Elizabeth Drive, Rinzee Road or Poppy Lane as these roadways will continue to be low volume roads and would not meet the standards for the installation of centerline markings. Similarly, the traffic volumes along Wheeler Road and Wheeler Street would also not meet the centerline pavement marking standards; however, we have recommended that centerline pavement markings be provided on the approaches to Route 110 and Route 113.*

*A review of the intersection geometry, available right-of-way and adjacent roadway topography at the Route 113/Wheeler Street intersection indicates that a left-turn lane cannot be accommodated on the Route 113 westbound approach. That being said, the traffic operations analysis for the intersection does not indicate that the absence of a turn lane is materially impeding westbound through traffic.*



*A review of the motor vehicle crash data for the study area intersections does not indicate that roadway lighting conditions are a primary contributing factor in the reported motor vehicle crashes. As such, the decision to install street lighting on a public road will be determined by the municipality as they are responsible for the energy charges.*

**VHB Follow-Up:** *The response indicates that the projected volume of traffic on the roadways do not meet the standards for installation of centerline markings. It is noted that the MUTCD Section 3B.01 has an optional reference that says that “center line markings may be placed on other paved two-way traveled ways that are 16 feet or more in width.” The overall development is estimated to generate approximately 2,000 vehicle trips per day, of which approximately 50% will be oriented to/from Elizabeth Drive and the remaining 50% to/from Rinzee Road. While adding marking on the referenced streets (Wilshire Court, Elizabeth Drive and Rinzee Road) are subject to engineering judgement, and noted as an option in the MUTCD, the Applicant should confirm that the increase in the ADT of 1,000 vehicle trips per day on streets that currently serve fewer than 30 single family homes, do not justify the application of new centerline markings and shoulder markings.*

*The Applicant should commit to installing centerline pavement markings and updated stop lines along the Wheeler Street approaches to Route 113 and Route 110. The centerline pavement marking should extend for a minimum of 100 feet to delineate the directions of travel at the intersection.*

*The Applicant should also commit to implementing the recommended improvements listed in the revised TIA at the intersections of Wheeler Road at Wilshire Circle and Paddock Lane, Route 110 at Wheeler Street, Wheeler Road at Wilshire Circle (east location), Wheeler Street at Rinzee Road, and Wilshire Circle at Elizabeth Drive.*

*The Applicant should also review the need for installing a stop sign and stop line along the Rinzee Road approach to Poppy Lane, considering that the intersection will provide one of the two primary access points to the site. If it is determined that there is a need for these improvements, they should commit to installing the stop sign and stop line.*

*The Applicant did not prepare a left-turn lane warrant analysis at the intersection of Route 113/Wheeler Street as part of the revised TIA. Notwithstanding the availability of right of way to construct a left turn lane, it is recommended that the Applicant prepare the turn lane warrant analysis with and without the project. Additionally, it is recommended that the sight distance in the westbound direction, along the curve in the road, be measured as vehicles traveling westbound on Route 113 may approach vehicles stopped in the single lane on a relatively sharp bend in the road.*

*When improvements within MassDOT’s state highway layout are necessary and certain thresholds related to land disturbance/impervious area are exceeded, MEPA review may be necessary for the project. The Applicant should confirm if MassDOT and MEPA will be consulted to determine the scope of their jurisdiction on the project after the scope of off-site improvements for the project are identified.*



**Response:** As indicated in response to Comment 14, Rinzee Road, Poppy Lane, Wilshire Circle, and Elizabeth Drive provide sufficient width (approximately 30-feet) to accommodate two-way traffic and occasional on-street parking that is and will continue to be indicative of low-volume residential roadways. The installation of centerline pavement markings along these roadways is not recommended given that the roadways will continue to be low volume roads (less than 2,000 vehicles per day) in a slow speed residential neighborhood setting with on-street parking. A review of the alignment of these roadways also does not indicate that modifications are necessary to accommodate the predicted increase in traffic that may be associated with the Project. That being said, safety and mobility improvements have been suggested that will be designed and constructed as a part of the project subject to receipt of all necessary rights, permits and approvals.

The Applicant will commit to the design and construction of the following improvements that were identified in the July 2024 TIA Update or as a part of VHB's Peer Review prior to the issuance of a Certificate of Occupancy for the Project subject to receipt of all necessary rights, permits and approvals and to the extent desired by the Town of Dracut or the City of Methuen, as appropriate:

➤ **Route 113 at Wheeler Street**

Remove the existing STOP-sign on the Wheeler Street approach from the utility pole and install a new STOP-sign on a break-away sign post with a marked STOP-line adjacent to the new STOP-sign.

➤ **Route 110 at Wheeler Street**

Reapply the STOP-line, centerline and crosswalk pavement markings on the Wheeler Street approach to Route 110. The centerline pavement markings will extend for a distance of 100 feet.

➤ **Wheeler Road at Wilshire Circle and Paddock Lane**

- Install new, 12-inch wide, high-visibility STOP-lines on the Wilshire Circle and Paddock Lane approaches;
- Replace and relocate the STOP-sign on the Wilshire Circle approach adjacent to the new STOP-line;
- Install a STOP-sign on the Paddock Lane approach adjacent to the new STOP-line; and
- Install intersection ahead (W2-1 and W16-9P) signs on the Wheeler Road eastbound approach to the intersection in advance of the curve to the west of the intersection to include yellow reflective tape on the sign post.

➤ **Wheeler Road at Wilshire Circle**

Install a marked STOP-line on the Wilshire Circle approach to Wheeler Road adjacent to the STOP-sign.



➤ **Wheeler Street at Rinzee Road**

Install a STOP-sign and marked STOP-line on the Rinzee Road approach to Wheeler Road.

➤ **Wilshire Circle at Elizabeth Drive**

Install a STOP-sign and marked STOP-line on the Elizabeth Drive approach to Wilshire Circle.

➤ **Rinzee Road at Poppy Lane**

Install a STOP-sign and marked STOP-line on the Rinzee Road approach to Poppy Lane.

See response to Comment 16 regarding the results of the left-turn lane warrants analysis performed at the Route 113/Wheeler Street intersection.

A sight distance plan has been prepared and is attached for the Route 113/Wheeler Street intersection that includes a review of the stopping sight distance (SSD) for a vehicle traveling westbound on Route 113 approaching Wheeler Street. Vehicle travel speeds measured along Route 113 at Wheeler Street in November 2024 indicate that the 85<sup>th</sup> percentile vehicle travel speed is 42 mph in the westbound direction, which was used to complete the sight distance evaluation. We note that the posted speed limit on Route 113 approaching Wheeler Street is 35 mph. As can be seen on the sight distance plan, a portion of the stopping sight distance sight line extends outside of the public right-of-way. As such and as noted in response to Comment 7 and independent of the Project, the Applicant will work with the City of Methuen, MassDOT and the property owners adjacent to the intersection to establish sight line easements to allow for future vegetation maintenance to the extent necessary.

### **Parking and Site Plan Review**

*Comment 23: As previously noted, the site plans should include additional details based on the specific circulation comments included in this review.*

*Response: Revised Site Plans will be provided by others under separate cover and will reflect the recommendations provided in the July 2024 TIA Update and those identified as a part of this response.*

*VHB Follow-Up: The new overall site plan exhibit indicates that some areas of the development can only be accessed via a single access/egress point from the main site driveway that runs between Poppy Lane and Elizabeth Drive. Consideration should be given to an internal roadway layout that allows more than one access/egress point for these areas. The Applicant should also get confirmation from the Town of Dracut fire and police departments that adequate emergency access is available throughout the site.*

*Response: Response to be provided by others under separate cover.*



**Comment 24:** *Comment on the viability of extending Poppy Lane to Wheeler Street to provide an additional point of access/egress for the development.*

**Response:** *The City of Methuen has stated that they do not approve of the extension of Poppy Lane to Wheeler Street.*

**VHB Follow-Up:** ***Comment resolved.***

**Response:** **No response required.**

**Comment 25:** *The recommendations provided in the TIA related to roadway widths, drive aisles, pavement markings, and signage should be reflected in the site plans.*

**Response:** *The recommendations provided in the July 2024 TIA Update will be added to Site Plans and will be provided by others under separate cover.*

**VHB Follow-Up:** ***VHB will review the updated site plan package when it becomes available.***

**Response:** **The updated Site Plans will be provided by others under separate cover.**

**Comment 26:** *Stop signs and lines should be installed along the minor approaches at internal intersections on the site, where appropriate.*

**Response:** *STOP-signs and STOP-lines will be provided at internal intersections within the Project site where appropriate and will be shown on the revised Site Plans that will be submitted by others under separate cover.*

**VHB Follow-Up:** ***VHB will review the updated site plan package when it becomes available.***

**Response:** **The updated Site Plans will be provided by others under separate cover.**

**Comment 27:** *Traffic calming measures should be considered on the Site in areas where the geometry may promote increased speed to travel, for example in the vicinity of the clubhouses depicted on the schematic site plan exhibit and on relatively long sections of the driveways without any interruptions.*

**Response:** *The installation of traffic calming measures will be considered as appropriate locations within the Project site to promote slower travel speeds.*

**VHB Follow-Up:** ***VHB will review the updated site plan package when it becomes available.***

**Response:** **The updated Site Plans will be provided by others under separate cover.**

**Comment 28:** *Lighting along the main driveways should take into consideration illumination needs at internal intersections and pedestrian crossing areas.*

**Response:** *Lighting fixtures will be placed at specific locations within the Project site to illuminate intersections and pedestrian crossings.*



**VHB Follow-Up:** *VHB will review the updated site plan package when it becomes available.*

**Response:** **The updated Site Plans will be provided by others under separate cover.**

**Comment 29:** *Locations and dimensions of sidewalks, crosswalks, and curb ramps for continuous pedestrian connectivity should be shown on the site plans. Further, pedestrian connectivity should be provided to the public rights-of-way along Poppy Lane, Elizabeth Drive, and Wheeler Street.*

**Response:** *The revised Site Plans to be provided by others under separate cover will include dimensions of pedestrian accommodations within the site and will detail the connections to the existing pedestrian infrastructure along Poppy Lane and Elizabeth Drive.*

**VHB Follow-Up:** *VHB will review the updated site plan package when it becomes available.*

**Response:** **The updated Site Plans will be provided by others under separate cover.**

**Comment 30:** *A total of 600 parking spaces are proposed for the 300 residential units. The TIA indicated that the parking is in compliance with Section 3.10.24 of the Town's Zoning By-Laws. The Applicant should provide confirmation that the parking supply would satisfy the operational demand of a development comprised of 100-percent 4-bedroom units.*

**Response:** *As stated previously, the development program for the Project has been reduced to 268 units and will include a conventional mix of 1, 2 and 3-bedroom units.*

**VHB Follow-Up:** *The Applicant should provide a discussion of the adequacy of parking for various portions of the site. The TIA noted that the project will have a minimum parking ratio of 2.0 spaces per unit. However, it is not clear if the 2.0 ratio is maintained consistently throughout the site or if some areas are over/under parked. Under parked areas, if they exist, will require residents to walk to another portion of the site to access additional parking, which may not be a convenient solution. A plan showing areas that will be under parked, and pedestrian routing to the remote parking areas where the deficiency will be made up, should be prepared.*

**Response:** **An annotated site plan illustrating the distribution of parking within the Project site and identifying the pedestrian infrastructure will be provided by others under separate cover.**

**Comment 31:** *Prepare vehicle turning templates for the largest emergency vehicle for the Town of Dracut and coordinate with the Dracut Fire Department to ensure adequate emergency/public safety access throughout the site. If intermunicipal agency emergency support is provided to the site, the site design should be adjusted where needed to accommodate City of Methuen emergency apparatus.*

**Response:** *A vehicle turning analysis will be prepared for the Dracut and Methuen Fire Department design vehicles and will be provided by others under separate cover.*

**VHB Follow-Up:** *VHB will review the vehicle turning templates when they become available.*



**Response:** **The requested vehicle turning analysis will be provided by others as a part of the updated Site Plans under separate cover.**

*Comment 32: VHB recommends that the Applicant commit to providing electric-vehicle (EV) charging stations as well as EV-ready spaces on the site, both to meet the new building code requirements as well as to make the site future-ready. The exact number of EV and EV-ready spaces and how they are distributed throughout the site should be reviewed with town staff.*

*Response: The Project proponent will discuss the installation of EV charging stations within the site, the number of stations to be installed and the location within the Project site with Town staff.*

**VHB Follow-Up:** **Updated site plans should show the number and location of EV charging stations.**

**Response:** **The updated Site Plans will be provided by others under separate cover and will indicate the location and number of EV charging stations.**

*Comment 33: Provide a discussion of traffic control measures that may be appropriate to discourage vehicles from using the site as a cut-through route between Wheeler Street and Wheeler Road.*

*Response: The Project proponent will consider the installation of speed bumps within the Project site as a means to dissuade local traffic from using the Project site roadway to travel between Wheeler Street and Wheeler Road.*

**VHB Follow-Up:** **The specific traffic control measures should be identified on the updated site plans.**

**Response:** **Updated Site Plans will be provided by others under separate cover that will identify the location of any proposed traffic calming measures within the site.**

*Comment 34: School bus access to/from the site should be outlined, and necessary accommodations for on-site bus stop(s) and turnarounds should be reviewed.*

*Response: The Applicant will discuss school bus access to the Project site and any necessary accommodations with the Dracut School Department.*

**VHB Follow-Up:** **The Applicant should provide an update on coordination with the Dracut School Department, and show locations of bus stops that will serve the development.**

**Response:** **The Applicant has not yet discussed school bus access with the Dracut School Department. Once these discussions have occurred, the Site Plans will be revised if necessary to reflect school bus stop locations.**

*Comment 35: Describe site operations and policies related to trash/recycling, move-in/move-out, mail and package deliveries, pick-up/drop-off, TNCs (Uber & Lyft) and snow storage. Specific areas for each activity should be identified on the site plans, where appropriate.*

**Response:** *Residents will place trash and recycling in totes that will be wheeled by the resident curbside for collection similar to the collection program for a single-family home.*

*Resident moves will be scheduled in advance with the property manager who will provide directions to the loading areas within the Project site. These areas will be curbside or entail temporary use of parking spaces that will be designated by the placement of cones or other devices by building management staff on the day that the move is scheduled or in designated loading/delivery spaces located throughout the site. The location of these areas will be shown on the revised Site Plans that will be provided by others under separate cover.*

*Mail and package deliveries will be provided in a central location(s) within the Project site.*

*Resident pick-up and drop-offs will take place in designated short-term parking spaces of a loading zone that will be established for each building or collection of buildings where appropriate. These areas will be shown on the revised Site Plans that will be provided by others under separate cover.*

*Snow storage areas will be shown on the revised Site Plans that will be provided by others under separate cover.*

**VHB Follow-Up:** *Comment resolved. The updated site plans should show the snow storage areas.*

**Response:** **Updated Site Plans will be provided by others under separate cover and will show the location of snow storage areas within the Project site.**

#### Additional Comments

**Comment 36:** *The updated site plan shows a total of 23 parking spaces near Buildings 1A and 2A that are perpendicular to the main roadway that travels through the site between Poppy Lane and Elizabeth Drive. It is recommended that the Applicant review alternative parking configurations to reduce conflicts between vehicles marking parking maneuvers and vehicles traveling along the main driveway.*

**Response:** *A review of alternative parking configurations will be undertaken as a part of the updated Site Plans that will be submitted by others under separate cover.*

**Comment 37:** *Based on information presented in the TIA, approximately 30 percent of the site-generated traffic will use this intersection of Route 110 at Wheeler Street. It is recommended that the Applicant prepare a Traffic Signal Warrants Analysis (TSWA) at the intersection of Route 110 at Wheeler Street to determine if the installation of a traffic signal is warranted.*

**Response:** *A TSWA was conducted for intersection of Route 110 at Wheeler Street using the methodology described in the July 2024 TIA Update under the following design conditions and using data collected as a part of a 12-hour TMC that was performed on October 30<sup>th</sup>, 2024:*



- **Design Speed:** >40 mph
- **Traffic Volumes:**<sup>2</sup>
  - 2024 Existing conditions
  - 2024 Build conditions
- **Geometry:**
  - **Route 110 Northbound Approach:** 1 left-turn/through travel lane
  - **Route 110 Southbound Approach:** 1 through/right-turn travel lane
  - **Wheeler Street Eastbound Approach:** 1 left-turn/right-turn travel lane

Table 12A summarizes the results of the TSWA for the subject intersection, with the detailed TSWA worksheets and supporting materials attached.

**Table 12A**  
**TRAFFIC SIGNAL WARRANTS ANALYSIS**  
**ROUTE 110 AT WHEELER STREET**

Warrant No.	Description	Analysis Condition	
		2024 Existing	2024 Build
		Satisfied?	Satisfied?
1	Eight-Hour Vehicular Volume	Yes	Yes
2	Four-Hour Vehicular Volume	Yes	Yes
3	Peak Hour <sup>a</sup>	Yes	Yes
4	Pedestrian Volume	No	No
5	School Crossing	No	No
6	Coordinated Signal System	No	No
7	Crash Experience	No	No
8	Roadway Network	No	No
9	Intersection Near a Grade Crossing	No	No

<sup>a</sup>Warrant 3 is evaluated when the need for the installation of a traffic control signal is intended to accommodate a peak traffic flow condition during a distinct period or periods of the day, such as a school, factory, or industrial use, where there is a significant peak traffic demand during a distinct hour(s) of the day. Warrant 3 does not apply to the subject intersection.

**As can be seen in Table 12A, the Route 110/Wheeler Street intersection was found to satisfy Warrant 1, *Eight-Hour Vehicle Volume*, Warrant 2, *Four-Hour Vehicle Volume*, and Warrant 3, *Peak-Hour*, under 2024 Existing and 2024 Build conditions.**

**To the extent so desired by the Town, the Applicant is willing to provide funding to the Town on a proportionate basis for the design and construction of a traffic control signal at the Route 110/Wheeler Street intersection based on the**

<sup>2</sup>October 2024 traffic volumes were not adjusted to average-month conditions consistent with MassDOT guidelines for counts that were conducted during a year in which a Weekday Seasonal and Axle Correction Factors File is not published. (*Traffic and Safety Engineering 25% Design Submission Guidelines*; MassDOT; Revised March 31, 2022.)

**predicted increase in traffic that the Project represents at the intersection over No-Build conditions (i.e., a “fair-share” cost allocation).**

**Comment 38:** *While not a subdivision road, the main driveway connecting Poppy Lane and Elizabeth Drive would generally function as a “Neighborhood Street”<sup>3</sup> as defined in the regulations. Neighborhood streets should have a maximum of 26 feet of paved width, maximum grades of 8% for no longer than 300 feet, minimum centerline radii of 200 feet, and maximum curb radii of 30 feet. The regulations also state that traffic calming measures and bicycle lanes on these types of roadways may be required by the Planning Board for neighborhood streets. The Applicant should consider the usage of traffic calming measures throughout the site, especially on the main driveway through the site, as stated in Comment 27. The Applicant should also consider the usage of sharrows on the main roadway for bicycle accommodations. The roadway and sidewalk design requirements for neighborhood streets in the subdivision regulations should be reviewed, and instances where the proposed main driveway does not meet requirements related to adequacy of multimodal accommodations should be identified.*

**Response:** To the extent so directed by the Zoning Board of Appeals (ZBA), the Applicant will install traffic calming measures such as speed humps or raised intersections within the Project. The installation of “sharrow” pavement markings on low volume, slow speed residential roadways is not common; however, the pavement markings can be added if desired by the ZBA. The roadway network within the Project site has been designed to accommodate all roadway users in a manner that is consistent with a low volume, slow speed residential roadway, and consistent with the residential roadways to which the Project will connect.

We trust that this information is responsive to the comments that were identified in the September 12, 2024 memorandum prepared by VHB concerning their latest review of the Project. If you should have any questions or would like to discuss our responses in more detail, please feel free to contact me.

Sincerely,

VANASSE & ASSOCIATES, INC.



Jeffrey S. Dirk, P.E., PTOE, FITE  
Managing Partner

*Professional Engineer in CT, MA, ME, NH, RI, and VA*

JSD/dcl

Attachments

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<sup>3</sup>Page 60 of 105, *Rules and Regulations Governing the Subdivision of Land in Dracut, Massachusetts*.

## Attachments

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Collision Diagrams (Figures CD1 and CD2)

Route 113 at Wheeler Street Left-Turn Lane Warrants Analysis

Route 113 at Wheeler Street Sight Distance Figure

Route 110 at Wheeler Street Traffic Signal Warrants Analysis

Collision Diagrams (Figures CD1 and CD2)

**Legend:**



Personal Injury



**Figure CD1A**

**Collision Diagram**  
**North Lowell Street (Route 113)**  
**at Wheeler Street**

CRASH TYPE				Severity	Road Surface (R/S)			Weather (W)	No. Of VEHICLES
Angle (A)	Unknown (U)	Turning Movement (TM)	Backing Up (BU)		Head On (HO)	Lane Change (LC)	Out of Control (OC)		
Angle (A)	Unknown (U)	Turning Movement (TM)	Backing Up (BU)	PD	5	6	OC	1	
Rear End (RE)				PD	1	1	A	2	
Head On (HO)				PD	1	1	SS	3	
Fixed Object (FO)				PD	2	2	RE	2	
Side Swipe (SS)				PD	1	1	RE	2	
				PI	1	1	A	2	
				PD	1	1	FO	1	
				PD	2	3	RE	2	
				PD	2	2	RE	2	
				PI	1	1	RE	2	
				PD	1	1	RE	2	

Figure CD1B



**Collision Diagram**  
**North Lowell Street (Route 113)**  
**at Wheeler Street**

Legend:



Personal Injury



Figure CD2A



Collision Diagram  
Wheeler Road at  
Wilshire Circle and  
Paddock Lane

CRASH TYPE		Severity	Road Surface (R/S)		Weather (W)			
Angle (A)	Unknown (U)	PD = Property Damage Only						
	Turning Movement (TM)	PI = Personal Injury						
Rear End (RE)	Backing Up (BU)	F = Fatality						
Head On (HO)	Lane Change (LC)	U = Unknown						
Fixed Object (FO)	Out of Control (OC)		1 = Dry	1 = Clear				
Side Swipe (SS)	Pedest./Bicycle (P/B)		2 = Wet	2 = Cloudy				
			3 = Snowy	3 = Rain				
			4 = Icy	4 = Snow				
			5 = Unknown	5 = Other				
			6 = Slush	6 = Unknown				
CRASH #	DATE	DAY	TIME	SEV.	R/S	W	CRASH TYPE	No. Of VEHICLES
1	06/23/2022	Thursday	8:24 PM	PD	5	6	FO	1

Figure CD2B



**Collision Diagram**  
**Wheeler Road at**  
**Wilshire Circle and**  
**Paddock Lane**

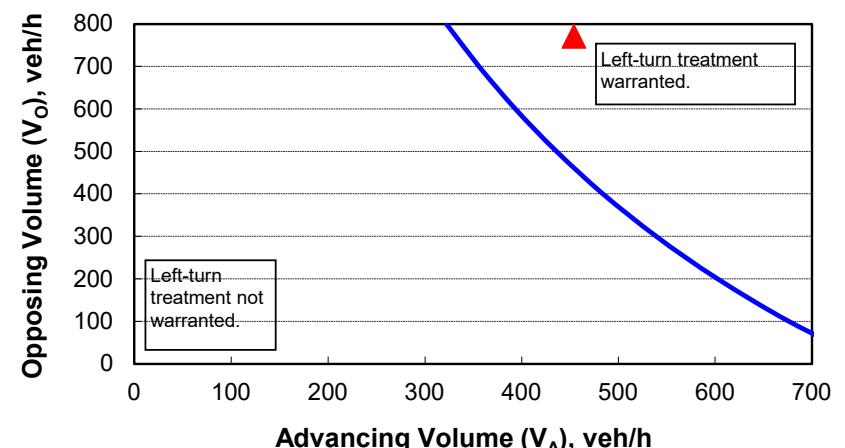
## Route 113 at Wheeler Street Left-Turn Lane Warrants Analysis

**Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.****2-lane roadway (English)****INPUT**

Variable	Value
85 <sup>th</sup> percentile speed, mph:	40
Percent of left-turns in advancing volume ( $V_A$ ), %:	6%
Advancing volume ( $V_A$ ), veh/h:	454
Opposing volume ( $V_O$ ), veh/h:	771

**OUTPUT**

Variable	Value
Limiting advancing volume ( $V_A$ ), veh/h:	332
<b>Guidance for determining the need for a major-road left-turn bay:</b>	
<b>Left-turn treatment warranted.</b>	

**CALIBRATION CONSTANTS**

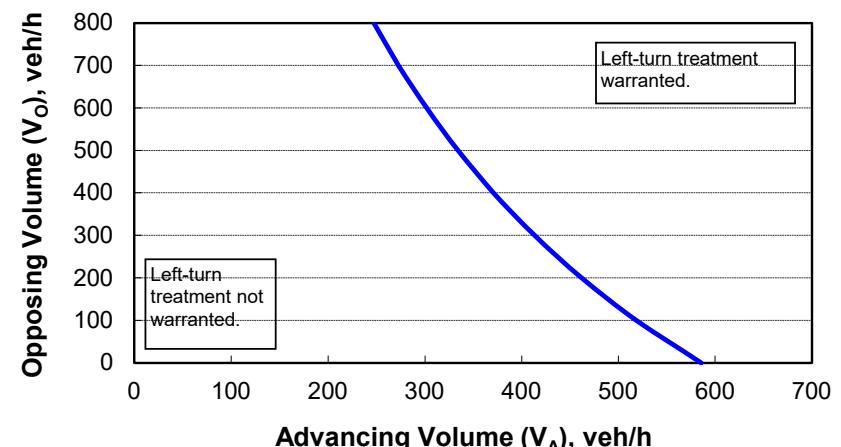
Variable	Value
Average time for making left-turn, s:	3.0
Critical headway, s:	5.0
Average time for left-turn vehicle to clear the advancing lane, s:	1.9

**Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.****2-lane roadway (English)****INPUT**

Variable	Value
85 <sup>th</sup> percentile speed, mph:	40
Percent of left-turns in advancing volume ( $V_A$ ), %:	10%
Advancing volume ( $V_A$ ), veh/h:	1006
Opposing volume ( $V_O$ ), veh/h:	594

**OUTPUT**

Variable	Value
Limiting advancing volume ( $V_A$ ), veh/h:	304
<b>Guidance for determining the need for a major-road left-turn bay:</b>	
<b>Left-turn treatment warranted.</b>	

**CALIBRATION CONSTANTS**

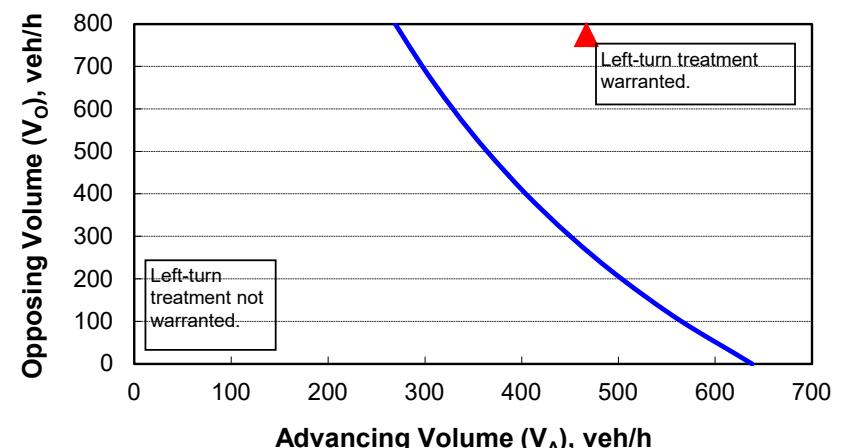
Variable	Value
Average time for making left-turn, s:	3.0
Critical headway, s:	5.0
Average time for left-turn vehicle to clear the advancing lane, s:	1.9

**Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.****2-lane roadway (English)****INPUT**

Variable	Value
85 <sup>th</sup> percentile speed, mph:	40
Percent of left-turns in advancing volume ( $V_A$ ), %:	8%
Advancing volume ( $V_A$ ), veh/h:	467
Opposing volume ( $V_O$ ), veh/h:	775

**OUTPUT**

Variable	Value
Limiting advancing volume ( $V_A$ ), veh/h:	276
<b>Guidance for determining the need for a major-road left-turn bay:</b>	
<b>Left-turn treatment warranted.</b>	

**CALIBRATION CONSTANTS**

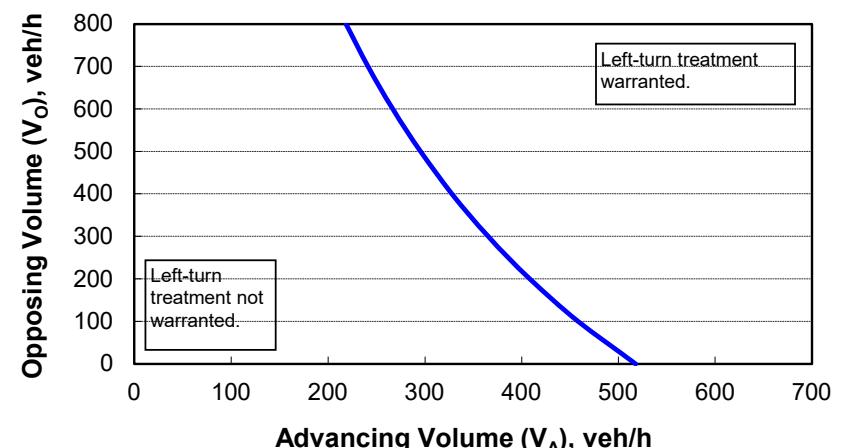
Variable	Value
Average time for making left-turn, s:	3.0
Critical headway, s:	5.0
Average time for left-turn vehicle to clear the advancing lane, s:	1.9

**Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.****2-lane roadway (English)****INPUT**

Variable	Value
85 <sup>th</sup> percentile speed, mph:	40
Percent of left-turns in advancing volume ( $V_A$ ), %:	13%
Advancing volume ( $V_A$ ), veh/h:	1043
Opposing volume ( $V_O$ ), veh/h:	604

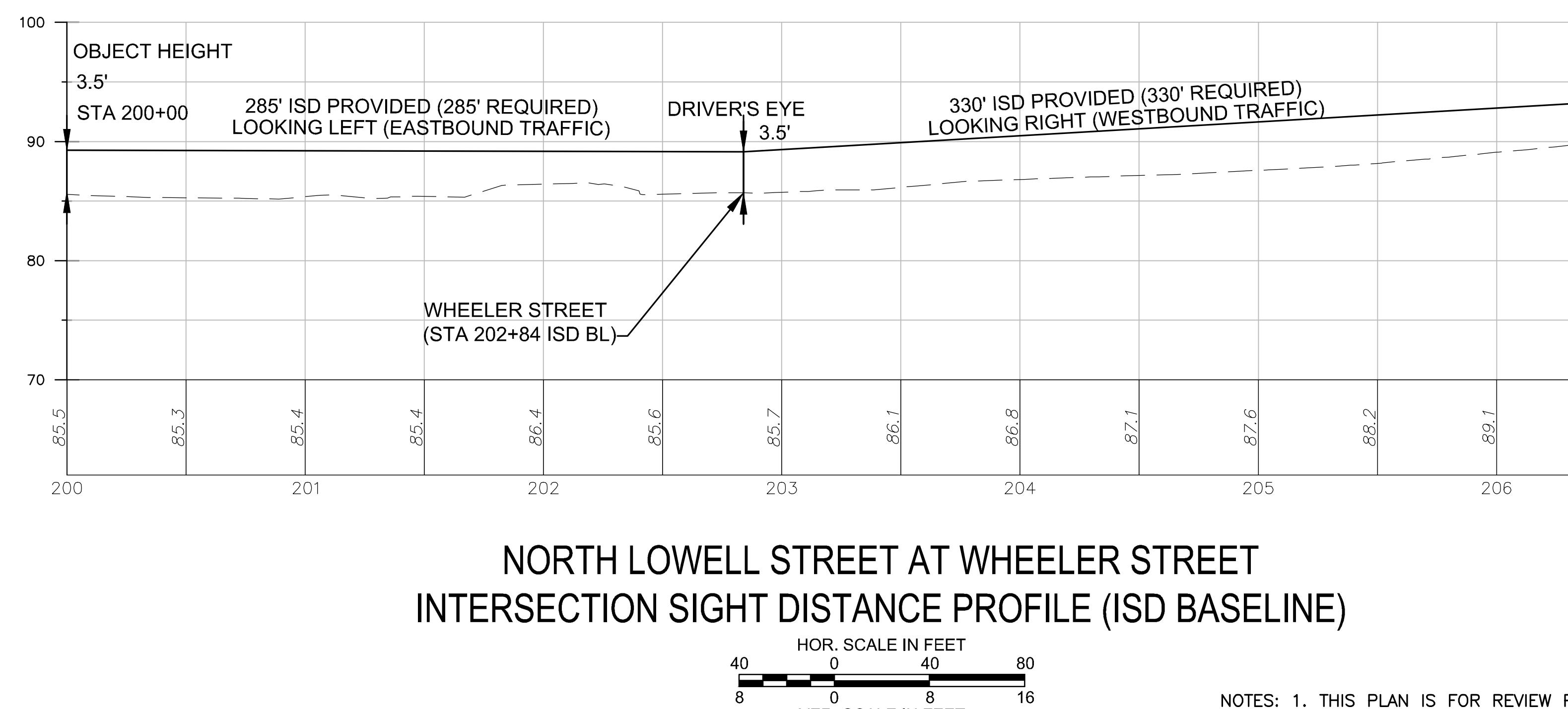
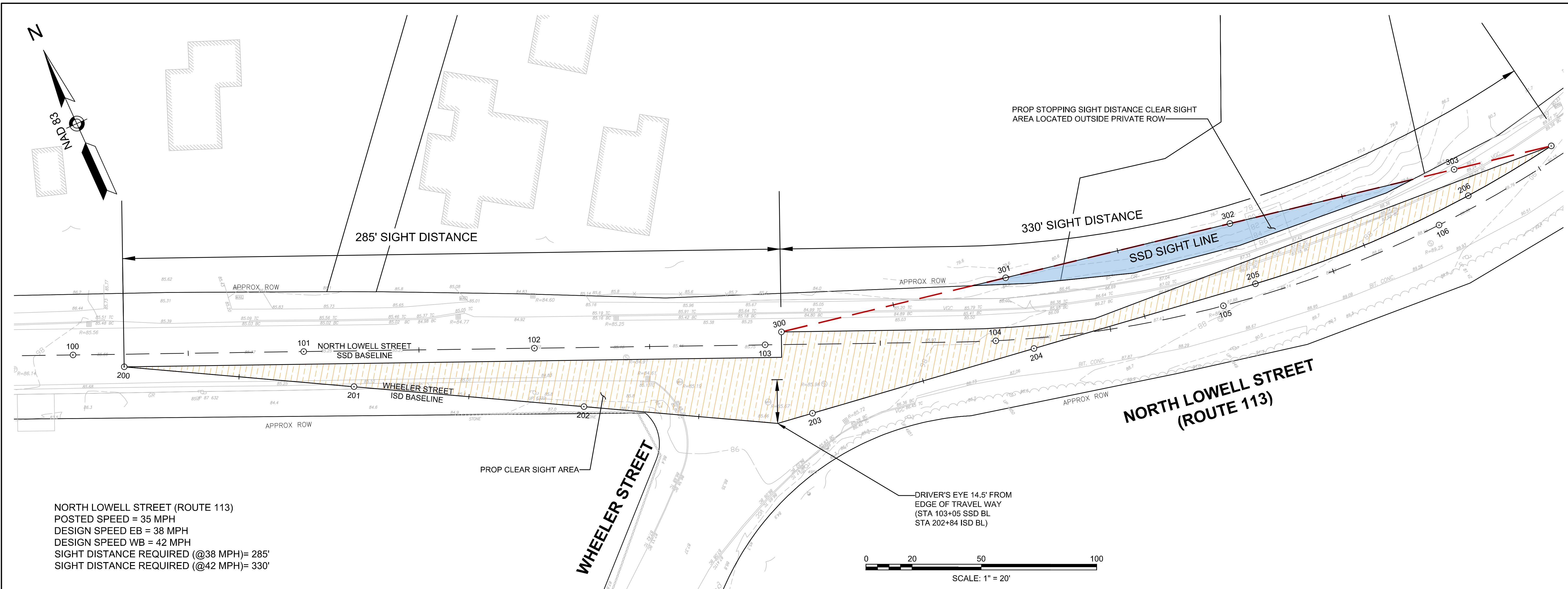
**OUTPUT**

Variable	Value
Limiting advancing volume ( $V_A$ ), veh/h:	266
<b>Guidance for determining the need for a major-road left-turn bay:</b>	
<b>Left-turn treatment warranted.</b>	

**CALIBRATION CONSTANTS**

Variable	Value
Average time for making left-turn, s:	3.0
Critical headway, s:	5.0
Average time for left-turn vehicle to clear the advancing lane, s:	1.9

Route 113 at Wheeler Street Sight Distance Figure



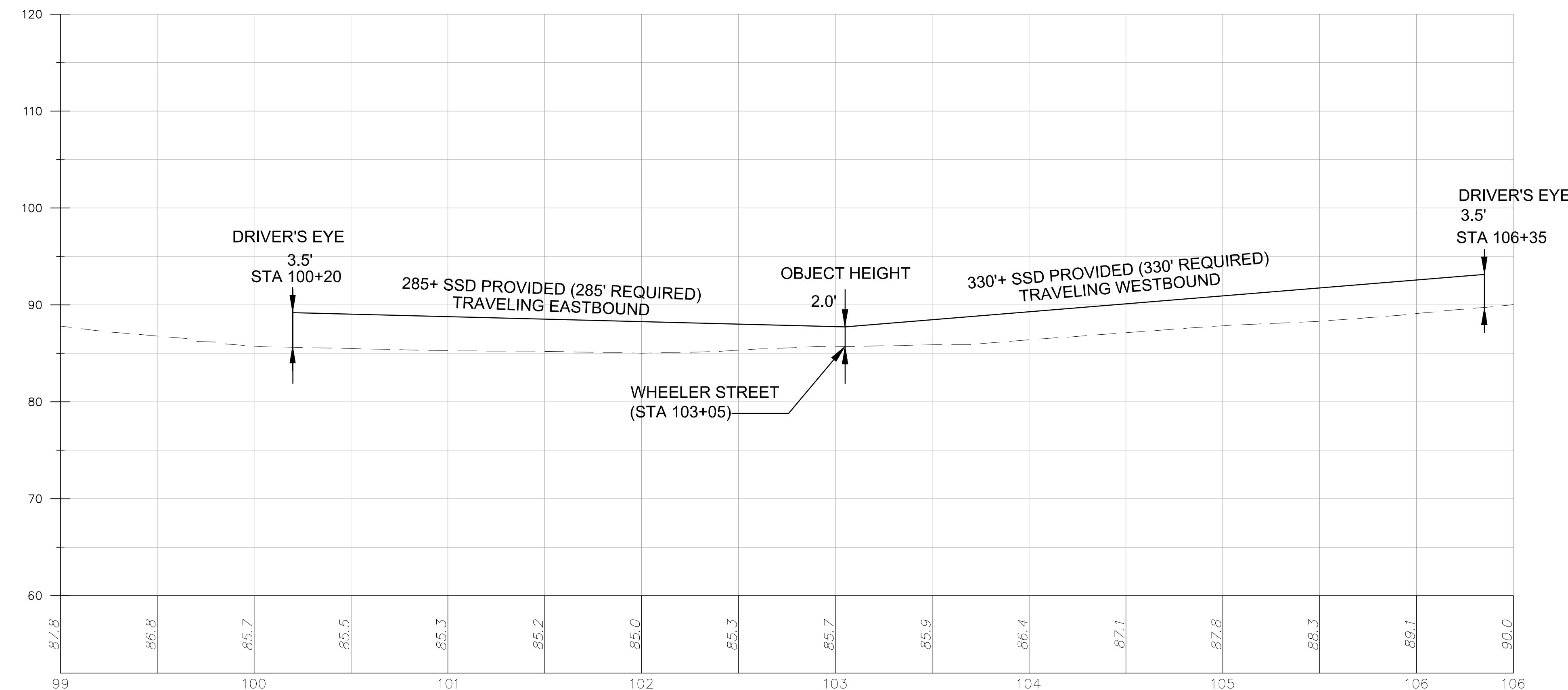
# NORTH LOWELL STREET (ROUTE 113) AT WHEELER STREET INTERSECTION SIGHT DISTANCE

PROJECT:  
**Proposed Multifamily Residential Development  
Dracut, Massachusetts**

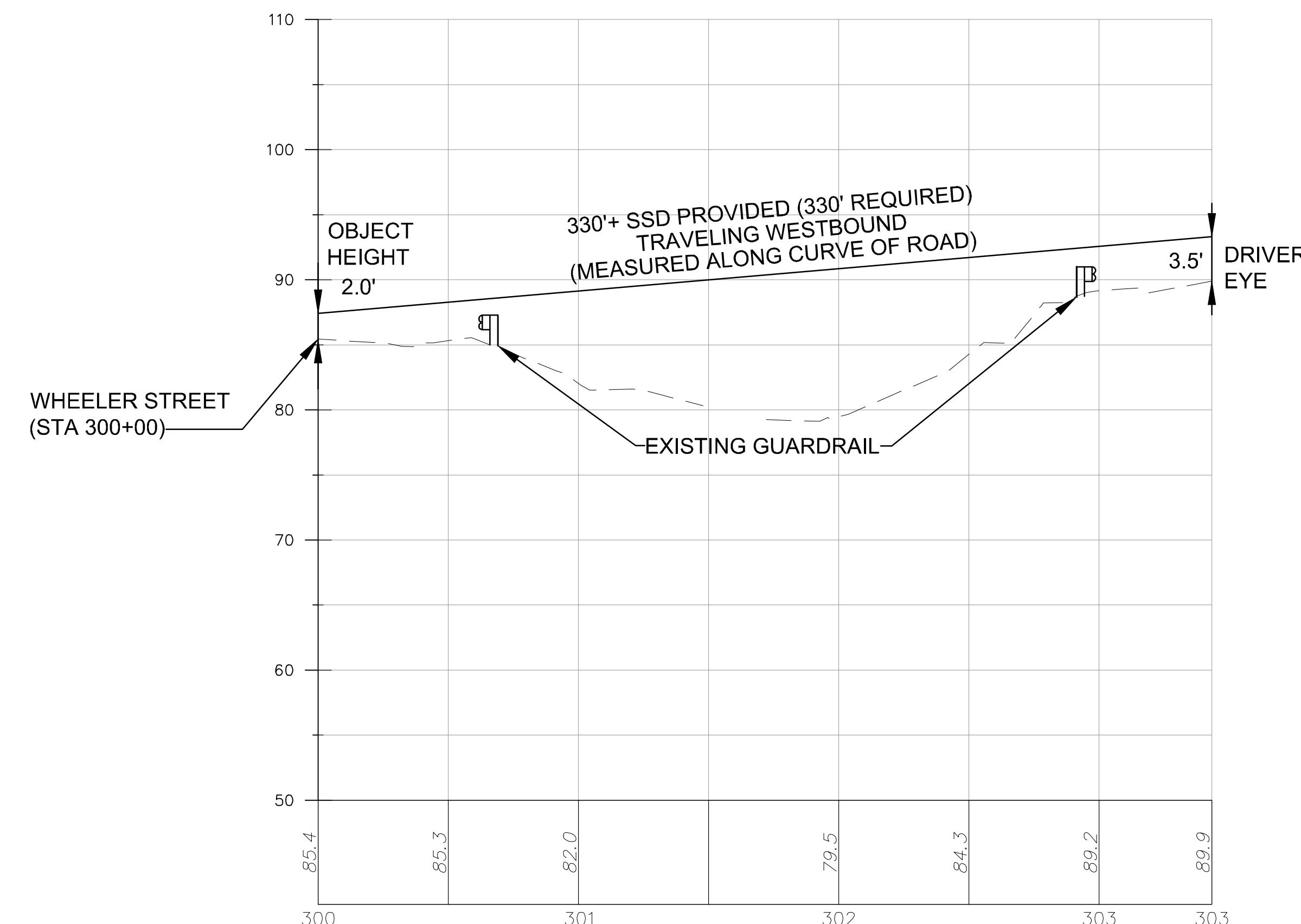
PROPOSAL, ANDOVER, MASSACHUSETTS  
PROPOSER: O'Brien Homes, Inc.  
Andover, Massachusetts

NO.	REVISIONS	DATE	 <b>Vanasse &amp; Associates inc</b> <b>Transportation Engineers &amp; Planners</b> 35 New England Business Center Drive – Suite 140 – Andover, MA 01810 <a href="http://www.rdfa.com">www.rdfa.com</a>	
			DESIGNED BY:	<b>TWO</b>
			DRAWN BY:	<b>TWO</b>
			CHECKED BY:	<b>IPC</b>
			SHEET 1	OF 2

NORTH LOWELL STREET (ROUTE 113)  
POSTED SPEED = 35 MPH  
DESIGN SPEED EB = 38 MPH  
DESIGN SPEED WB = 42 MPH  
SIGHT DISTANCE REQUIRED (@38 MPH)= 285'  
SIGHT DISTANCE REQUIRED (@42 MPH)= 330'



# NORTH LOWELL STREET AT WHEELER STREET STOPPING SIGHT DISTANCE PROFILE (SSD BASELINE)



# NORTH LOWELL STREET AT WHEELER STREET SSD SIGHT LINE PROFILE

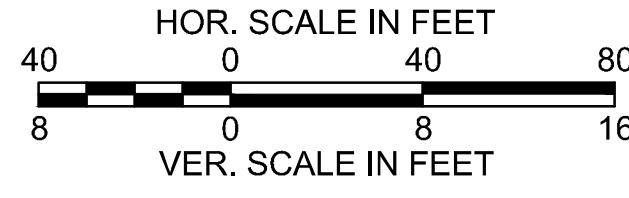
# NORTH LOWELL STREET (ROUTE 113) AT WHEELER STREET STOPPING SIGHT DISTANCE PROFILES

PROJECT:  
Proposed Multifamily Residential Development  
Dracut, Massachusetts

PROONENT:  
O'Brien Homes, Inc.  
Andover, Massachusetts

NO.	REVISIONS	DATE	 <b>Vanasse &amp; Associates inc</b> <b>Transportation Engineers &amp; Planners</b> 35 New England Business Center Drive – Suite 140 – Andover, MA 01810 <a href="http://www.rdfa.com">www.rdfa.com</a> 978-474-8800
			DESIGNED BY: TWO DATE: 12/03/24
			DRAWN BY: TWO SCALE: 1"=40'H;1"=8'V
			CHECKED BY: JPC SHEET 2 OF 2

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The logo for Vanasse & Associates inc. It features a stylized lowercase 'v' and 'a' in a dark red color, with a small circle above the 'a'. To the right of the logo, the company name 'Vanasse & Associates inc' is written in a serif font, with 'Vanasse &' on the first line and 'Associates inc' on the second line. Below the company name, the words 'Transportation Engineers & Planners' are written in a bold, dark red sans-serif font. At the bottom of the page, the address 'New England Business Center Drive – Suite 140 – Andover, MA 01811' is printed in a smaller, dark gray sans-serif font.

**Transportation Engineers & Planners**  
New England Business Center Drive – Suite 140 – Andover, MA 01810  
rdva.com 978-474-8800

GNED BY: TWO	DATE: 12/03/24
WN BY: TWO	SCALE: 1"=40'H; 1"=8'V
CKED BY: JPC	SHEET 2 OF 2

Accurate Counts  
978-664-2565

Locatio : Route 113  
Locatio : East of Whee er Street  
City/State: Methue MA  
Directio : E

Site Code: 74630001

11/23/2024	0 MPH	15 MPH	15 MPH	20 MPH	25 MPH	30 MPH	35 MPH	40 MPH	45 MPH	50 MPH	55 MPH	60 MPH	65 MPH	70 MPH	70 MPH	Total
12:00 AM	2	4	2	16	21	4	3	0	0	0	0	0	0	0	0	52
1:00	1	2	2	4	14	4	0	0	0	0	0	0	0	0	0	27
2:00	0	0	2	8	6	8	1	0	0	0	0	0	0	0	0	25
3:00	0	1	0	5	17	9	2	1	0	0	0	0	0	0	0	35
4:00	0	4	1	9	16	22	5	3	0	0	0	0	0	0	0	60
5:00	2	2	3	7	45	26	10	2	0	0	0	0	0	0	0	97
6:00	3	16	0	6	98	84	5	1	0	0	0	0	0	0	0	213
7:00	5	19	5	27	111	115	20	1	0	0	0	0	0	0	0	303
8:00	3	29	7	20	113	155	30	4	0	0	0	0	0	0	0	361
9:00	7	44	21	49	175	143	19	2	0	0	0	0	0	0	0	460
10:00	5	53	8	32	211	188	31	2	0	0	0	0	0	0	0	530
11:00	10	45	15	32	201	211	30	1	0	0	0	0	0	0	0	545
12:00 PM	9	45	2	16	133	237	45	5	0	0	0	0	0	0	0	492
1:00	4	39	5	33	197	210	41	5	0	0	0	0	0	0	0	534
2:00	6	33	7	28	159	231	37	2	0	0	0	0	0	0	0	503
3:00	6	49	10	33	163	214	37	6	0	0	0	0	0	0	0	518
4:00	7	44	12	32	174	164	22	1	1	0	1	0	0	0	0	458
5:00	2	48	7	42	183	166	20	3	0	0	0	0	0	0	0	471
6:00	3	24	10	49	164	109	32	6	0	0	0	0	0	0	0	397
7:00	1	26	3	15	118	101	27	1	1	0	0	0	0	0	0	293
8:00	3	15	3	20	85	97	26	3	1	0	0	0	0	0	0	253
9:00	1	13	5	11	94	71	13	5	0	1	0	0	0	0	0	214
10:00	1	11	1	17	60	56	26	2	0	0	0	0	0	0	0	174
11:00	1	8	2	13	29	27	8	3	1	0	0	0	0	0	0	92
Total	82	574	133	524	2587	2652	490	59	4	1	1	0	0	0	0	7107
Perce t tie			15th	50th	85th	95th										
Se ed		28		34	38	40										
Mea S (Avera e)			33.7													
10 MPH Pace S eed			31.40													
Nu er i Pace			5239													
Perce t i Pace			74.0													
Nu er 35 MPH			3207													
Perce t 35 MPH			45.1													

Accurate Counts  
978-664-2565

Location : Route 113  
Location : East of Wheeler Street  
City/State: Methuen MA  
Direction : E

Site Code: 74630001

Time	0 MPH	15 MPH	15 MPH	20 MPH	25 MPH	30 MPH	35 MPH	40 MPH	45 MPH	50 MPH	55 MPH	60 MPH	65 MPH	70 MPH	70 MPH	Total
12:00 AM	1	3	1	4	17	16	5	1	0	0	0	0	0	0	0	48
1:00	0	4	1	1	12	16	4	1	0	0	0	0	0	0	0	39
2:00	1	1	0	0	5	11	8	3	0	1	0	0	0	0	0	30
3:00	0	5	1	4	4	6	2	1	1	0	0	0	0	0	0	24
4:00	0	1	1	2	6	10	7	3	0	0	0	0	0	0	0	30
5:00	4	3	0	7	22	9	5	0	0	0	0	0	0	0	0	50
6:00	0	9	3	13	50	33	18	3	0	0	0	0	0	0	0	129
7:00	5	17	0	8	66	68	19	4	0	0	0	0	0	0	0	187
8:00	4	24	9	12	73	128	32	3	0	0	0	0	0	0	0	285
9:00	1	36	13	14	111	148	48	2	0	1	0	0	0	0	0	374
10:00	4	48	8	36	137	189	61	3	0	0	0	0	0	0	0	486
11:00	4	70	17	25	167	251	32	1	0	0	0	0	0	0	0	567
12:00 PM	3	44	11	29	138	213	43	2	1	0	0	0	0	0	0	484
1:00	5	42	7	38	141	172	40	1	0	0	0	0	0	0	0	446
2:00	3	35	11	21	144	191	31	3	2	0	0	0	0	0	0	441
3:00	4	25	11	22	91	173	52	5	2	0	0	0	0	0	0	385
4:00	3	29	7	31	173	141	25	4	0	0	0	0	0	0	0	413
5:00	3	22	7	39	126	139	22	1	0	1	0	0	0	0	0	360
6:00	1	30	4	25	124	97	26	1	0	0	0	0	0	0	0	308
7:00	5	16	9	38	73	48	16	1	0	0	0	0	0	0	0	206
8:00	4	17	9	22	55	40	4	1	0	0	0	0	0	0	0	152
9:00	0	2	7	29	43	36	13	0	0	0	0	0	0	0	0	130
10:00	3	4	4	10	39	19	4	1	0	0	0	0	0	0	0	84
11:00	0	2	1	8	22	13	3	2	0	0	0	0	0	0	0	51
Total	58	489	142	438	1839	2167	520	47	6	3	0	0	0	0	0	5709
	Percentile	15th	50th	85th	95th											
	Seed	27	34	38	41											
Mean Speed (Average)		33.8														
10 MPH Pace Speed		31.40														
Number Pace		3913														
Percentile Pace		70.0														
Number 35 MPH		2743														
Percentile 35 MPH		48.0														
Radius Total	140	1063	275	962	4426	4819	1010	106	10	4	1	0	0	0	0	12816
Stats	Percentile	15th	50th	85th	95th											
	Seed	28	34	38	40											
Mean Speed (Average)		33.7														
10 MPH Pace Speed		31.40														
Number Pace		9210														
Percentile Pace		72.0														
Number 35 MPH		5950														
Percentile 35 MPH		46.4														

Accurate Counts  
978-664-2565

Location : Route 113  
Location : East of Wheeler Street  
City/State: Methuen MA  
Direction : W

Site Code: 74630001

Time	0 MPH	15 MPH	15 MPH	20 MPH	25 MPH	30 MPH	35 MPH	40 MPH	45 MPH	50 MPH	55 MPH	60 MPH	65 MPH	70 MPH	70 MPH	Total
12:00 AM	2	10	3	7	18	55	32	3	0	0	0	0	0	0	0	130
1:00	0	4	0	1	5	23	20	8	2	0	0	0	0	0	0	63
2:00	0	1	2	0	5	12	21	4	1	0	0	0	0	0	0	46
3:00	0	1	2	2	1	16	11	3	0	0	0	0	0	0	0	36
4:00	0	0	0	3	8	10	14	4	0	0	0	0	0	0	0	39
5:00	0	0	0	2	19	36	18	2	0	0	0	0	0	0	0	77
6:00	2	4	1	1	16	45	26	2	0	0	0	0	0	0	0	97
7:00	4	8	4	8	28	72	58	11	1	0	0	0	0	0	0	194
8:00	8	15	8	5	28	109	80	7	0	0	0	0	0	0	0	260
9:00	26	12	19	8	67	152	71	8	0	0	0	0	0	0	0	363
10:00	32	26	20	44	72	176	100	10	0	0	0	0	0	0	0	480
11:00	20	32	29	52	65	229	111	9	1	0	0	0	0	0	0	548
12:00 PM	21	27	25	29	77	250	132	12	0	0	0	0	0	0	0	573
1:00	37	41	40	26	61	196	145	17	0	0	0	0	0	0	0	563
2:00	17	30	28	31	64	227	132	16	1	0	0	0	0	0	0	546
3:00	33	51	50	55	79	206	115	3	0	0	0	0	0	0	0	592
4:00	19	27	26	31	74	232	98	10	0	0	0	0	0	0	0	517
5:00	22	27	33	32	104	220	134	8	0	0	0	0	0	0	0	580
6:00	25	34	27	39	54	215	94	4	0	0	0	0	0	0	0	492
7:00	12	17	23	17	41	113	94	8	0	0	0	0	0	0	0	325
8:00	4	10	12	9	34	111	100	16	1	0	0	0	0	0	0	297
9:00	7	19	14	10	24	99	81	10	2	0	1	0	0	0	0	267
10:00	7	11	16	12	24	96	72	7	1	0	0	0	0	0	0	246
11:00	1	6	6	3	8	48	67	21	2	0	0	0	0	0	0	162
Total	299	413	388	427	976	2948	1826	203	12	0	1	0	0	0	0	7493
Percentile		15th	50th	85th	95th											
Speed	24	36	41	43												
Mean Speed (Average)	35.3															
10 MPH Pace Speed	36.45															
Number of Vehicles	4774															
Percentile Pace	64.0															
Number of 35 MPH	4990															
Percentile 35 MPH	66.6															

Accurate Counts  
978-664-2565

Location : Route 113  
Location : East of Wheeler Street  
City/State: Methuen MA  
Direction : W

Site Code: 74630001

Time	0 MPH	15 MPH	15 MPH	20 MPH	25 MPH	30 MPH	35 MPH	40 MPH	45 MPH	50 MPH	55 MPH	60 MPH	65 MPH	70 MPH	70 MPH	Total
12:00 AM	3	5	4	3	3	35	47	10	3	0	0	0	0	0	0	113
1:00	0	5	1	1	2	19	29	6	2	0	0	0	0	0	0	65
2:00	0	3	2	0	1	13	8	11	1	0	0	0	0	0	0	39
3:00	1	2	2	0	2	6	13	3	1	0	0	0	0	0	0	30
4:00	0	0	0	1	1	7	5	3	1	0	0	0	0	0	0	18
5:00	0	0	0	0	0	6	10	3	1	1	0	0	0	0	0	21
6:00	0	2	1	3	5	12	21	5	3	0	0	0	1	0	0	53
7:00	7	12	9	5	12	42	55	9	1	0	0	0	0	0	0	152
8:00	8	12	4	12	16	57	70	18	1	0	0	0	0	0	0	198
9:00	7	16	10	10	26	106	124	21	0	0	0	0	0	0	0	320
10:00	25	38	31	29	44	128	113	16	3	0	0	0	0	0	0	427
11:00	32	23	22	30	51	157	145	16	2	0	0	0	0	0	0	478
12:00 PM	23	26	47	30	43	185	129	12	0	1	0	0	0	0	0	496
1:00	36	42	20	26	48	139	135	19	0	1	0	0	0	0	0	466
2:00	21	32	27	22	43	148	112	23	1	0	0	0	0	0	0	429
3:00	18	24	23	34	43	179	156	8	0	0	0	0	1	0	0	486
4:00	23	34	30	18	50	218	131	9	1	0	0	0	0	0	0	514
5:00	20	35	18	15	51	159	107	13	1	0	0	0	0	0	0	419
6:00	12	22	25	16	40	151	108	11	0	0	0	0	0	0	0	385
7:00	10	22	16	12	20	98	83	18	1	0	0	0	0	0	0	280
8:00	3	21	14	13	10	71	78	23	4	0	0	0	0	0	0	237
9:00	5	11	3	4	7	35	58	26	7	0	0	0	0	0	0	156
10:00	3	5	3	2	9	31	39	15	4	1	0	0	0	0	0	112
11:00	0	9	3	3	5	18	29	18	4	0	0	0	0	0	0	89
Total	257	401	315	289	532	2020	1805	316	42	4	0	2	0	0	0	5983

Percentile 15th 50th 85th 95th  
Speed 23 38 42 44

Measured Average 35.9  
10 MPH Pace Speed 36.45  
Numerical Pace 3708  
Percentile Pace 64.0  
Numerical 35 MPH 4189  
Percentile 35 MPH 70.0

Radius Total	556	814	703	716	1508	4968	3631	519	54	4	1	2	0	13476
Stats	Per centile 15th 50th 85th 95th													
	Speed 24	37	41	44										
	Measured Average 35.5													
	10 MPH Pace Speed 36.45													
	Numerical Pace 8552													
	Percentile Pace 64.0													
	Numerical 35 MPH 9179													
	Percentile 35 MPH 68.1													

## Route 110 at Wheeler Street Traffic Signal Warrants Analysis

# HCS Warrants Report

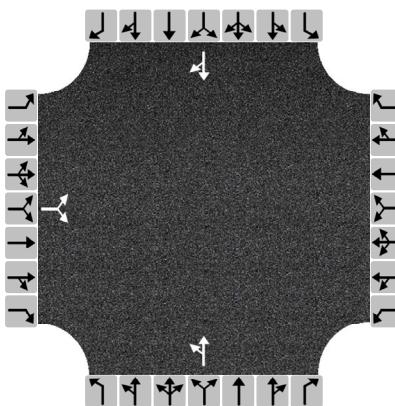
## Project Information

Analyst	DCL Vanasse & Associates	Date	11/21/24
Agency		Analysis Year	2024
Jurisdiction	MassDOT	Time Period Analyzed	7:00 AM to 7:00 PM
Project Description	Proposed Multifamily Residential Development - Murphy's Farm		

## General

Major Street Direction	North-South	Population < 10,000	No
Starting Time Interval	7	Coordinated Signal System	No
Median Type	Undivided	Crashes (crashes/year)	0
Major Street Speed (mi/h)	45	Adequate Trials of Crash Exp. Alt.	No
Nearest Signal (ft)	0		

## Geometry and Traffic



Approach	Eastbound			Westbound			Northbound			Southbound		
Movement	L	T	R	L	T	R	L	T	R	L	T	R
Number of Lanes, N	0	0	0	0	0	0	0	1	0	0	1	0
Lane Usage		LR						LT			TR	
Vehicle Volumes Averages (veh/h)	56	0	13	0	0	0	12	511	0	0	468	52
Pedestrian Averages (peds/h)		0						0			0	
Gap Averages (gaps/h)		0						0			0	
Delay Averages (s/veh)		0.0						0.0			0.0	
Delay Averages (veh-hrs)		0.0						0.0			0.0	

## School Crossing and Roadway Network

Number of Students in Highest Hour	0	Two or More Major Routes	No
Number of Adequate Gaps in Period	0	Weekend Counts	No
Number of Minutes in Period	0	5-year Growth Factor (%)	0

## Railroad Crossing

Grade Crossing Approach	None	Rail Traffic (trains/day)	4
Highest Volume Hour with Trains	Unknown	High Occupancy Buses (%)	0
Distance to Stop Line (ft)	-	Tractor-Trailer Trucks (%)	10

## Volume Summary

Hour	Major Volume	Minor Volume	Total Volume	Peds/h	Gaps/h	1A (70%)	1A (56%)	1B (70%)	1B (56%)	2 (70%)	3A (70%)	3B (56%)	4A (70%)	4B (56%)
07 - 08	1139	79	1218	0	0	No	No	Yes	Yes	Yes	No	Yes	No	No
08 - 09	1145	91	1236	0	0	No	Yes	Yes	Yes	Yes	No	Yes	No	No
09 - 10	794	83	877	0	0	No	No	Yes	Yes	Yes	No	No	No	No
10 - 11	739	76	815	0	0	No	No	Yes	Yes	Yes	No	No	No	No
11 - 12	745	75	820	0	0	No	No	Yes	Yes	Yes	No	No	No	No
12 - 13	761	93	854	0	0	No	Yes	Yes	Yes	Yes	No	No	No	No
13 - 14	875	70	945	0	0	No	No	Yes	Yes	Yes	No	No	No	No
14 - 15	1050	71	1121	0	0	No	No	Yes	Yes	Yes	No	No	No	No
15 - 16	1331	74	1405	0	0	No	No	Yes	Yes	Yes	No	No	No	No
16 - 17	1556	51	1607	0	0	No	No	No	Yes	No	No	No	No	No
17 - 18	1428	40	1468	0	0	No	No	No	No	No	No	No	No	No
18 - 19	982	30	1012	0	0	No	No	No	No	No	No	No	No	No
Total	12545	833	13378	0	0	0	2	9	10	9	0	2	0	0

## Warrants

### Warrant 1: Eight-Hour Vehicular Volume



A. Minimum Vehicular Volumes (Both major approaches --and-- higher minor approach) --or--

B. Interruption of Continuous Traffic (Both major approaches --and-- higher minor approach) --or--

56% Vehicular --and-- Interruption Volumes (Both major approaches --and-- higher minor approach)

### Warrant 2: Four-Hour Vehicular Volume



Four-Hour Vehicular Volume (Both major approaches --and-- higher minor approach)



### Warrant 3: Peak Hour



A. Peak-Hour Conditions (Minor delay -- and-- minor volume --and-- total volume) --or--

B. Peak-Hour Vehicular Volumes (Both major approaches --and-- higher minor approach)



### Warrant 4: Pedestrian Volume

A. Four Hour Volumes --or--

B. One-Hour Volumes

### Warrant 5: School Crossing

Gaps Same Period --and--

Student Volumes

Nearest Traffic Control Signal (optional)

### Warrant 6: Coordinated Signal System

Degree of Platooning (Predominant direction or both directions)

### Warrant 7: Crash Experience

A. Adequate trials of alternatives, observance and enforcement failed --and--

B. Reported crashes susceptible to correction by signal (12-month period) --and--

C. 56% Volumes for Warrants 1A, 1B, --or-- 4 are satisfied



### Warrant 8: Roadway Network

A. Weekday Volume (Peak hour total --and-- projected warrants 1, 2, or 3) --or--

B. Weekend Volume (Five hours total)

### Warrant 9: Grade Crossing

A. Grade Crossing within 140 ft --and--

B. Peak-Hour Vehicular Volumes

# HCS Warrants Report

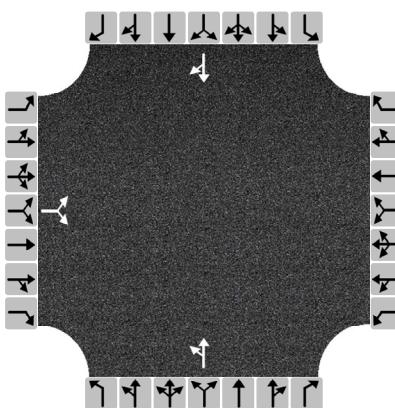
## Project Information

Analyst	DCL Vanasse & Associates	Date	11/21/24
Agency		Analysis Year	2024
Jurisdiction	MassDOT	Time Period Analyzed	7:00 AM to 7:00 PM
Project Description	Proposed Multifamily Residential Development - Murphy's Farm		

## General

Major Street Direction	North-South	Population < 10,000	No
Starting Time Interval	7	Coordinated Signal System	No
Median Type	Undivided	Crashes (crashes/year)	0
Major Street Speed (mi/h)	45	Adequate Trials of Crash Exp. Alt.	No
Nearest Signal (ft)	0		

## Geometry and Traffic



Approach	Eastbound			Westbound			Northbound			Southbound		
Movement	L	T	R	L	T	R	L	T	R	L	T	R
Number of Lanes, N	0	0	0	0	0	0	0	1	0	0	1	0
Lane Usage		LR						LT			TR	
Vehicle Volumes Averages (veh/h)	62	0	26	0	0	0	25	511	0	0	468	58
Pedestrian Averages (peds/h)		0			0			0			0	
Gap Averages (gaps/h)		0			0			0			0	
Delay Averages (s/veh)		0.0			0.0			0.0			0.0	
Delay Averages (veh-hrs)		0.0			0.0			0.0			0.0	

## School Crossing and Roadway Network

Number of Students in Highest Hour	0	Two or More Major Routes	No
Number of Adequate Gaps in Period	0	Weekend Counts	No
Number of Minutes in Period	0	5-year Growth Factor (%)	0

## Railroad Crossing

Grade Crossing Approach	None	Rail Traffic (trains/day)	4
Highest Volume Hour with Trains	Unknown	High Occupancy Buses (%)	0
Distance to Stop Line (ft)	-	Tractor-Trailer Trucks (%)	10

## Volume Summary

Hour	Major Volume	Minor Volume	Total Volume	Peds/h	Gaps/h	1A (70%)	1A (56%)	1B (70%)	1B (56%)	2 (70%)	3A (70%)	3B (56%)	4A (70%)	4B (56%)
07 - 08	1149	109	1258	0	0	Yes	Yes	Yes	Yes	Yes	No	Yes	No	No
08 - 09	1157	119	1276	0	0	Yes	Yes	Yes	Yes	Yes	No	Yes	No	No
09 - 10	806	105	911	0	0	Yes	Yes	Yes	Yes	Yes	No	No	No	No
10 - 11	751	90	841	0	0	No	Yes	Yes	Yes	Yes	No	No	No	No
11 - 12	760	93	853	0	0	No	Yes	Yes	Yes	Yes	No	No	No	No
12 - 13	778	109	887	0	0	Yes	Yes	Yes	Yes	Yes	No	No	No	No
13 - 14	889	85	974	0	0	No	Yes	Yes	Yes	Yes	No	No	No	No
14 - 15	1067	90	1157	0	0	No	Yes	Yes	Yes	Yes	No	Yes	No	No
15 - 16	1357	89	1446	0	0	No	Yes	Yes	Yes	Yes	No	Yes	No	No
16 - 17	1586	67	1653	0	0	No	No	Yes	Yes	Yes	No	No	No	No
17 - 18	1456	59	1515	0	0	No	No	Yes	Yes	No	No	No	No	No
18 - 19	1010	49	1059	0	0	No	No	No	Yes	No	No	No	No	No
Total	12766	1064	13830	0	0	4	9	11	12	10	0	4	0	0

## Warrants

### Warrant 1: Eight-Hour Vehicular Volume



A. Minimum Vehicular Volumes (Both major approaches --and-- higher minor approach) --or--

B. Interruption of Continuous Traffic (Both major approaches --and-- higher minor approach) --or--

56% Vehicular --and-- Interruption Volumes (Both major approaches --and-- higher minor approach)

### Warrant 2: Four-Hour Vehicular Volume



Four-Hour Vehicular Volume (Both major approaches --and-- higher minor approach)

### Warrant 3: Peak Hour



A. Peak-Hour Conditions (Minor delay -- and-- minor volume --and-- total volume) --or--

B. Peak-Hour Vehicular Volumes (Both major approaches --and-- higher minor approach)



### Warrant 4: Pedestrian Volume

A. Four Hour Volumes --or--

B. One-Hour Volumes

### Warrant 5: School Crossing

Gaps Same Period --and--

Student Volumes

Nearest Traffic Control Signal (optional)

### Warrant 6: Coordinated Signal System

Degree of Platooning (Predominant direction or both directions)

### Warrant 7: Crash Experience

A. Adequate trials of alternatives, observance and enforcement failed --and--

B. Reported crashes susceptible to correction by signal (12-month period) --and--

C. 56% Volumes for Warrants 1A, 1B, --or-- 4 are satisfied



### Warrant 8: Roadway Network

A. Weekday Volume (Peak hour total --and-- projected warrants 1, 2, or 3) --or--

B. Weekend Volume (Five hours total)

### Warrant 9: Grade Crossing

A. Grade Crossing within 140 ft --and--

B. Peak-Hour Vehicular Volumes

### 2024 Existing Volumes

#### Raw Data

10/30/2024

#### 2024 Existing Volumes

Adjusted to average-month

\*0.90 - U3 Oct.

Time:	SB TH	SB RT	WB LT	WB RT	NB LT	NB TH
12:00 AM						
1:00 AM						
2:00 AM						
3:00 AM						
4:00 AM						
5:00 AM						
6:00 AM						
7:00 AM	487	30	64	15	6	616
8:00 AM	573	42	75	16	9	521
9:00 AM	364	32	73	10	10	388
10:00 AM	356	31	61	15	8	344
11:00 AM	313	45	66	9	14	373
12:00 PM	354	56	82	11	10	341
1:00 PM	377	63	55	15	14	421
2:00 PM	437	65	53	18	15	533
3:00 PM	583	78	61	13	17	653
4:00 PM	631	70	31	20	19	836
5:00 PM	644	70	30	10	24	690
6:00 PM	503	50	23	7	7	422
7:00 PM						
8:00 PM						
9:00 PM						
10:00 PM						
11:00 PM						

5622      632      674      159      153      6138

Time:	SB TH	SB RT	WB LT	WB RT	NB LT	NB TH
12:00 AM	0	0	0	0	0	0
1:00 AM	0	0	0	0	0	0
2:00 AM	0	0	0	0	0	0
3:00 AM	0	0	0	0	0	0
4:00 AM	0	0	0	0	0	0
5:00 AM	0	0	0	0	0	0
6:00 AM	0	0	0	0	0	0
7:00 AM	438	27	58	14	5	554
8:00 AM	516	38	68	14	8	469
9:00 AM	328	29	66	9	9	349
10:00 AM	320	28	55	14	7	310
11:00 AM	282	41	59	8	13	336
12:00 PM	319	50	74	10	9	307
1:00 PM	339	57	50	14	13	379
2:00 PM	393	59	48	16	14	480
3:00 PM	525	70	55	12	15	588
4:00 PM	568	63	28	18	17	752
5:00 PM	580	63	27	9	22	621
6:00 PM	453	45	21	6	6	380
7:00 PM	0	0	0	0	0	0
8:00 PM	0	0	0	0	0	0
9:00 PM	0	0	0	0	0	0
10:00 PM	0	0	0	0	0	0
11:00 PM	0	0	0	0	0	0

5061      570      609      144      138      5525

Project-Generated Cars

Hourly Distribution of Entering and Exiting Vehicle Trips by Land Use			
Source: ITE <i>Trip Generation Manual</i> , 11th Edition			
Land Use Code	215		
Land Use	Single-Family Attached Housing		
Setting	General Urban/Suburban		
Time Period	Weekday		
# Data Sites	7		
% of 24-Hour Vehicle Trips			
Time	Total	Entering	Exiting
12:00 - 1:00 AM	0.5%	0.7%	0.3%
1:00 - 2:00 AM	0.2%	0.4%	0.1%
2:00 - 3:00 AM	0.3%	0.2%	0.3%
3:00 - 4:00 AM	0.3%	0.3%	0.4%
4:00 - 5:00 AM	0.7%	0.4%	1.0%
5:00 - 6:00 AM	1.4%	0.1%	2.6%
6:00 - 7:00 AM	3.5%	1.1%	5.8%
7:00 - 8:00 AM	7.9%	2.7%	13.2%
8:00 - 9:00 AM	6.6%	3.8%	9.3%
9:00 - 10:00 AM	5.3%	3.7%	6.9%
10:00 - 11:00 AM	4.1%	4.0%	4.3%
11:00 - 12:00 PM	5.3%	4.8%	5.7%
12:00 - 1:00 PM	5.2%	5.4%	5.1%
1:00 - 2:00 PM	4.7%	4.5%	4.8%
2:00 - 3:00 PM	5.8%	5.5%	6.0%
3:00 - 4:00 PM	6.5%	8.2%	4.8%
4:00 - 5:00 PM	7.5%	9.8%	5.1%
5:00 - 6:00 PM	9.4%	12.1%	6.8%
6:00 - 7:00 PM	8.2%	9.8%	6.6%
7:00 - 8:00 PM	5.9%	7.3%	4.5%
8:00 - 9:00 PM	4.7%	5.9%	3.5%
9:00 - 10:00 PM	3.0%	4.8%	1.3%
10:00 - 11:00 PM	2.0%	3.0%	1.1%
11:00 - 12:00 AM	0.9%	1.5%	0.4%
	71.6%	64.1%	

Peak Hour Adjusted Project Generated Cars

Time	Total	Entering	Exiting
12:00 - 1:00 AM	10	7	3
1:00 - 2:00 AM	5	4	1
2:00 - 3:00 AM	5	2	3
3:00 - 4:00 AM	7	3	4
4:00 - 5:00 AM	15	4	11
5:00 - 6:00 AM	28	1	27
6:00 - 7:00 AM	72	11	61
7:00 - 8:00 AM	134	33	101
8:00 - 9:00 AM	131	38	93
9:00 - 10:00 AM	111	38	73
10:00 - 11:00 AM	86	41	45
11:00 - 12:00 PM	109	50	59
12:00 - 1:00 PM	109	56	53
1:00 - 2:00 PM	98	47	51
2:00 - 3:00 PM	120	57	63
3:00 - 4:00 PM	137	85	52
4:00 - 5:00 PM	154	100	54
5:00 - 6:00 PM	157	93	64
6:00 - 7:00 PM	156	93	63
7:00 - 8:00 PM	124	76	48
8:00 - 9:00 PM	97	60	37
9:00 - 10:00 PM	64	50	14
10:00 - 11:00 PM	43	31	12
11:00 - 12:00 AM	20	16	4
	1992	996	996

**2024 Existing Volumes**  
**\*\* No Seasonal Adjustment \*\***

Time:	SB TH	SB RT	WB LT	WB RT	NB LT	NB TH
12:00 AM	0	0	0	0	0	0
1:00 AM	0	0	0	0	0	0
2:00 AM	0	0	0	0	0	0
3:00 AM	0	0	0	0	0	0
4:00 AM	0	0	0	0	0	0
5:00 AM	0	0	0	0	0	0
6:00 AM	0	0	0	0	0	0
7:00 AM	487	30	64	15	6	616
8:00 AM	573	42	75	16	9	521
9:00 AM	364	32	73	10	10	388
10:00 AM	356	31	61	15	8	344
11:00 AM	313	45	66	9	14	373
12:00 PM	354	56	82	11	10	341
1:00 PM	377	63	55	15	14	421
2:00 PM	437	65	53	18	15	533
3:00 PM	583	78	61	13	17	653
4:00 PM	631	70	31	20	19	836
5:00 PM	644	70	30	10	24	690
6:00 PM	503	50	23	7	7	422
7:00 PM	0	0	0	0	0	0
8:00 PM	0	0	0	0	0	0
9:00 PM	0	0	0	0	0	0
10:00 PM	0	0	0	0	0	0
11:00 PM	0	0	0	0	0	0

5622 632 674 159 153 6138

Project-Generated AWT  
ITE LUC 215  
Single-Family Attached Housing

Time	Total	Entering	Exiting
12:00 - 1:00 AM	10	7	3
1:00 - 2:00 AM	5	4	1
2:00 - 3:00 AM	5	2	3
3:00 - 4:00 AM	7	3	4
4:00 - 5:00 AM	15	4	11
5:00 - 6:00 AM	28	1	27
6:00 - 7:00 AM	72	11	61
7:00 - 8:00 AM	134	33	101
8:00 - 9:00 AM	131	38	93
9:00 - 10:00 AM	111	38	73
10:00 - 11:00 AM	86	41	45
11:00 - 12:00 PM	109	50	59
12:00 - 1:00 PM	109	56	53
1:00 - 2:00 PM	98	47	51
2:00 - 3:00 PM	120	57	63
3:00 - 4:00 PM	137	85	52
4:00 - 5:00 PM	154	100	54
5:00 - 6:00 PM	157	93	64
6:00 - 7:00 PM	156	93	63
7:00 - 8:00 PM	124	76	48
8:00 - 9:00 PM	97	60	37
9:00 - 10:00 PM	64	50	14
10:00 - 11:00 PM	43	31	12
11:00 - 12:00 AM	20	16	4

1992 996 996

= entering  
= exiting  
Trip Distribution Percentages  
Passenger Cars 10% 10% 20% 20%

Time	SB TH	SB RT	WB LT	WB RT	NB LT	NB TH	w/ 20% reduction WB RT	+WB LT
12:00 - 1:00 AM	0	1	0	1	1	0	1	1
1:00 - 2:00 AM	0	0	0	0	1	0	0	0
2:00 - 3:00 AM	0	0	0	1	0	0	1	1
3:00 - 4:00 AM	0	0	0	1	1	0	1	1
4:00 - 5:00 AM	0	0	1	2	1	0	2	3
5:00 - 6:00 AM	0	0	3	5	0	0	4	7
6:00 - 7:00 AM	0	1	6	12	2	0	10	16
7:00 - 8:00 AM	487	33	74	35	13	616	28	102
8:00 - 9:00 AM	573	46	84	35	17	521	28	112
9:00 - 10:00 AM	364	36	80	25	18	388	20	100
10:00 - 11:00 AM	356	35	66	24	16	344	19	85
11:00 - 12:00 PM	313	50	72	21	24	373	17	89
12:00 - 1:00 PM	354	62	87	22	21	341	18	105
1:00 - 2:00 PM	377	68	60	25	23	421	20	80
2:00 - 3:00 PM	437	71	59	31	26	533	25	84
3:00 - 4:00 PM	583	87	66	23	34	653	18	84
4:00 - 5:00 PM	631	80	36	31	39	836	25	61
5:00 - 6:00 PM	644	79	36	23	43	690	18	54
6:00 - 7:00 PM	503	59	29	20	26	422	16	45
7:00 - 8:00 PM	0	8	5	10	15	0	8	13
8:00 - 9:00 PM	0	6	4	7	12	0	6	10
9:00 - 10:00 PM	0	5	1	3	10	0	2	3
10:00 - 11:00 PM	0	3	1	2	6	0	2	3
11:00 - 12:00 AM	0	2	0	1	3	0	1	1

**2024 Existing Volumes**

Adjusted to average-month

\*0.90 - U3 Oct.

Time:	SB TH	SB RT	WB LT	WB RT	NB LT	NB TH
12:00 AM	0	0	0	0	0	0
1:00 AM	0	0	0	0	0	0
2:00 AM	0	0	0	0	0	0
3:00 AM	0	0	0	0	0	0
4:00 AM	0	0	0	0	0	0
5:00 AM	0	0	0	0	0	0
6:00 AM	0	0	0	0	0	0
7:00 AM	438	27	58	14	5	554
8:00 AM	516	38	68	14	8	469
9:00 AM	328	29	66	9	9	349
10:00 AM	320	28	55	14	7	310
11:00 AM	282	41	59	8	13	336
12:00 PM	319	50	74	10	9	307
1:00 PM	339	57	50	14	13	379
2:00 PM	393	59	48	16	14	480
3:00 PM	525	70	55	12	15	588
4:00 PM	568	63	28	18	17	752
5:00 PM	580	63	27	9	22	621
6:00 PM	453	45	21	6	6	380
7:00 PM	0	0	0	0	0	0
8:00 PM	0	0	0	0	0	0
9:00 PM	0	0	0	0	0	0
10:00 PM	0	0	0	0	0	0
11:00 PM	0	0	0	0	0	0

5061 570 609 144 138 5525

Project-Generated AWT  
ITE LUC 215  
Single-Family Attached Housing

Total 1992 Enter/Exit 996

Time	Total	Entering	Exiting
12:00 - 1:00 AM	10	7	3
1:00 - 2:00 AM	5	4	1
2:00 - 3:00 AM	5	2	3
3:00 - 4:00 AM	7	3	4
4:00 - 5:00 AM	15	4	11
5:00 - 6:00 AM	28	1	27
6:00 - 7:00 AM	72	11	61
7:00 - 8:00 AM	134	33	101
8:00 - 9:00 AM	131	38	93
9:00 - 10:00 AM	111	38	73
10:00 - 11:00 AM	86	41	45
11:00 - 12:00 PM	109	50	59
12:00 - 1:00 PM	109	56	53
1:00 - 2:00 PM	98	47	51
2:00 - 3:00 PM	120	57	63
3:00 - 4:00 PM	137	85	52
4:00 - 5:00 PM	154	100	54
5:00 - 6:00 PM	157	93	64
6:00 - 7:00 PM	156	93	63
7:00 - 8:00 PM	124	76	48
8:00 - 9:00 PM	97	60	37
9:00 - 10:00 PM	64	50	14
10:00 - 11:00 PM	43	31	12
11:00 - 12:00 AM	20	16	4

1992 996 996

= entering  
= exiting  
Trip Distribution Percentages  
Passenger Cars 10% 10% 20% 20%

Time	SB TH	SB RT	WB LT	WB RT	NB LT	NB TH	w/ 20% reduction WB RT	+WB LT
12:00 - 1:00 AM	0	1	0	1	1	0	1	1
1:00 - 2:00 AM	0	0	0	0	1	0	0	0
2:00 - 3:00 AM	0	0	0	1	0	0	1	1
3:00 - 4:00 AM	0	0	0	1	1	0	1	1
4:00 - 5:00 AM	0	0	1	2	1	0	2	3
5:00 - 6:00 AM	0	0	3	5	0	0	4	7
6:00 - 7:00 AM	0	1	6	12	2	0	10	16
7:00 - 8:00 AM	438	30	68	34	12	554	27	95
8:00 - 9:00 AM	516	42	77	33	16	469	26	103
9:00 - 10:00 AM	328	33	73	24	17	349	19	92
10:00 - 11:00 AM	320	32	60	23	15	310	18	78
11:00 - 12:00 PM	282	46	65	20	23	336	16	81
12:00 - 1:00 PM	319	56	79	21	20	307	17	96
1:00 - 2:00 PM	339	62	55	24	22	379	19	74
2:00 - 3:00 PM	393	65	54	29	25	480	23	77
3:00 - 4:00 PM	525	79	60	22	32	588	18	78
4:00 - 5:00 PM	568	73	33	29	37	752	23	56
5:00 - 6:00 PM	580	72	33	22	41	621	18	51
6:00 - 7:00 PM	453	54	27	19	25	380	15	42
7:00 - 8:00 PM	0	8	5	10	15	0	8	13
8:00 - 9:00 PM	0	6	4	7	12	0	6	10
9:00 - 10:00 PM	0	5	1	3	10	0	2	3
10:00 - 11:00 PM	0	3	1	2	6	0	2	3
11:00 - 12:00 AM	0	2	0	1	3	0	1	1

Massachusetts Highway Department  
 Statewide Traffic Data Collection  
 2023 Weekday Seasonal Factors

Factor Group	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Axle Factor
<b>R1</b>	1.23	1.14	1.11	1.06	1.01	0.96	0.93	0.91	1.00	0.97	1.04	1.08	0.77
<b>R3</b>	1.11	1.07	1.02	0.95	0.90	0.89	0.87	0.87	0.92	0.89	0.95	0.99	0.98
<b>R4-R7</b>	1.19	1.16	1.10	1.00	0.92	0.91	0.87	0.88	0.93	0.93	1.01	1.06	0.98
<b>U1-Boston</b>	1.07	1.05	1.00	0.95	0.93	0.92	0.92	0.92	0.94	0.93	0.96	0.99	0.94
<b>U1-Essex</b>	1.14	1.11	1.06	1.00	0.95	0.91	0.87	0.87	0.94	0.95	1.00	1.03	0.96
<b>U1-Southeast</b>	1.12	1.09	1.04	0.96	0.91	0.87	0.84	0.86	0.92	0.94	0.98	1.03	0.96
<b>U1-West</b>	1.05	1.02	0.98	0.96	0.94	0.93	0.94	0.94	0.95	0.92	0.96	0.98	0.81
<b>U1-Worcester</b>	1.06	1.04	0.97	0.93	0.92	0.90	0.92	0.92	0.93	0.92	0.94	0.97	0.88
<b>U3</b>	1.05	1.02	0.96	0.92	0.89	0.89	0.91	0.92	0.91	0.90	0.94	0.96	0.98
<b>U4-U7</b>	1.02	1.00	0.94	0.89	0.86	0.88	0.91	0.92	0.89	0.88	0.91	0.91	0.99
<b>UR2</b>	1.05	1.01	0.97	0.92	0.90	0.90	0.91	0.91	0.91	0.90	0.94	0.97	0.98
<b>Rec - East</b>	1.17	1.16	1.09	1.04	0.92	0.84	0.76	0.80	0.93	1.00	1.03	1.06	0.98
<b>Rec - West</b>	1.46	1.38	1.32	1.06	0.94	0.79	0.59	0.69	0.97	0.99	1.18	1.28	0.98

Round off:

0-999 = 10  
 >1000 = 100

U = Urban

R = Rural

1 - Interstate

2 - Freeway and Expressway

3 - Other Principal Arterial

4 - Minor Arterial

5 - Major Collector

6 - Minor Collector

7 - Local Road and Street

**UR2 Group** - Combination of Urban Freeways and Expressways and Rural Freeways and Expressways.

**Recreational - East Group** - Cape Cod (all towns) including the town of Plymouth south of Route 3A (stations 7014,7079,7080,7090,7091,7092,7093,7094,7095,7096,7097,7108 and 7178), Martha's Vineyard and Nantucket.

**Recreational - West Group** - Continuous Stations 2 and 189 including stations

1066,1067,1083,1084,1085,1086,1087,1088,1089,1090,1091,1092,1093,1094,1095,1096,1097,1098,1099,1100,1101,1102,1103,1104,1105,1106,1107,1108,1113,1114,1116,2196,2197 and 2198.

# Accurate Counts

978-664-2565

N/S Street : Route 110  
 E/W Street : Wheeler Street  
 City/State : Methuen, MA  
 Weather : Cloudy

File Name : 74630001  
 Site Code : 74630001  
 Start Date : 10/30/2024  
 Page No : 1

## Groups Printed- Cars - Trucks

Start Time	Route 110 From North		Route 110 From South		Wheeler St From West		Int. Total
	Thru	Right	Left	Thru	Left	Right	
07:00 AM	106	16	0	140	12	3	277
07:15 AM	123	5	1	146	18	4	297
07:30 AM	128	3	1	166	16	5	319
07:45 AM	130	6	4	164	18	3	325
Total	487	30	6	616	64	15	1218
08:00 AM	124	8	0	120	11	5	268
08:15 AM	161	11	3	145	17	6	343
08:30 AM	140	14	2	155	24	2	337
08:45 AM	148	9	4	101	23	3	288
Total	573	42	9	521	75	16	1236
09:00 AM	118	8	3	101	25	2	257
09:15 AM	90	7	4	102	13	1	217
09:30 AM	79	10	2	89	21	4	205
09:45 AM	77	7	1	96	14	3	198
Total	364	32	10	388	73	10	877
10:00 AM	81	6	3	97	21	7	215
10:15 AM	66	11	2	88	16	2	185
10:30 AM	109	4	2	76	8	3	202
10:45 AM	100	10	1	83	16	3	213
Total	356	31	8	344	61	15	815
11:00 AM	76	6	7	95	17	4	205
11:15 AM	86	19	5	100	11	2	223
11:30 AM	78	9	1	87	18	1	194
11:45 AM	73	11	1	91	20	2	198
Total	313	45	14	373	66	9	820
12:00 PM	88	17	4	71	22	4	206
12:15 PM	90	15	2	77	32	3	219
12:30 PM	109	15	2	106	14	2	248
12:45 PM	67	9	2	87	14	2	181
Total	354	56	10	341	82	11	854
01:00 PM	82	19	5	85	17	2	210
01:15 PM	109	15	0	123	18	8	273
01:30 PM	80	14	3	110	10	1	218
01:45 PM	106	15	6	103	10	4	244
Total	377	63	14	421	55	15	945
02:00 PM	97	22	2	130	13	5	269
02:15 PM	111	13	4	130	5	5	268
02:30 PM	114	12	2	138	18	7	291
02:45 PM	115	18	7	135	17	1	293
Total	437	65	15	533	53	18	1121
03:00 PM	149	17	4	183	16	5	374
03:15 PM	142	13	3	160	13	4	335
03:30 PM	134	26	3	140	20	3	326
03:45 PM	158	22	7	170	12	1	370
Total	583	78	17	653	61	13	1405
04:00 PM	145	13	4	184	8	9	363
04:15 PM	170	19	6	232	10	5	442
04:30 PM	153	24	5	203	8	3	396
04:45 PM	164	14	4	217	5	3	407
Total	632	70	19	836	31	20	1608
05:00 PM	170	23	12	167	8	4	384
05:15 PM	163	14	4	203	13	2	399
05:30 PM	172	16	7	168	5	2	370

# Accurate Counts

978-664-2565

N/S Street : Route 110  
 E/W Street : Wheeler Street  
 City/State : Methuen, MA  
 Weather : Cloudy

File Name : 74630001  
 Site Code : 74630001  
 Start Date : 10/30/2024  
 Page No : 2

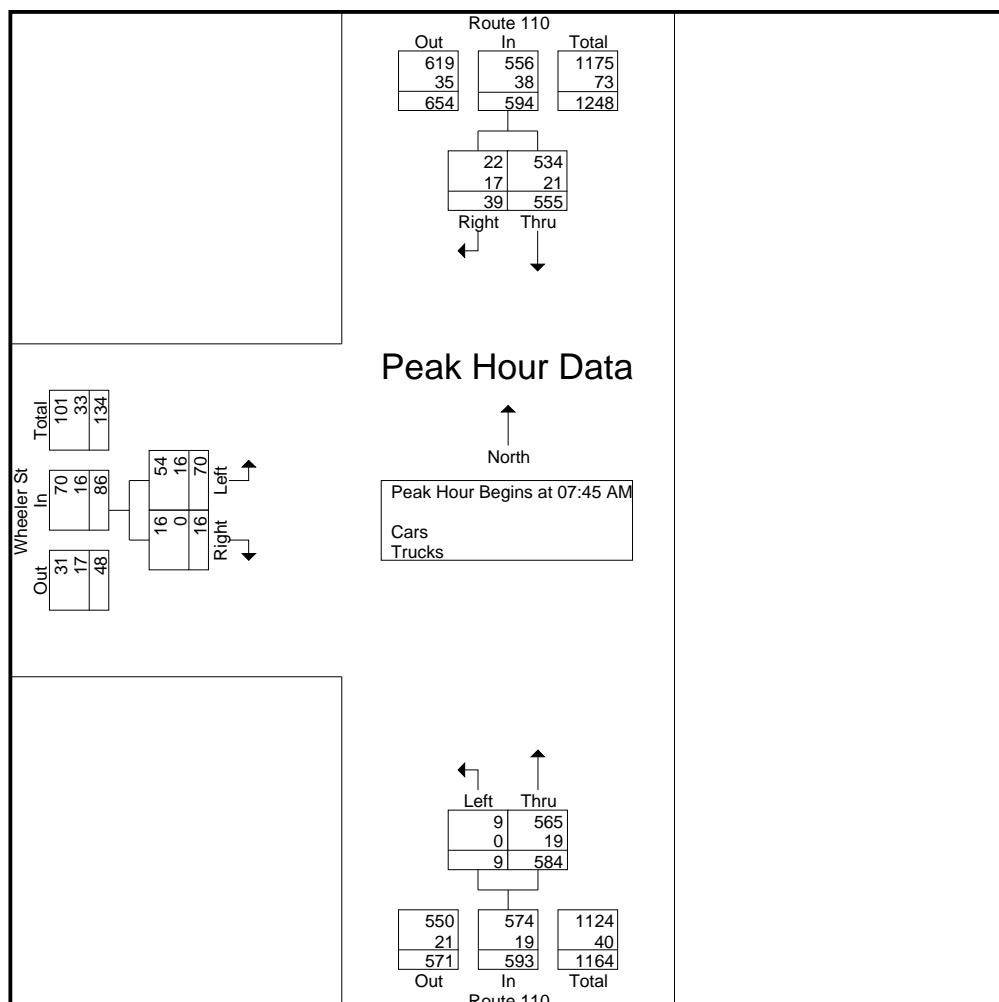
## Groups Printed- Cars - Trucks

	Route 110 From North		Route 110 From South		Wheeler St From West		
Start Time	Thru	Right	Left	Thru	Left	Right	Int. Total
05:45 PM	139	17	1	152	4	2	315
Total	644	70	24	690	30	10	1468
06:00 PM	145	14	2	141	5	2	309
06:15 PM	137	13	3	102	6	3	264
06:30 PM	113	15	2	87	7	1	225
06:45 PM	108	8	0	92	5	1	214
Total	503	50	7	422	23	7	1012
Grand Total	5623	632	153	6138	674	159	13379
Apprch %	89.9	10.1	2.4	97.6	80.9	19.1	
Total %	42	4.7	1.1	45.9	5	1.2	
Cars	5414	494	138	5923	504	138	12611
% Cars	96.3	78.2	90.2	96.5	74.8	86.8	94.3
Trucks	209	138	15	215	170	21	768
% Trucks	3.7	21.8	9.8	3.5	25.2	13.2	5.7

	Route 110 From North			Route 110 From South			Wheeler St From West			
Start Time	Thru	Right	App. Total	Left	Thru	App. Total	Left	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 09:45 AM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 07:45 AM										
07:45 AM	130	6	136	4	164	168	18	3	21	325
08:00 AM	124	8	132	0	120	120	11	5	16	268
08:15 AM	161	11	172	3	145	148	17	6	23	343
08:30 AM	140	14	154	2	155	157	24	2	26	337
Total Volume	555	39	594	9	584	593	70	16	86	1273
% App. Total	93.4	6.6		1.5	98.5		81.4	18.6		
PHF	.862	.696	.863	.563	.890	.882	.729	.667	.827	.928
Cars	534	22	556	9	565	574	54	16	70	1200
% Cars	96.2	56.4	93.6	100	96.7	96.8	77.1	100	81.4	94.3
Trucks	21	17	38	0	19	19	16	0	16	73
% Trucks	3.8	43.6	6.4	0	3.3	3.2	22.9	0	18.6	5.7

N/S Street : Route 110  
E/W Street : Wheeler Street  
City/State : Methuen, MA  
Weather : Cloudy

File Name : 74630001  
Site Code : 74630001  
Start Date : 10/30/2024  
Page No : 3



Peak Hour Analysis From 07:00 AM to 09:45 AM - Peak 1 of 1

## Peak Hour Analysis From 07:00 AM to 08:00 AM

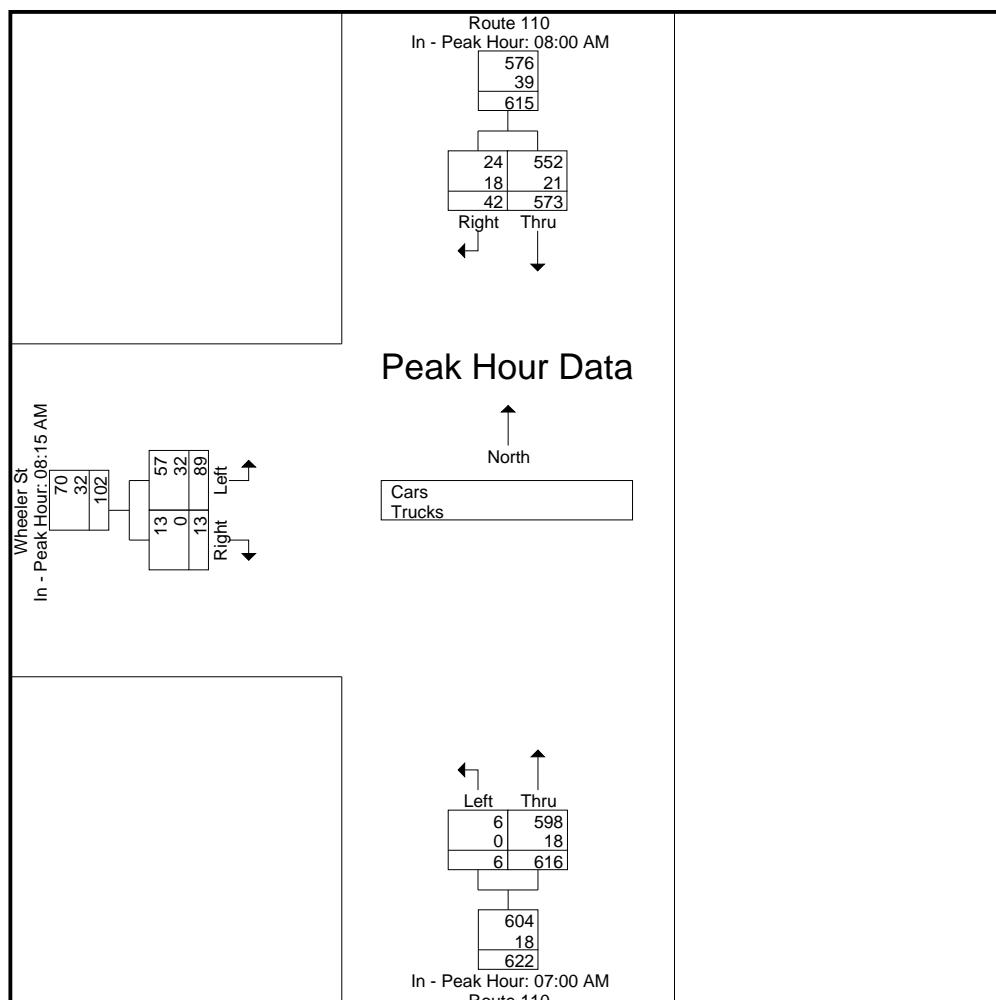
### Peak Hour for Each Approach Begins at:

Peak Hour for Each Approach Begins at:									
	08:00 AM			07:00 AM			08:15 AM		
+0 mins.	124	8	132	0	140	140	17	6	23
+15 mins.	161	11	172	1	146	147	24	2	26
+30 mins.	140	14	154	1	166	167	23	3	26
+45 mins.	148	9	157	4	164	168	25	2	27
Total Volume	573	42	615	6	616	622	89	13	102
% App. Total	93.2	6.8		1	99		87.3	12.7	
PHF	.890	.750	.894	.375	.928	.926	.890	.542	.944
Cars	552	24	576	6	598	604	57	13	70
% Cars	96.3	57.1	93.7	100	97.1	97.1	64	100	68.6
Trucks	21	18	39	0	18	18	32	0	32
% Trucks	3.7	42.9	6.3	0	2.9	2.9	36	0	31.4

**Accurate Counts**  
978-664-2565

N/S Street : Route 110  
E/W Street : Wheeler Street  
City/State : Methuen, MA  
Weather : Cloudy

File Name : 74630001  
Site Code : 74630001  
Start Date : 10/30/2024  
Page No : 4



Peak Hour Analysis From 10:00 AM to 01:45 PM - Peak 1 of 1

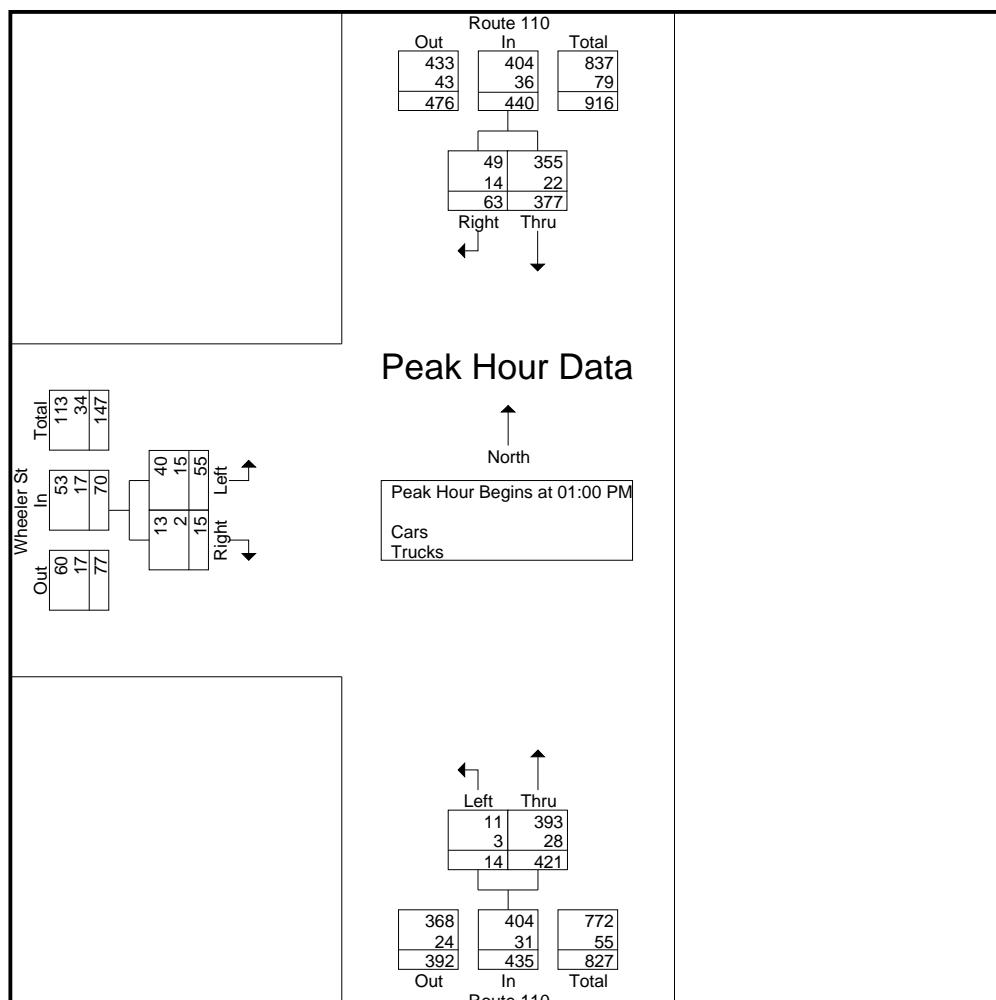
Peak Hour for Entire Intersection Begins at 01:00 PM

01:00 PM	82	<b>19</b>	101	5	85	90	17	2	19	210
01:15 PM	<b>109</b>	15	<b>124</b>	0	<b>123</b>	<b>123</b>	<b>18</b>	<b>8</b>	<b>26</b>	<b>273</b>
01:30 PM	80	14	94	3	110	113	10	1	11	218
01:45 PM	106	15	121	<b>6</b>	103	109	10	4	14	244
Total Volume	377	63	440	14	421	435	55	15	70	945
% App. Total	85.7	14.3		3.2	96.8		78.6	21.4		
PHF	.865	.829	.887	.583	.856	.884	.764	.469	.673	.865
Cars	355	49	404	11	393	404	40	13	53	861
% Cars	94.2	77.8	91.8	78.6	93.3	92.9	72.7	86.7	75.7	91.1
Trucks	22	14	36	3	28	31	15	2	17	84
% Trucks	5.8	22.2	8.2	21.4	6.7	7.1	27.3	13.3	24.3	8.9

**Accurate Counts**  
978-664-2565

N/S Street : Route 110  
E/W Street : Wheeler Street  
City/State : Methuen, MA  
Weather : Cloudy

File Name : 74630001  
Site Code : 74630001  
Start Date : 10/30/2024  
Page No : 5



Peak Hour Analysis From 10:00 AM to 01:45 PM - Peak 1 of 1

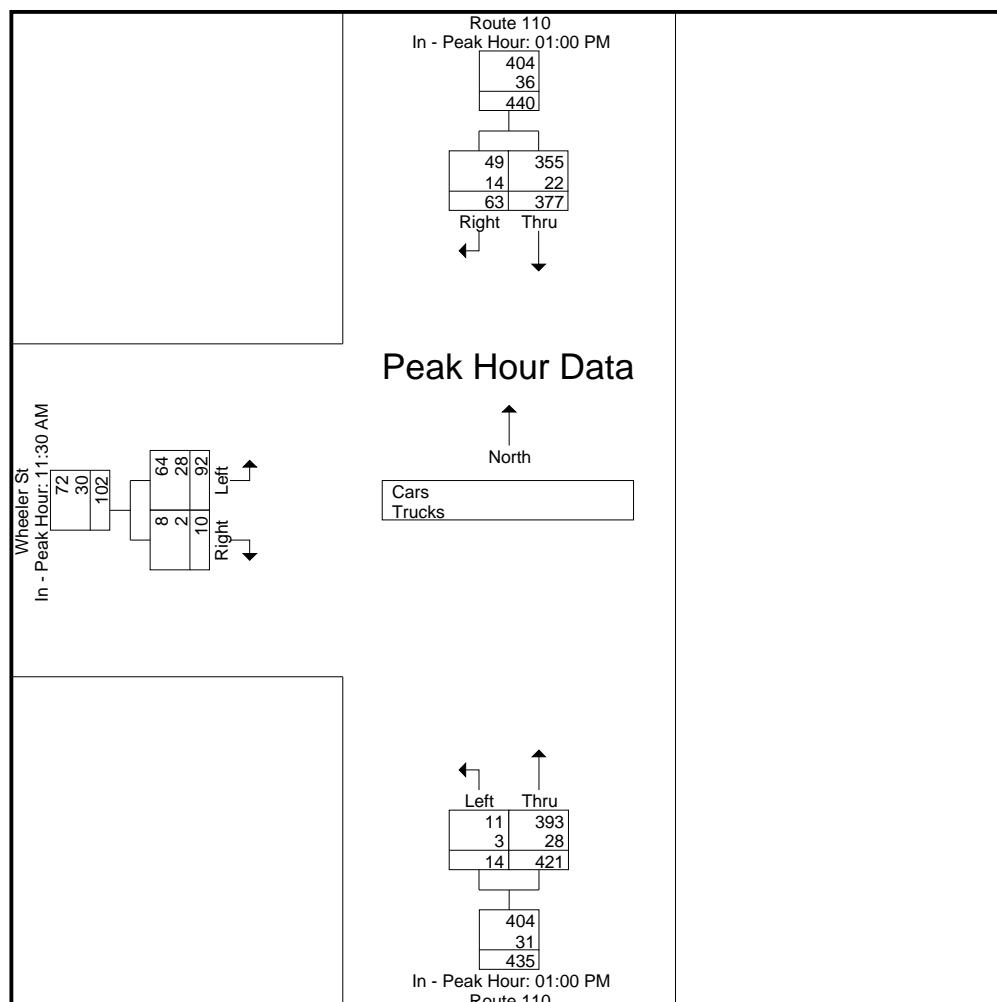
Peak Hour for Each Approach Begins at:

	01:00 PM			01:00 PM			11:30 AM		
+0 mins.	82	<b>19</b>	101	5	85	90	18	1	19
+15 mins.	<b>109</b>	15	<b>124</b>	0	<b>123</b>	<b>123</b>	20	2	22
+30 mins.	80	14	94	3	110	113	22	<b>4</b>	26
+45 mins.	106	15	121	<b>6</b>	103	109	<b>32</b>	3	<b>35</b>
Total Volume	377	63	440	14	421	435	92	10	102
% App. Total	85.7	14.3		3.2	96.8		90.2	9.8	
PHF	.865	.829	.887	.583	.856	.884	.719	.625	.729
Cars	355	49	404	11	393	404	64	8	72
% Cars	94.2	77.8	91.8	78.6	93.3	92.9	69.6	80	70.6
Trucks	22	14	36	3	28	31	28	2	30
% Trucks	5.8	22.2	8.2	21.4	6.7	7.1	30.4	20	29.4

**Accurate Counts**  
978-664-2565

N/S Street : Route 110  
E/W Street : Wheeler Street  
City/State : Methuen, MA  
Weather : Cloudy

File Name : 74630001  
Site Code : 74630001  
Start Date : 10/30/2024  
Page No : 6



Peak Hour Analysis From 02:00 PM to 06:45 PM - Peak 1 of 1

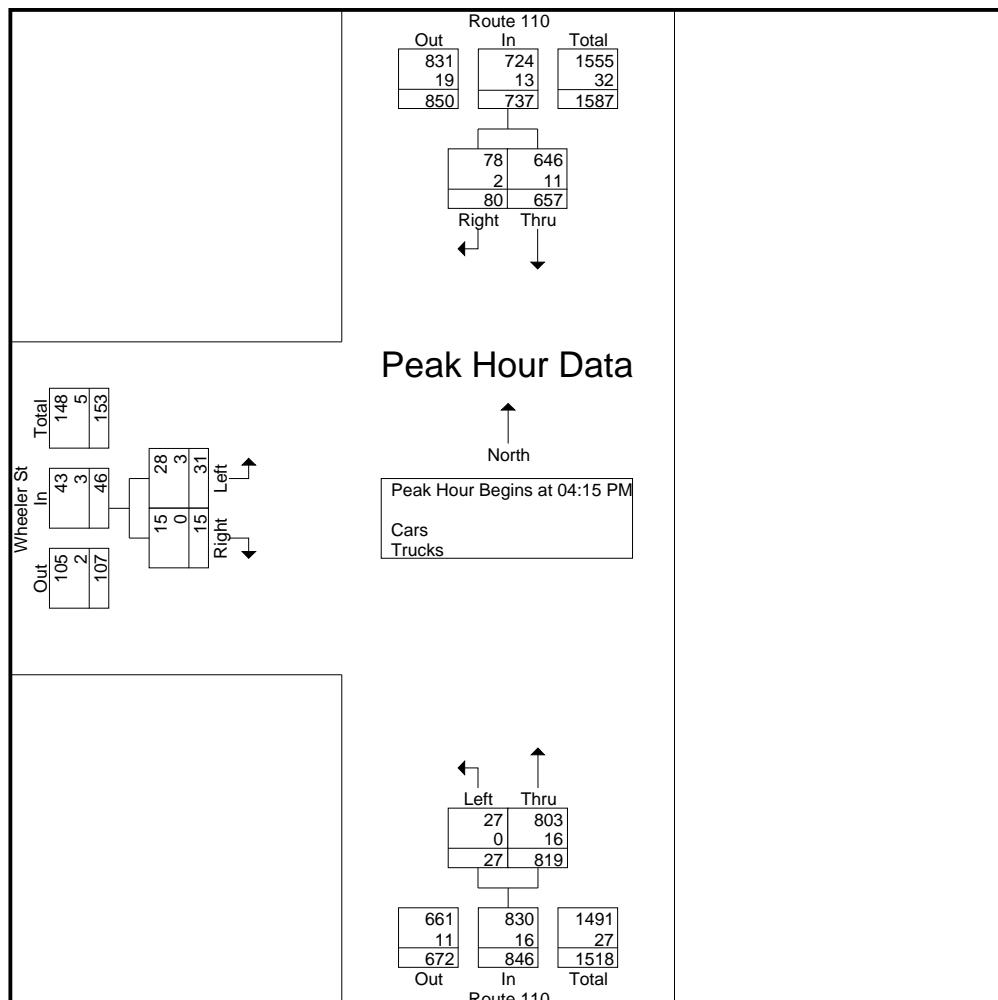
Peak Hour for Entire Intersection Begins at 04:15 PM

04:15 PM	<b>170</b>	19	189	6	<b>232</b>	<b>238</b>	<b>10</b>	5	15	442
04:30 PM	153	<b>24</b>	177	5	203	208	8	3	11	396
04:45 PM	164	14	178	4	217	221	5	3	8	407
05:00 PM	170	23	<b>193</b>	<b>12</b>	167	179	8	4	12	384
Total Volume	657	80	737	27	819	846	31	15	46	1629
% App. Total	89.1	10.9		3.2	96.8		67.4	32.6		
PHF	.966	.833	.955	.563	.883	.889	.775	.750	.767	.921
Cars	646	78	724	27	803	830	28	15	43	1597
% Cars	98.3	97.5	98.2	100	98.0	98.1	90.3	100	93.5	98.0
Trucks	11	2	13	0	16	16	3	0	3	32
% Trucks	1.7	2.5	1.8	0	2.0	1.9	9.7	0	6.5	2.0

**Accurate Counts**  
978-664-2565

N/S Street : Route 110  
E/W Street : Wheeler Street  
City/State : Methuen, MA  
Weather : Cloudy

File Name : 74630001  
Site Code : 74630001  
Start Date : 10/30/2024  
Page No : 7



Peak Hour Analysis From 02:00 PM to 06:45 PM - Peak 1 of 1

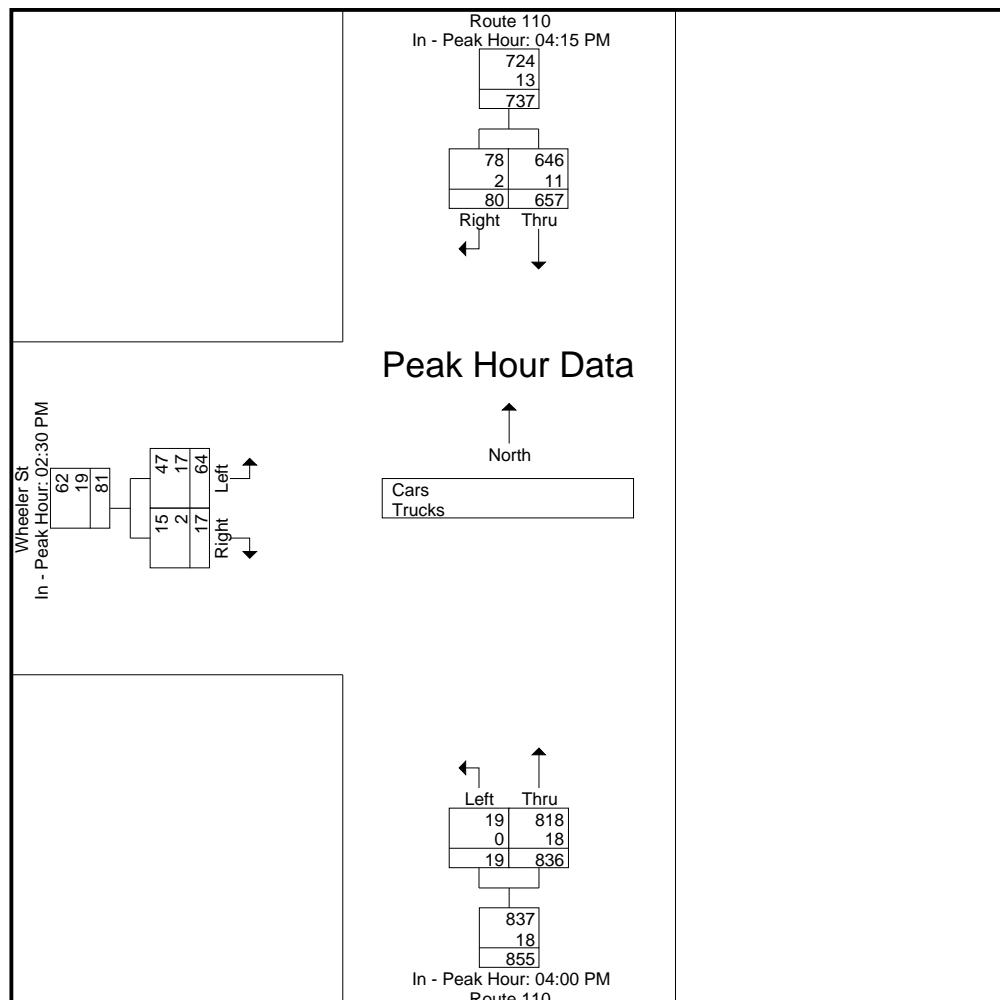
Peak Hour for Each Approach Begins at:

	04:15 PM			04:00 PM			02:30 PM		
+0 mins.	<b>170</b>	19	189	4	184	188	<b>18</b>	7	<b>25</b>
+15 mins.	153	<b>24</b>	177	<b>6</b>	<b>232</b>	<b>238</b>	17	1	18
+30 mins.	164	14	178	5	203	208	16	5	21
+45 mins.	170	23	<b>193</b>	4	217	221	13	4	17
Total Volume	657	80	737	19	836	855	64	17	81
% App. Total	89.1	10.9		2.2	97.8		79	21	
PHF	.966	.833	.955	.792	.901	.898	.889	.607	.810
Cars	646	78	724	19	818	837	47	15	62
% Cars	98.3	97.5	98.2	100	97.8	97.9	73.4	88.2	76.5
Trucks	11	2	13	0	18	18	17	2	19
% Trucks	1.7	2.5	1.8	0	2.2	2.1	26.6	11.8	23.5

**Accurate Counts**  
978-664-2565

N/S Street : Route 110  
E/W Street : Wheeler Street  
City/State : Methuen, MA  
Weather : Cloudy

File Name : 74630001  
Site Code : 74630001  
Start Date : 10/30/2024  
Page No : 8



# Accurate Counts

978-664-2565

N/S Street : Route 110  
 E/W Street : Wheeler Street  
 City/State : Methuen, MA  
 Weather : Cloudy

File Name : 74630001  
 Site Code : 74630001  
 Start Date : 10/30/2024  
 Page No : 9

## Groups Printed- Cars

	Route 110 From North		Route 110 From South		Wheeler St From West		
Start Time	Thru	Right	Left	Thru	Left	Right	Int. Total
07:00 AM	97	7	0	137	10	3	254
07:15 AM	121	3	1	138	15	4	282
07:30 AM	122	1	1	163	14	2	303
07:45 AM	125	3	4	160	15	3	310
Total	465	14	6	598	54	12	1149
08:00 AM	120	4	0	116	10	5	255
08:15 AM	156	7	3	139	13	6	324
08:30 AM	133	8	2	150	16	2	311
08:45 AM	143	5	4	94	15	3	264
Total	552	24	9	499	54	16	1154
09:00 AM	110	4	3	99	13	2	231
09:15 AM	84	6	3	92	6	0	191
09:30 AM	75	9	1	84	14	3	186
09:45 AM	70	5	1	93	12	3	184
Total	339	24	8	368	45	8	792
10:00 AM	78	2	2	88	18	6	194
10:15 AM	60	7	2	84	10	2	165
10:30 AM	104	4	2	72	6	2	190
10:45 AM	93	9	0	76	15	3	196
Total	335	22	6	320	49	13	745
11:00 AM	72	5	4	92	13	2	188
11:15 AM	80	11	4	93	7	0	195
11:30 AM	73	6	1	83	12	0	175
11:45 AM	70	5	1	85	17	2	180
Total	295	27	10	353	49	4	738
12:00 PM	84	7	3	69	16	4	183
12:15 PM	85	11	2	72	19	2	191
12:30 PM	104	10	2	102	11	1	230
12:45 PM	61	6	2	78	7	2	156
Total	334	34	9	321	53	9	760
01:00 PM	78	13	4	78	11	2	186
01:15 PM	98	14	0	115	12	7	246
01:30 PM	76	11	2	103	9	1	202
01:45 PM	103	11	5	97	8	3	227
Total	355	49	11	393	40	13	861
02:00 PM	91	18	2	128	11	5	255
02:15 PM	108	9	3	124	3	3	250
02:30 PM	114	10	2	135	10	7	278
02:45 PM	113	15	7	133	13	1	282
Total	426	52	14	520	37	16	1065
03:00 PM	141	12	3	182	13	3	354
03:15 PM	137	11	2	152	11	4	317
03:30 PM	131	24	3	134	16	3	311
03:45 PM	157	20	7	166	7	1	358
Total	566	67	15	634	47	11	1340
04:00 PM	142	11	4	180	7	9	353
04:15 PM	167	19	6	228	9	5	434
04:30 PM	150	24	5	196	6	3	384
04:45 PM	163	12	4	214	5	3	401
Total	622	66	19	818	27	20	1572
05:00 PM	166	23	12	165	8	4	378
05:15 PM	162	13	4	202	11	2	394
05:30 PM	169	16	7	167	5	2	366
05:45 PM	137	17	1	150	4	2	311
Total	634	69	24	684	28	10	1449

# Accurate Counts

978-664-2565

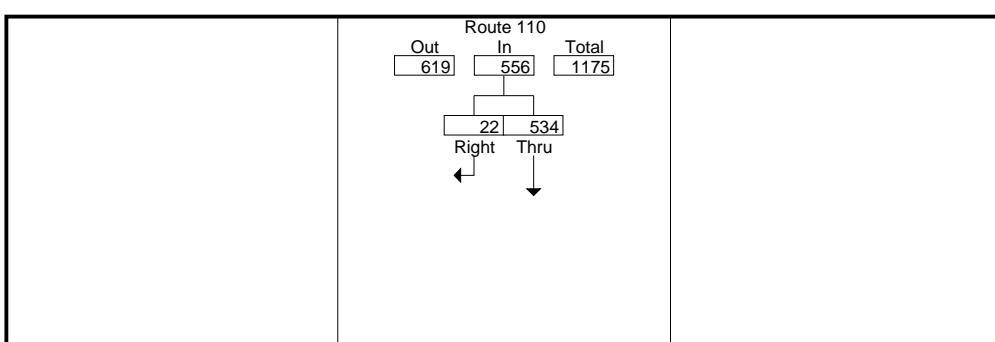
N/S Street : Route 110  
 E/W Street : Wheeler Street  
 City/State : Methuen, MA  
 Weather : Cloudy

File Name : 74630001  
 Site Code : 74630001  
 Start Date : 10/30/2024  
 Page No : 10

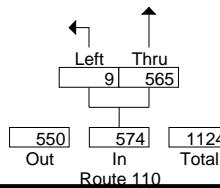
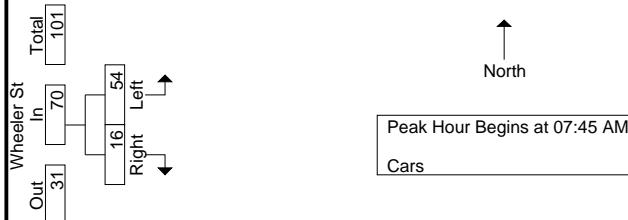
## Groups Printed- Cars

		Route 110 From North		Route 110 From South		Wheeler St From West		
Start Time		Thru	Right	Left	Thru	Left	Right	Int. Total
06:00 PM		143	13	2	140	5	2	305
06:15 PM		134	11	3	101	6	3	258
06:30 PM		108	15	2	84	5	0	214
06:45 PM		106	7	0	90	5	1	209
Total		491	46	7	415	21	6	986
Grand Total		5414	494	138	5923	504	138	12611
Apprch %		91.6	8.4	2.3	97.7	78.5	21.5	
Total %		42.9	3.9	1.1	47	4	1.1	

		Route 110 From North			Route 110 From South			Wheeler St From West			
Start Time		Thru	Right	App. Total	Left	Thru	App. Total	Left	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 09:45 AM - Peak 1 of 1											
Peak Hour for Entire Intersection Begins at 07:45 AM											
07:45 AM		125	3	128	4	160	164	15	3	18	310
08:00 AM		120	4	124	0	116	116	10	5	15	255
08:15 AM		156	7	163	3	139	142	13	6	19	324
08:30 AM		133	8	141	2	150	152	16	2	18	311
Total Volume		534	22	556	9	565	574	54	16	70	1200
% App. Total		96	4		1.6	98.4		77.1	22.9		
PHF		.856	.688	.853	.563	.883	.875	.844	.667	.921	.926



## Peak Hour Data

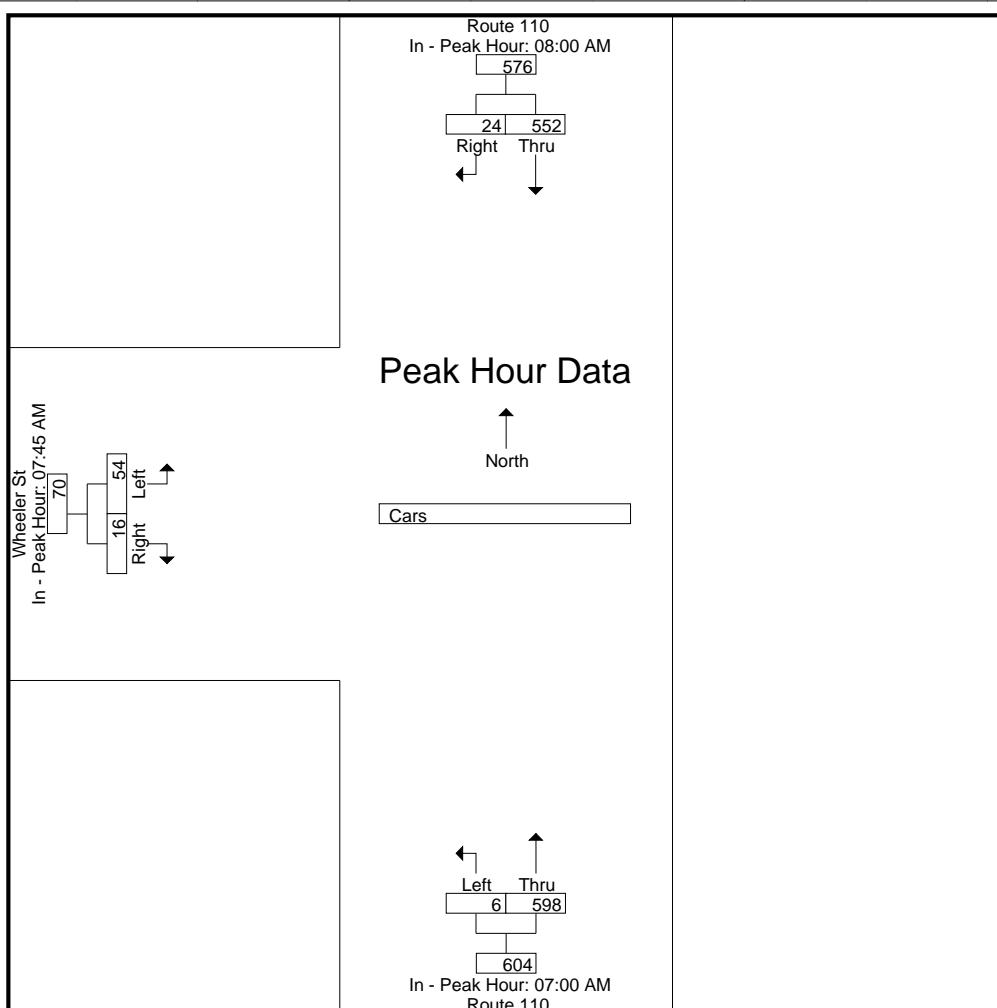


**Accurate Counts**  
978-664-2565

N/S Street : Route 110  
E/W Street : Wheeler Street  
City/State : Methuen, MA  
Weather : Cloudy

File Name : 74630001  
Site Code : 74630001  
Start Date : 10/30/2024  
Page No : 11

Route 110 From North				Route 110 From South				Wheeler St From West			
Start Time	Thru	Right	App. Total	Left	Thru	App. Total	Left	Right	App. Total	Int. Total	
Peak Hour Analysis From 07:00 AM to 09:45 AM - Peak 1 of 1											
Peak Hour for Each Approach Begins at:											
+0 mins.	120	4	124	0	137	137	15	3	18		
+15 mins.	<b>156</b>	7	<b>163</b>	1	138	139	10	5	15		
+30 mins.	133	<b>8</b>	141	1	<b>163</b>	<b>164</b>	13	<b>6</b>	<b>19</b>		
+45 mins.	143	5	148	<b>4</b>	160	164	<b>16</b>	2	18		
Total Volume	552	24	576	6	598	604	54	16	70		
% App. Total	95.8	4.2		1	99		77.1	22.9			
PHF	.885	.750	.883	.375	.917	.921	.844	.667	.921		



Peak Hour Analysis From 10:00 AM to 01:45 PM - Peak 1 of 1

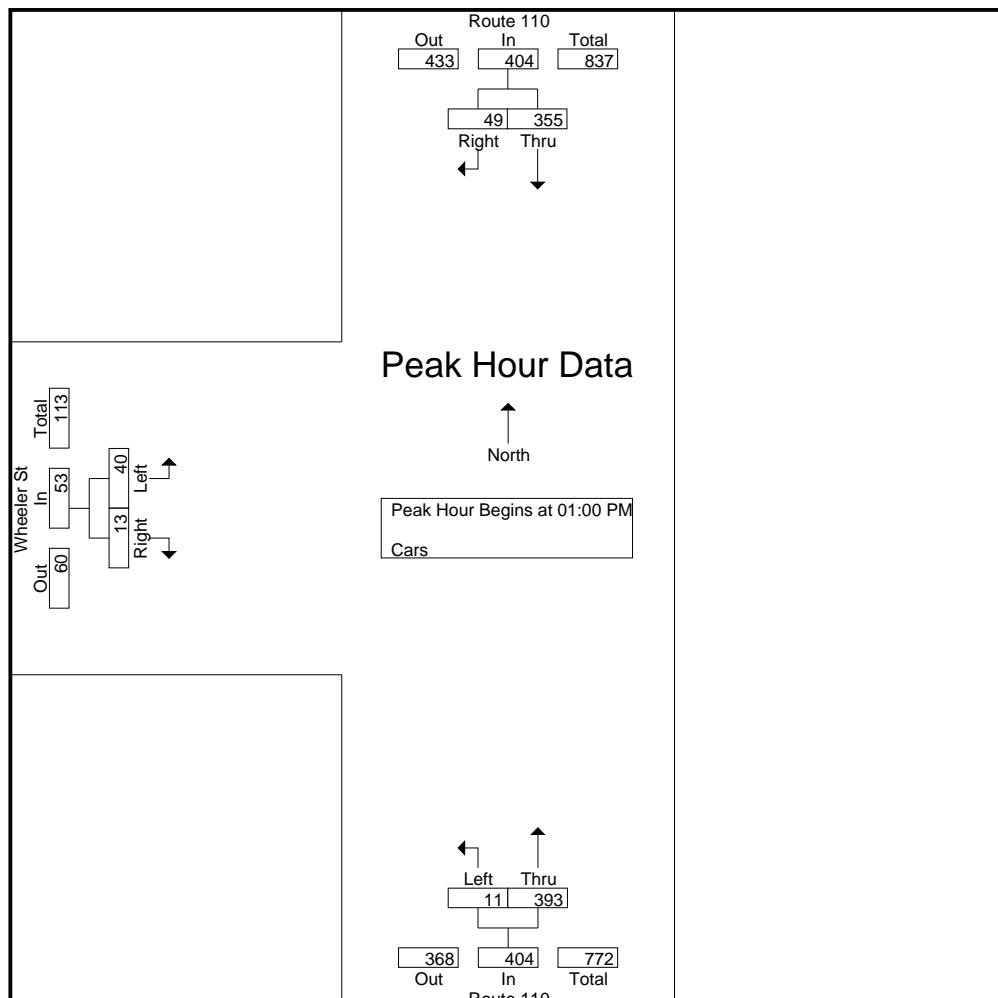
Peak Hour for Entire Intersection Begins at 01:00 PM

01:00 PM	78	13	91	4	78	82	11	2	13	186
01:15 PM	98	<b>14</b>	112	0	<b>115</b>	<b>115</b>	<b>12</b>	<b>7</b>	<b>19</b>	<b>246</b>
01:30 PM	76	11	87	2	103	105	9	1	10	202
01:45 PM	<b>103</b>	11	<b>114</b>	<b>5</b>	97	102	8	3	11	227
Total Volume	355	49	404	11	393	404	40	13	53	861
% App. Total	87.9	12.1		2.7	97.3		75.5	24.5		
PHF	.862	.875	.886	.550	.854	.878	.833	.464	.697	.875

**Accurate Counts**  
978-664-2565

N/S Street : Route 110  
E/W Street : Wheeler Street  
City/State : Methuen, MA  
Weather : Cloudy

File Name : 74630001  
Site Code : 74630001  
Start Date : 10/30/2024  
Page No : 12



Peak Hour Analysis From 10:00 AM to 01:45 PM - Peak 1 of 1

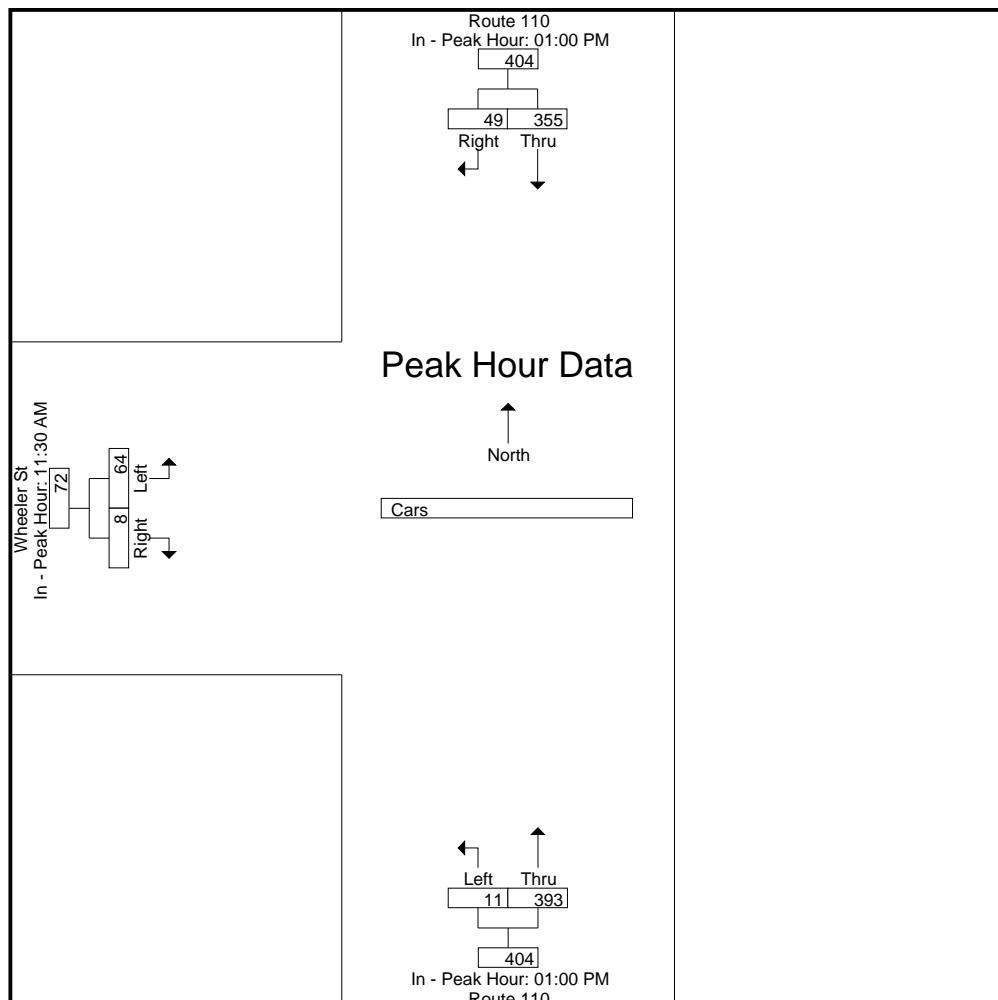
Peak Hour for Each Approach Begins at:

	01:00 PM			01:00 PM			11:30 AM		
+0 mins.	78	13	91	4	78	82	12	0	12
+15 mins.	98	14	112	0	115	115	17	2	19
+30 mins.	76	11	87	2	103	105	16	4	20
+45 mins.	<b>103</b>	11	<b>114</b>	<b>5</b>	97	102	<b>19</b>	2	<b>21</b>
Total Volume	355	49	404	11	393	404	64	8	72
% App. Total	87.9	12.1		2.7	97.3		88.9	11.1	
PHF	.862	.875	.886	.550	.854	.878	.842	.500	.857

**Accurate Counts**  
978-664-2565

N/S Street : Route 110  
E/W Street : Wheeler Street  
City/State : Methuen, MA  
Weather : Cloudy

File Name : 74630001  
Site Code : 74630001  
Start Date : 10/30/2024  
Page No : 13



Peak Hour Analysis From 02:00 PM to 06:45 PM - Peak 1 of 1

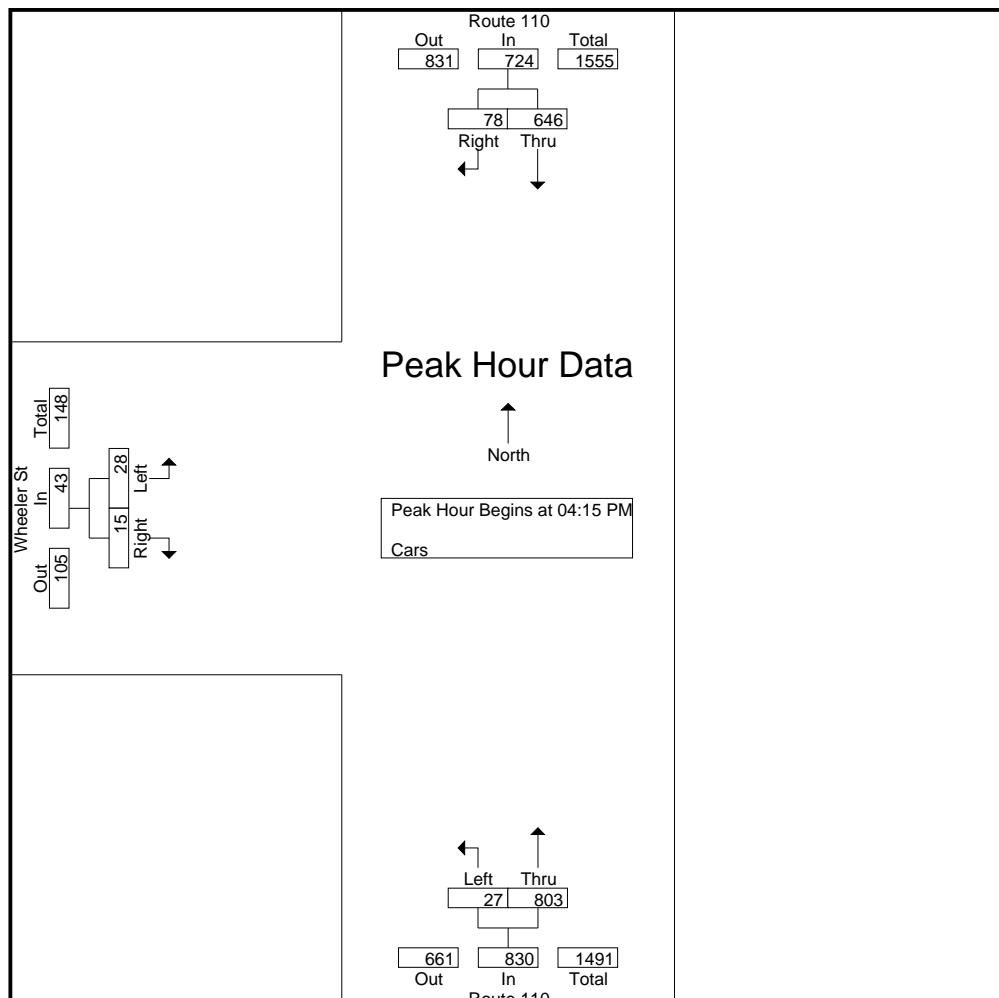
Peak Hour for Entire Intersection Begins at 04:15 PM

04:15 PM	167	19	186	6	228	234	9	5	14	434
04:30 PM	150	24	174	5	196	201	6	3	9	384
04:45 PM	163	12	175	4	214	218	5	3	8	401
05:00 PM	166	23	189	12	165	177	8	4	12	378
Total Volume	646	78	724	27	803	830	28	15	43	1597
% App. Total	89.2	10.8		3.3	96.7		65.1	34.9		
PHF	.967	.813	.958	.563	.880	.887	.778	.750	.768	.920

**Accurate Counts**  
978-664-2565

N/S Street : Route 110  
E/W Street : Wheeler Street  
City/State : Methuen, MA  
Weather : Cloudy

File Name : 74630001  
Site Code : 74630001  
Start Date : 10/30/2024  
Page No : 14



Peak Hour Analysis From 02:00 PM to 06:45 PM - Peak 1 of 1

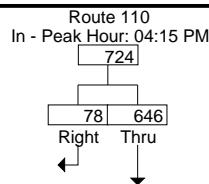
Peak Hour for Each Approach Begins at:

	04:15 PM	04:00 PM	02:45 PM
+0 mins.	<b>167</b>	19	186
+15 mins.	150	<b>24</b>	174
+30 mins.	163	12	175
+45 mins.	166	23	<b>189</b>
Total Volume	646	78	724
% App. Total	89.2	10.8	2.3
PHF	.967	.813	.958
		818	837
		97.7	82.8
		.792	.897
		.214	.218
		180	184
		<b>228</b>	<b>234</b>
		196	201
		214	218
		13	11
		16	16
		1	3
		4	4
		14	15
		16	16
		64	64
		17.2	17.2
		.894	.828
		.894	.828
		.688	.688
		.842	.842

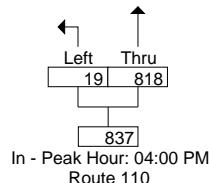
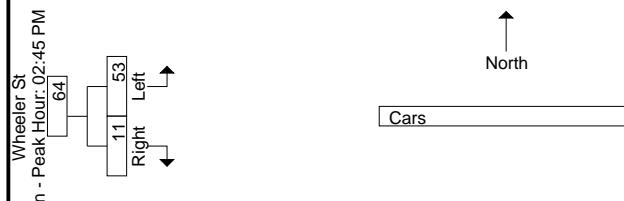
**Accurate Counts**  
978-664-2565

N/S Street : Route 110  
E/W Street : Wheeler Street  
City/State : Methuen, MA  
Weather : Cloudy

File Name : 74630001  
Site Code : 74630001  
Start Date : 10/30/2024  
Page No : 15



**Peak Hour Data**



North

Cars

# Accurate Counts

978-664-2565

N/S Street : Route 110  
 E/W Street : Wheeler Street  
 City/State : Methuen, MA  
 Weather : Cloudy

File Name : 74630001  
 Site Code : 74630001  
 Start Date : 10/30/2024  
 Page No : 16

## Groups Printed- Trucks

	Route 110 From North		Route 110 From South		Wheeler St From West		Int. Total	
	Start Time	Thru	Right	Left	Thru	Left	Right	
07:00 AM		9	9	0	3	2	0	23
07:15 AM		2	2	0	8	3	0	15
07:30 AM		6	2	0	3	2	3	16
07:45 AM		5	3	0	4	3	0	15
Total		22	16	0	18	10	3	69
08:00 AM		4	4	0	4	1	0	13
08:15 AM		5	4	0	6	4	0	19
08:30 AM		7	6	0	5	8	0	26
08:45 AM		5	4	0	7	8	0	24
Total		21	18	0	22	21	0	82
09:00 AM		8	4	0	2	12	0	26
09:15 AM		6	1	1	10	7	1	26
09:30 AM		4	1	1	5	7	1	19
09:45 AM		7	2	0	3	2	0	14
Total		25	8	2	20	28	2	85
10:00 AM		3	4	1	9	3	1	21
10:15 AM		6	4	0	4	6	0	20
10:30 AM		5	0	0	4	2	1	12
10:45 AM		7	1	1	7	1	0	17
Total		21	9	2	24	12	2	70
11:00 AM		4	1	3	3	4	2	17
11:15 AM		6	8	1	7	4	2	28
11:30 AM		5	3	0	4	6	1	19
11:45 AM		3	6	0	6	3	0	18
Total		18	18	4	20	17	5	82
12:00 PM		4	10	1	2	6	0	23
12:15 PM		5	4	0	5	13	1	28
12:30 PM		5	5	0	4	3	1	18
12:45 PM		6	3	0	9	7	0	25
Total		20	22	1	20	29	2	94
01:00 PM		4	6	1	7	6	0	24
01:15 PM		11	1	0	8	6	1	27
01:30 PM		4	3	1	7	1	0	16
01:45 PM		3	4	1	6	2	1	17
Total		22	14	3	28	15	2	84
02:00 PM		6	4	0	2	2	0	14
02:15 PM		3	4	1	6	2	2	18
02:30 PM		0	2	0	3	8	0	13
02:45 PM		2	3	0	2	4	0	11
Total		11	13	1	13	16	2	56
03:00 PM		8	5	1	1	3	2	20
03:15 PM		5	2	1	8	2	0	18
03:30 PM		3	2	0	6	4	0	15
03:45 PM		1	2	0	4	5	0	12
Total		17	11	2	19	14	2	65
04:00 PM		3	2	0	4	1	0	10
04:15 PM		3	0	0	4	1	0	8
04:30 PM		3	0	0	7	2	0	12
04:45 PM		1	2	0	3	0	0	6
Total		10	4	0	18	4	0	36
05:00 PM		4	0	0	2	0	0	6
05:15 PM		1	1	0	1	2	0	5
05:30 PM		3	0	0	1	0	0	4
05:45 PM		2	0	0	2	0	0	4
Total		10	1	0	6	2	0	19

# Accurate Counts

978-664-2565

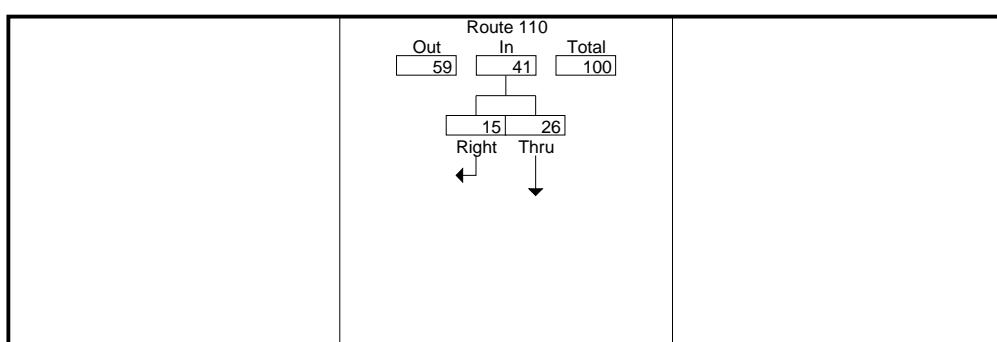
N/S Street : Route 110  
 E/W Street : Wheeler Street  
 City/State : Methuen, MA  
 Weather : Cloudy

File Name : 74630001  
 Site Code : 74630001  
 Start Date : 10/30/2024  
 Page No : 17

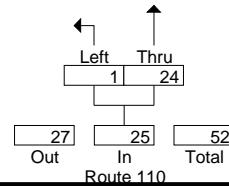
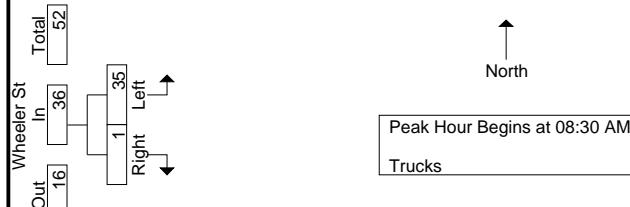
## Groups Printed- Trucks

	Route 110 From North		Route 110 From South		Wheeler St From West		
Start Time	Thru	Right	Left	Thru	Left	Right	Int. Total
06:00 PM	2	1	0	1	0	0	4
06:15 PM	3	2	0	1	0	0	6
06:30 PM	5	0	0	3	2	1	11
06:45 PM	2	1	0	2	0	0	5
Total	12	4	0	7	2	1	26
Grand Total	209	138	15	215	170	21	768
Apprch %	60.2	39.8	6.5	93.5	89	11	
Total %	27.2	18	2	28	22.1	2.7	

	Route 110 From North			Route 110 From South			Wheeler St From West			
Start Time	Thru	Right	App. Total	Left	Thru	App. Total	Left	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 09:45 AM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 08:30 AM										
08:30 AM	7	6	13	0	5	5	8	0	8	26
08:45 AM	5	4	9	0	7	7	8	0	8	24
09:00 AM	8	4	12	0	2	2	12	0	12	26
09:15 AM	6	1	7	1	10	11	7	1	8	26
Total Volume	26	15	41	1	24	25	35	1	36	102
% App. Total	63.4	36.6		4	96		97.2	2.8		
PHF	.813	.625	.788	.250	.600	.568	.729	.250	.750	.981



## Peak Hour Data

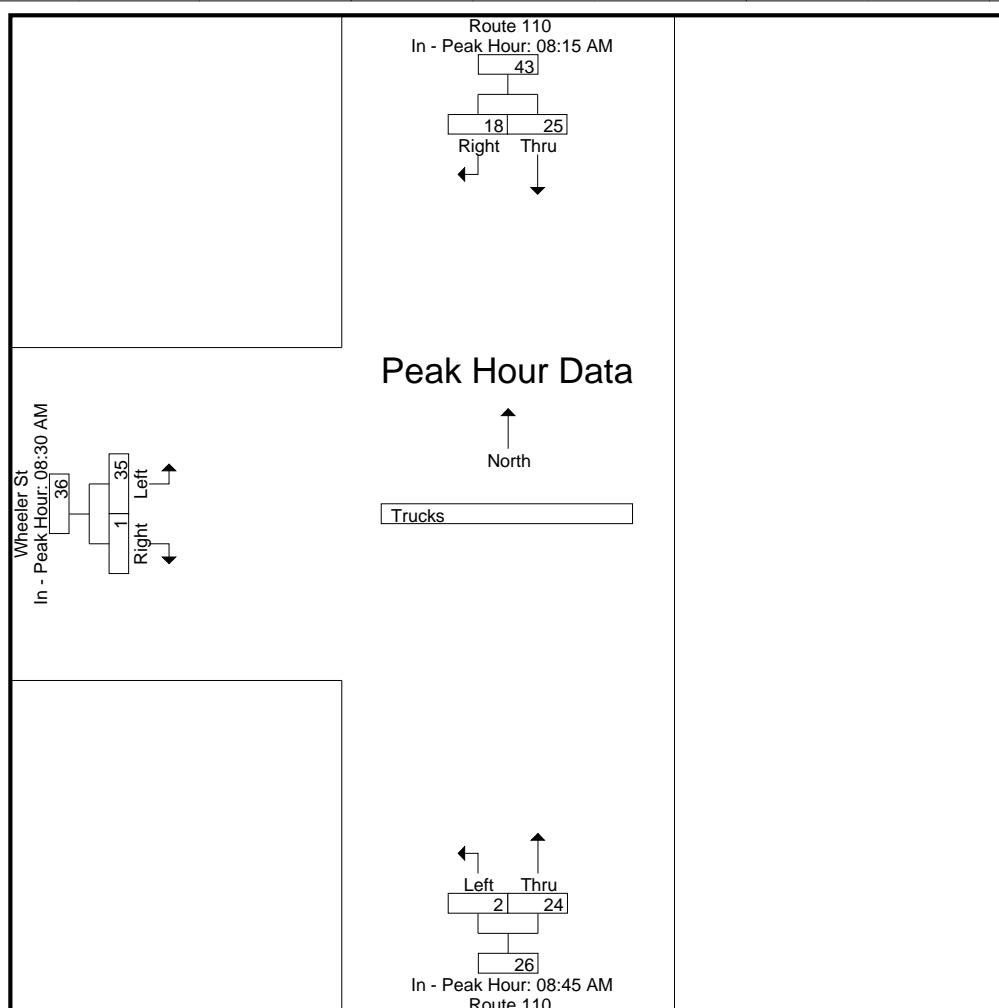


**Accurate Counts**  
978-664-2565

N/S Street : Route 110  
E/W Street : Wheeler Street  
City/State : Methuen, MA  
Weather : Cloudy

File Name : 74630001  
Site Code : 74630001  
Start Date : 10/30/2024  
Page No : 18

		Route 110 From North			Route 110 From South			Wheeler St From West			
Start Time		Thru	Right	App. Total	Left	Thru	App. Total	Left	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 09:45 AM - Peak 1 of 1											
Peak Hour for Each Approach Begins at:											
+0 mins.	08:15 AM	5	4	9	08:45 AM	0	7	7	8	0	8
+15 mins.		7	6	13		0	2	2	8	0	8
+30 mins.		5	4	9		1	10	11	12	0	12
+45 mins.		8	4	12		1	5	6	7	1	8
Total Volume		25	18	43		2	24	26	35	1	36
% App. Total		58.1	41.9			7.7	92.3		97.2	2.8	
PHF		.781	.750	.827		.500	.600	.591	.729	.250	.750



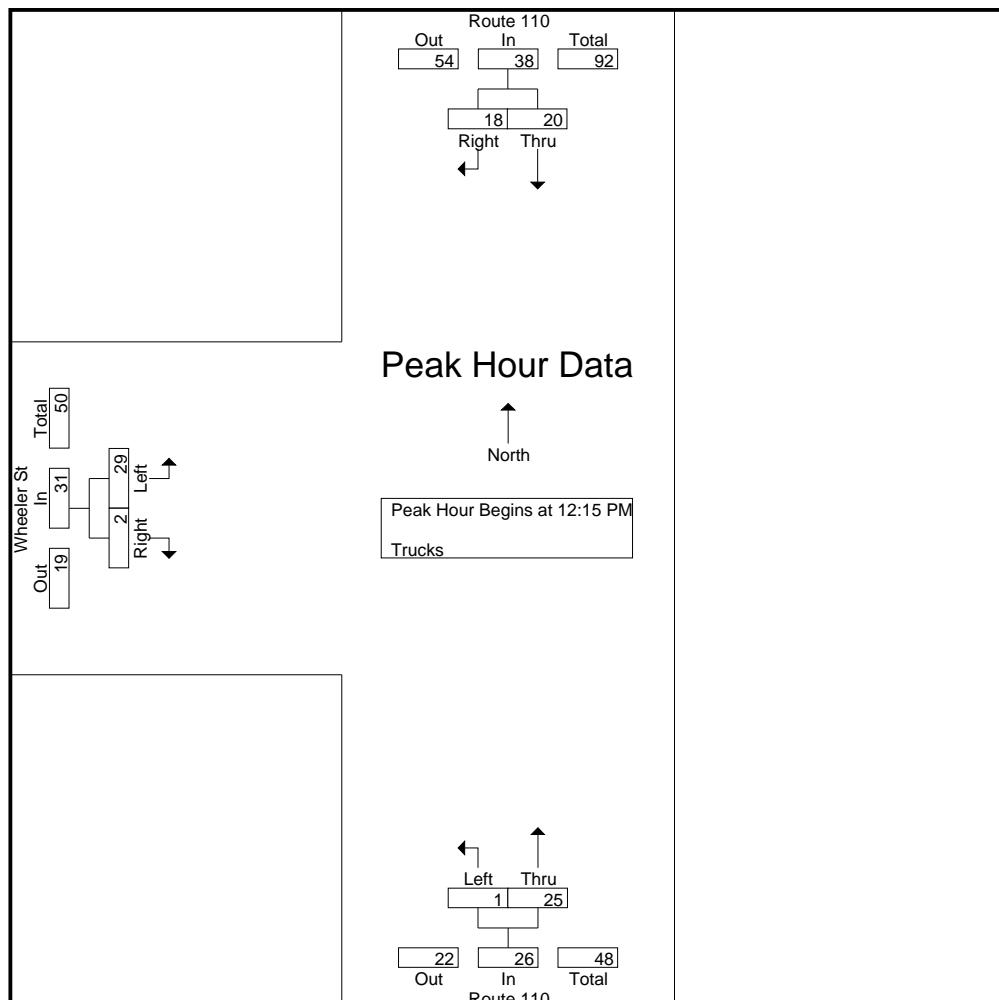
Peak Hour Analysis From 10:00 AM to 01:45 PM - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 12:15 PM

12:15 PM	5	4	9	0	5	5	13	1	14	28
12:30 PM	5	5	10	0	4	4	3	1	4	18
12:45 PM	6	3	9	0	9	9	7	0	7	25
01:00 PM	4	6	10	1	7	8	6	0	6	24
Total Volume	20	18	38	1	25	26	29	2	31	95
% App. Total	52.6	47.4		3.8	96.2		93.5	6.5		
PHF	.833	.750	.950	.250	.694	.722	.558	.500	.554	.848

N/S Street : Route 110  
E/W Street : Wheeler Street  
City/State : Methuen, MA  
Weather : Cloudy

File Name : 74630001  
Site Code : 74630001  
Start Date : 10/30/2024  
Page No : 19



Peak Hour Analysis From 10:00 AM to 01:45 PM - Peak 1 of 1

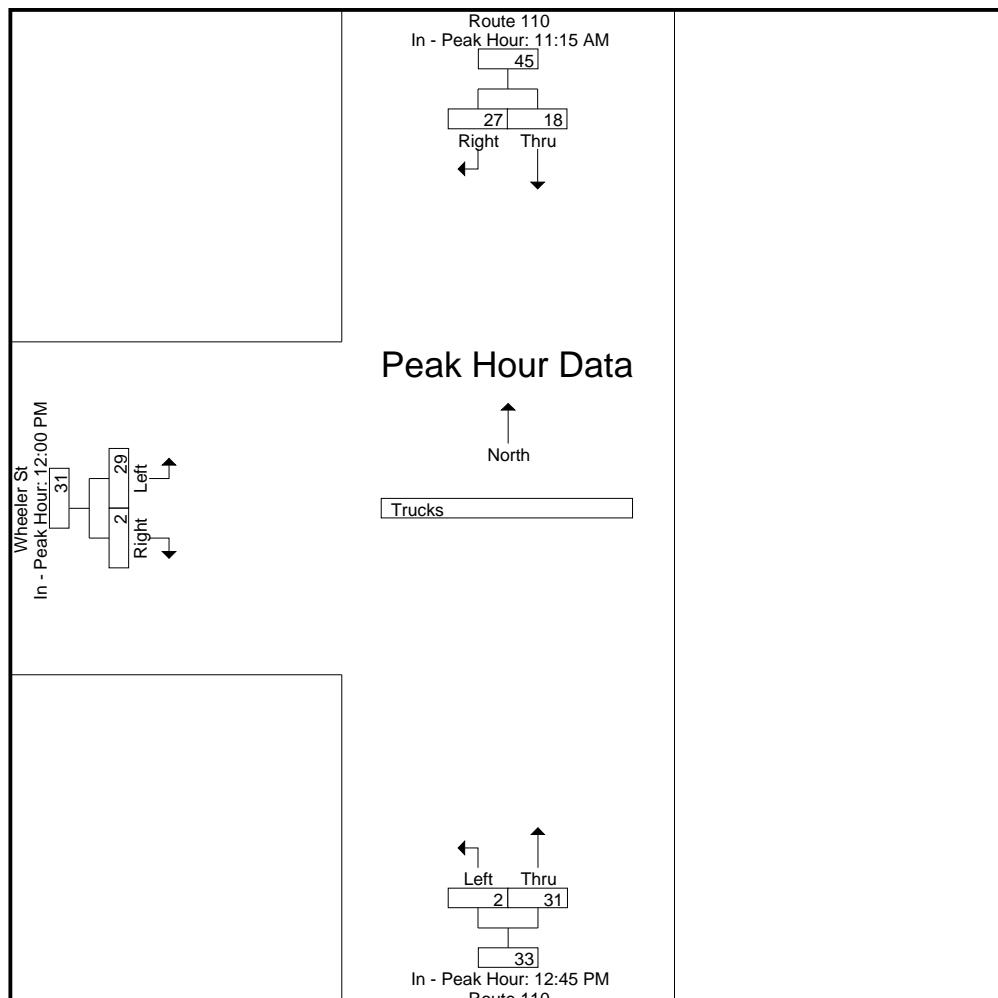
### Peak Hour Analysis From 10:00 AM to 3:00 PM

Peak Hour for Each Approach Begins at:	11:15 AM	12:45 PM	12:00 PM
+0 mins.	6	8	14
+15 mins.	5	3	8
+30 mins.	3	6	9
+45 mins.	4	10	14
Total Volume	18	27	45
% App. Total	40	60	6.1
PHE	750	675	804
	500	861	917
	558	500	554

**Accurate Counts**  
978-664-2565

N/S Street : Route 110  
E/W Street : Wheeler Street  
City/State : Methuen, MA  
Weather : Cloudy

File Name : 74630001  
Site Code : 74630001  
Start Date : 10/30/2024  
Page No : 20



Peak Hour Analysis From 02:00 PM to 06:45 PM - Peak 1 of 1

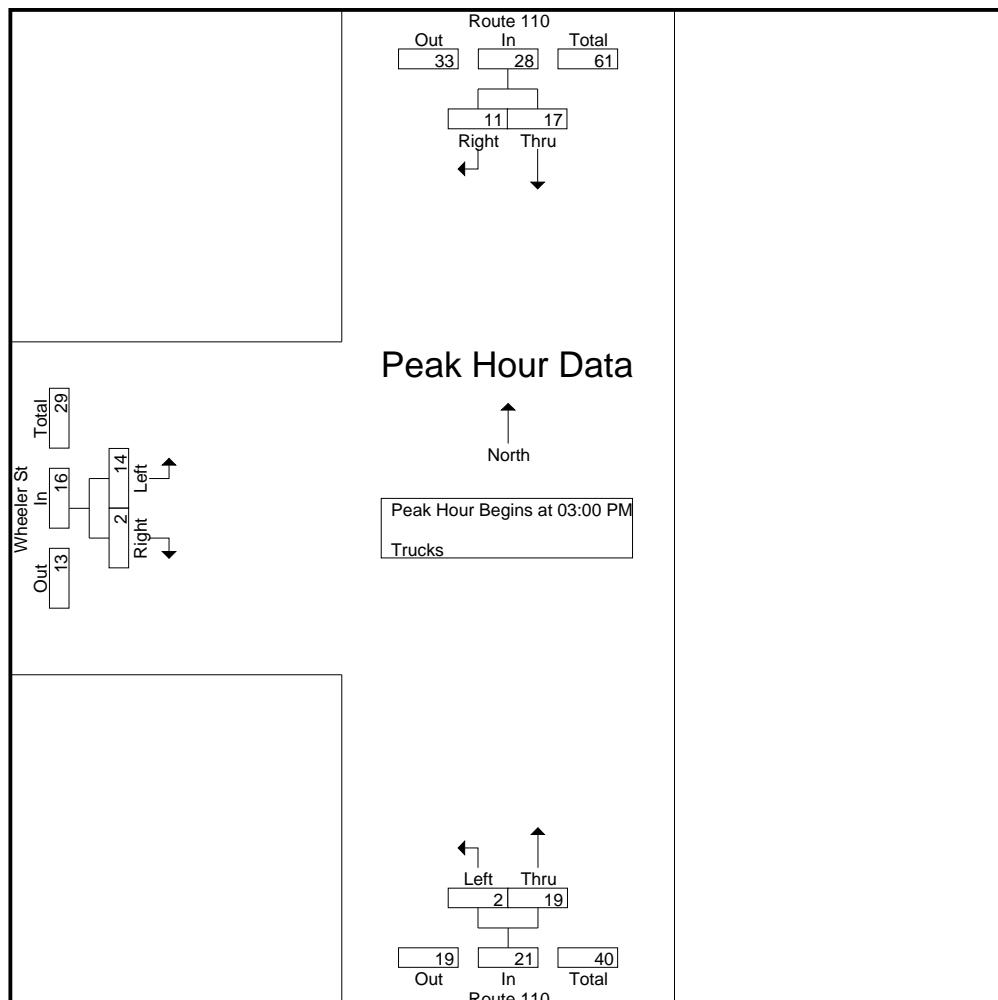
Peak Hour for Entire Intersection Begins at 03:00 PM

03:00 PM	8	5	13	1	1	2	3	2	5	20
03:15 PM	5	2	7	1	8	9	2	0	2	18
03:30 PM	3	2	5	0	6	6	4	0	4	15
03:45 PM	1	2	3	0	4	4	5	0	5	12
Total Volume	17	11	28	2	19	21	14	2	16	65
% App. Total	60.7	39.3		9.5	90.5		87.5	12.5		
PHF	.531	.550	.538	.500	.594	.583	.700	.250	.800	.813

**Accurate Counts**  
978-664-2565

N/S Street : Route 110  
E/W Street : Wheeler Street  
City/State : Methuen, MA  
Weather : Cloudy

File Name : 74630001  
Site Code : 74630001  
Start Date : 10/30/2024  
Page No : 21



Peak Hour Analysis From 02:00 PM to 06:45 PM - Peak 1 of 1

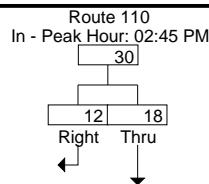
Peak Hour for Each Approach Begins at:

	02:45 PM		03:15 PM		02:15 PM	
+0 mins.	2	3	5	1	8	9
+15 mins.	8	5	13	0	6	6
+30 mins.	5	2	7	0	4	4
+45 mins.	3	2	5	0	4	3
Total Volume	18	12	30	1	22	23
% App. Total	60	40		4.3	95.7	81
PHF	.563	.600	.577	.250	.688	.639
					.531	.500
						.656

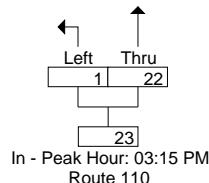
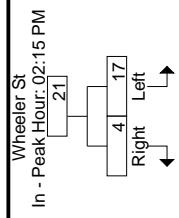
**Accurate Counts**  
978-664-2565

N/S Street : Route 110  
E/W Street : Wheeler Street  
City/State : Methuen, MA  
Weather : Cloudy

File Name : 74630001  
Site Code : 74630001  
Start Date : 10/30/2024  
Page No : 22



### Peak Hour Data



# Accurate Counts

978-664-2565

N/S Street : Route 110  
 E/W Street : Wheeler Street  
 City/State : Methuen, MA  
 Weather : Cloudy

File Name : 74630001  
 Site Code : 74630001  
 Start Date : 10/30/2024  
 Page No : 23

## Groups Printed- Bikes Peds

	Route 110 From North			Route 110 From South			Wheeler St From West						
	Start Time	Thru	Right	Peds	Left	Thru	Peds	Left	Right	Peds	Excl. Total	Incl. Total	Int. Total
07:00 AM		0	0	0	0	0	0	0	0	0	0	0	0
07:15 AM		0	0	0	0	0	0	0	0	0	0	0	0
07:30 AM		0	0	0	0	0	0	0	0	0	0	0	0
07:45 AM		0	0	0	0	0	0	0	0	0	0	0	0
Total		0	0	0	0	0	0	0	0	0	0	0	0
08:00 AM		0	0	0	0	0	0	0	0	0	0	0	0
08:15 AM		0	0	0	0	0	0	0	0	0	0	0	0
08:30 AM		0	0	0	0	1	0	0	0	0	0	1	1
08:45 AM		0	0	0	0	0	0	0	0	0	0	0	0
Total		0	0	0	0	1	0	0	0	0	0	1	1
09:00 AM		0	0	0	0	0	0	0	0	0	0	0	0
09:15 AM		0	0	0	0	0	0	0	0	0	0	0	0
09:30 AM		0	0	0	0	0	0	0	0	0	0	0	0
09:45 AM		0	0	0	0	0	0	0	0	0	0	0	0
Total		0	0	0	0	0	0	0	0	0	0	0	0
10:00 AM		0	0	0	0	0	0	0	0	0	0	0	0
10:15 AM		0	0	0	0	0	0	0	0	0	0	0	0
10:30 AM		0	0	0	0	0	0	0	0	0	0	0	0
10:45 AM		0	0	0	0	0	0	0	0	0	0	0	0
Total		0	0	0	0	0	0	0	0	0	0	0	0
11:00 AM		0	0	0	0	0	0	0	0	0	0	0	0
11:15 AM		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
11:45 AM		0	0	0	0	0	0	0	0	0	0	0	0
Total		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
12:15 PM		0	0	0	0	0	0	0	0	0	0	0	0
12:30 PM		0	0	0	0	2	0	0	0	0	0	2	2
12:45 PM		0	0	0	0	0	0	0	0	0	0	0	0
Total		0	0	0	0	2	0	0	0	0	0	2	2
01:00 PM		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
01:30 PM		0	0	0	0	0	0	0	1	0	0	1	1
01:45 PM		0	0	0	0	0	0	0	0	0	0	0	0
Total		0	0	0	0	0	0	0	1	0	0	1	1
02:00 PM		0	0	0	0	0	0	0	0	0	0	0	0
02:15 PM		0	0	0	0	0	0	0	0	0	0	0	0
02:30 PM		0	0	0	0	0	0	0	0	0	0	0	0
02:45 PM		0	0	0	0	0	0	0	0	0	0	0	0
Total		0	0	0	0	0	0	0	0	0	0	0	0
03:00 PM		0	0	0	0	0	0	0	0	0	0	0	0
03:15 PM		0	0	0	0	0	0	0	0	0	0	0	0
03:30 PM		0	0	0	0	0	0	0	0	0	0	0	0
03:45 PM		0	0	0	0	0	0	0	0	0	0	0	0
Total		0	0	0	0	0	0	0	0	0	0	0	0
04:00 PM		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
04:30 PM		1	0	0	0	0	0	0	0	0	0	1	1
04:45 PM		1	0	0	0	0	0	0	0	0	0	1	1
Total		2	0	0	0	0	0	0	0	0	0	2	2
05:00 PM		0	0	0	0	1	0	0	0	0	0	1	1
05:15 PM		0	0	0	0	0	0	0	0	0	0	0	0
05:30 PM		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
Total		0	0	0	0	1	0	0	0	0	0	1	1

# Accurate Counts

978-664-2565

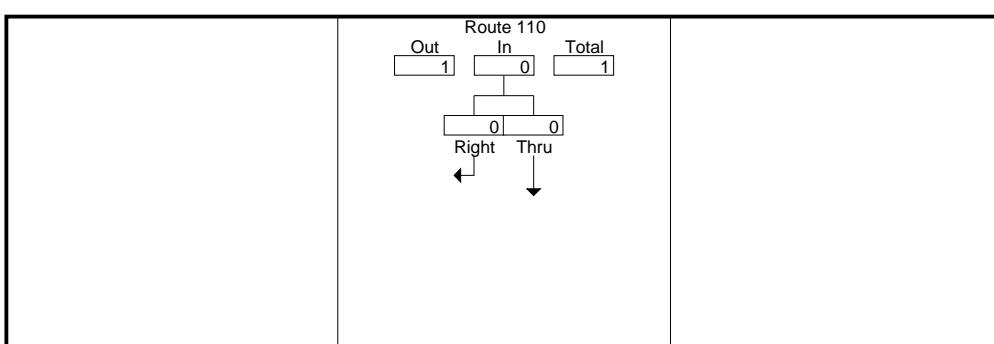
N/S Street : Route 110  
 E/W Street : Wheeler Street  
 City/State : Methuen, MA  
 Weather : Cloudy

File Name : 74630001  
 Site Code : 74630001  
 Start Date : 10/30/2024  
 Page No : 24

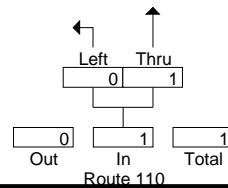
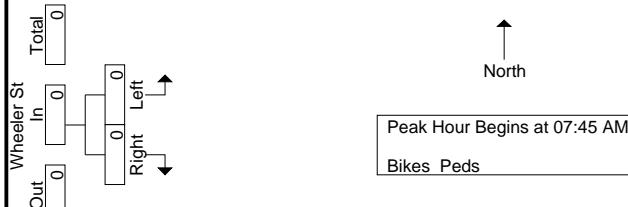
## Groups Printed- Bikes Peds

	Route 110 From North			Route 110 From South			Wheeler St From West						
	Start Time	Thru	Right	Peds	Left	Thru	Peds	Left	Right	Peds	Excl. Total	Incl. Total	Int. Total
06:00 PM		0	0	0	0	0	0	0	0	0	0	0	0
06:15 PM		0	0	0	0	0	0	0	0	0	0	0	0
06:30 PM		0	0	0	0	0	0	0	0	0	0	0	0
06:45 PM		0	0	0	0	0	0	0	0	0	0	0	0
Total		0	0	0	0	0	0	0	0	0	0	0	0
Grand Total		2	0	0	0	4	0	0	1	0	0	7	7
Apprch %		100	0		0	100		0	100				
Total %		28.6	0		0	57.1		0	14.3		0	100	

	Route 110 From North			Route 110 From South			Wheeler St From West					
	Start Time	Thru	Right	App. Total	Left	Thru	App. Total	Left	Right	App. Total	Int. Total	
Peak Hour Analysis From 07:00 AM to 09:45 AM - Peak 1 of 1												
Peak Hour for Entire Intersection Begins at 07:45 AM												
07:45 AM		0	0	0	0	0	0	0	0	0	0	0
08:00 AM		0	0	0	0	0	0	0	0	0	0	0
08:15 AM		0	0	0	0	0	0	0	0	0	0	0
08:30 AM		0	0	0	0	1	1	0	0	0	0	1
Total Volume		0	0	0	0	1	1	0	0	0	0	1
% App. Total		0	0		0	100		0	0			
PHF	.000	.000	.000	.000	.000	.250	.250	.000	.000	.000	.000	.250



## Peak Hour Data

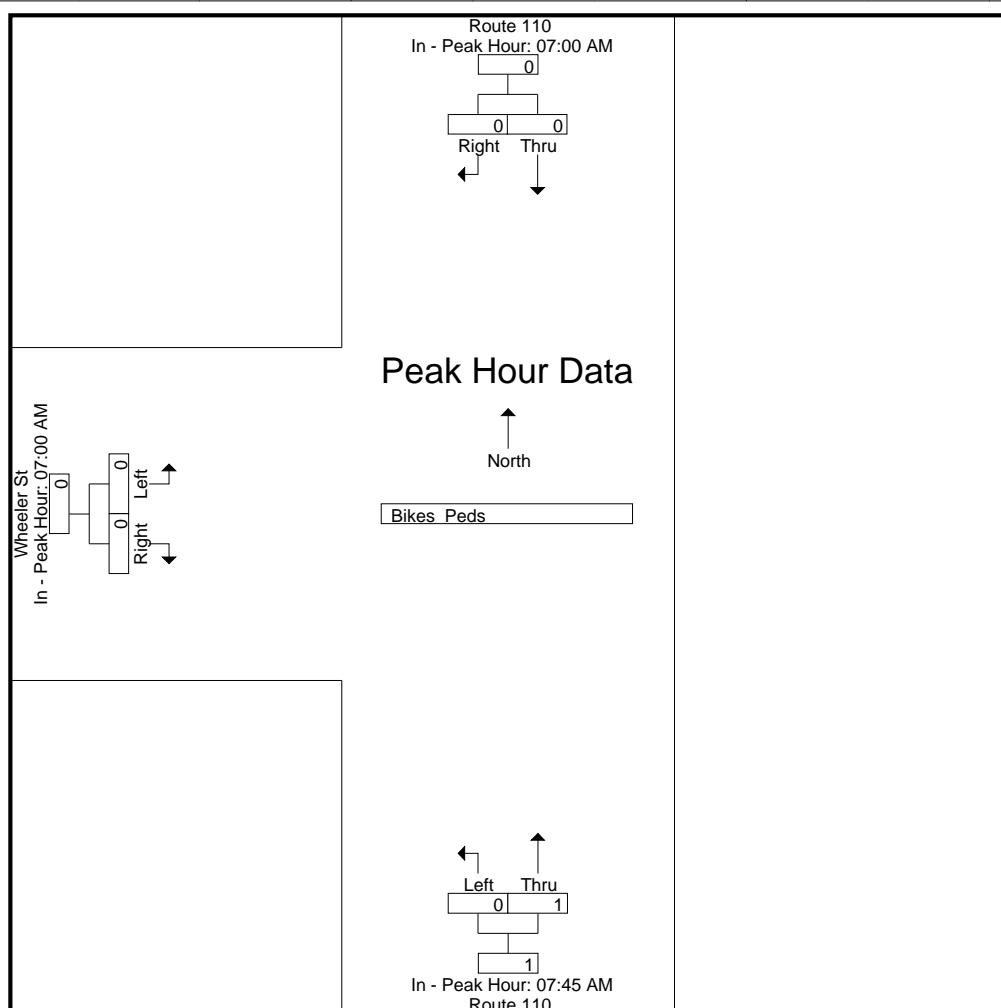


**Accurate Counts**  
978-664-2565

N/S Street : Route 110  
E/W Street : Wheeler Street  
City/State : Methuen, MA  
Weather : Cloudy

File Name : 74630001  
Site Code : 74630001  
Start Date : 10/30/2024  
Page No : 25

		Route 110 From North			Route 110 From South			Wheeler St From West			
Start Time		Thru	Right	App. Total	Left	Thru	App. Total	Left	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 09:45 AM - Peak 1 of 1											
Peak Hour for Each Approach Begins at:											
+0 mins.	07:00 AM	0	0	0	07:45 AM	0	0	0	0	0	0
+15 mins.		0	0	0		0	0	0	0	0	0
+30 mins.		0	0	0		0	0	0	0	0	0
+45 mins.		0	0	0		0	1	1	0	0	0
Total Volume		0	0	0		0	1	1	0	0	0
% App. Total		0	0			0	100		0	0	
PHF		.000	.000	.000		.000	.250	.250	.000	.000	.000



Peak Hour Analysis From 10:00 AM to 01:45 PM - Peak 1 of 1

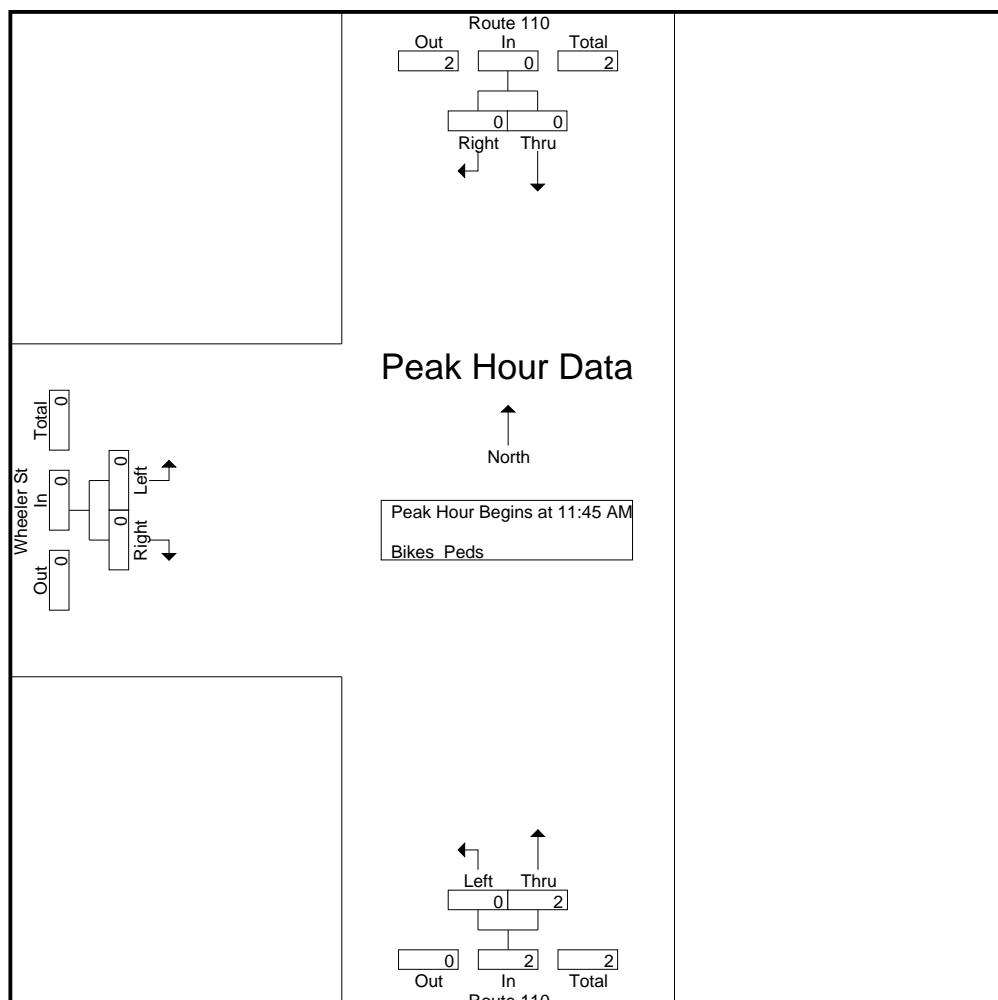
Peak Hour for Entire Intersection Begins at 11:45 AM

11:45 AM	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
12:15 PM	0	0	0	0	0	0	0	0	0	0	0
12:30 PM	0	0	0	0	2	2	2	0	0	0	2
Total Volume	0	0	0	0	2	2	2	0	0	0	2
% App. Total	0	0		0	100		0	0	0	0	
PHF	.000	.000	.000	.000	.250	.250	.250	.000	.000	.000	.250

**Accurate Counts**  
978-664-2565

N/S Street : Route 110  
E/W Street : Wheeler Street  
City/State : Methuen, MA  
Weather : Cloudy

File Name : 74630001  
Site Code : 74630001  
Start Date : 10/30/2024  
Page No : 26



Peak Hour Analysis From 10:00 AM to 01:45 PM - Peak 1 of 1

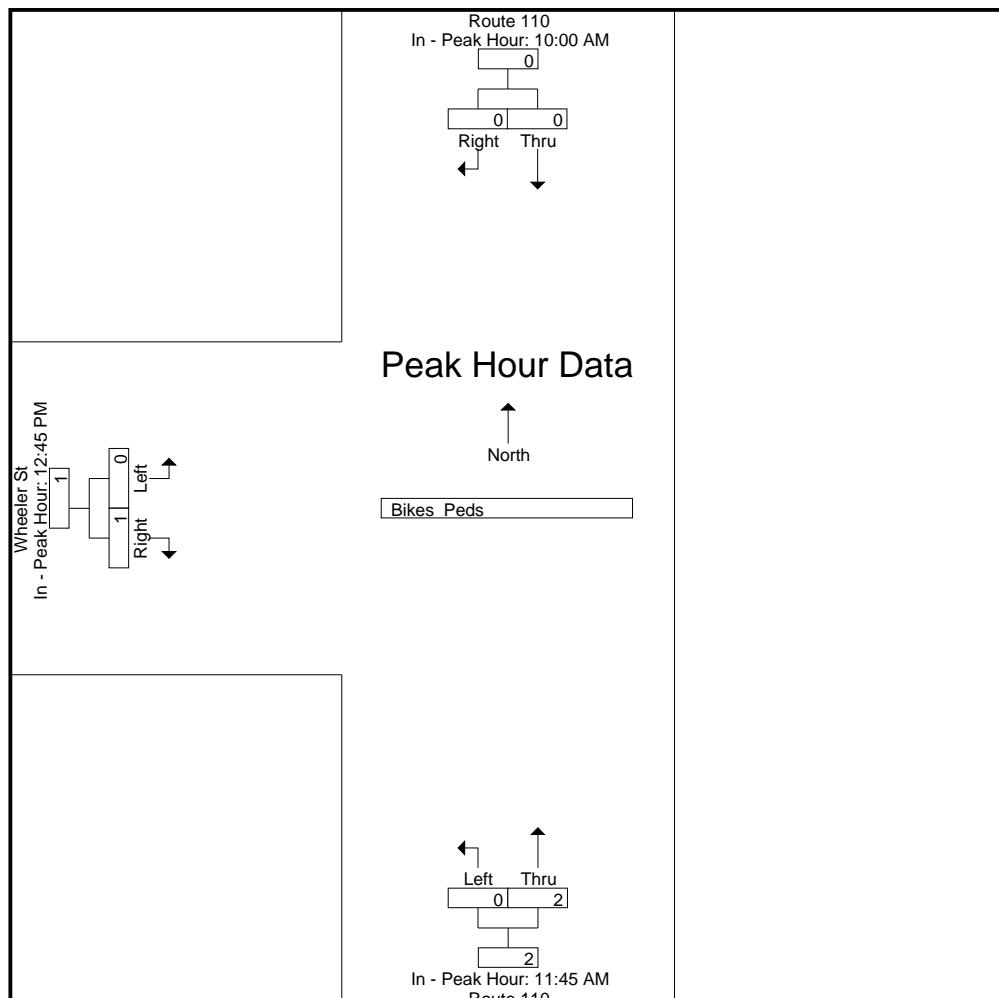
Peak Hour for Each Approach Begins at:

	10:00 AM		11:45 AM		12:45 PM	
+0 mins.	0	0	0	0	0	0
+15 mins.	0	0	0	0	0	0
+30 mins.	0	0	0	0	0	0
+45 mins.	0	0	0	0	1	1
Total Volume	0	0	0	2	0	1
% App. Total	0	0	0	100	0	100
PHF	.000	.000	.000	.250	.250	.250

**Accurate Counts**  
978-664-2565

N/S Street : Route 110  
E/W Street : Wheeler Street  
City/State : Methuen, MA  
Weather : Cloudy

File Name : 74630001  
Site Code : 74630001  
Start Date : 10/30/2024  
Page No : 27



Peak Hour Analysis From 02:00 PM to 06:45 PM - Peak 1 of 1

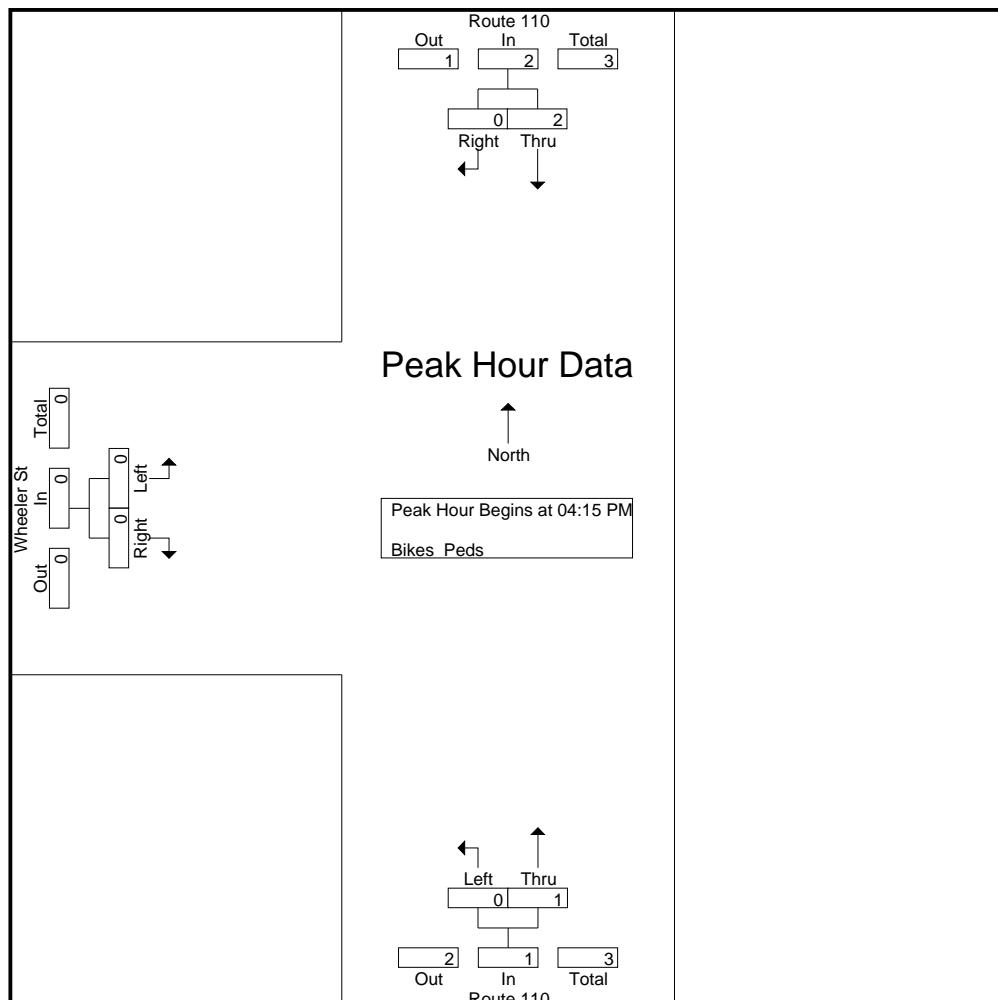
Peak Hour for Entire Intersection Begins at 04:15 PM

04:15 PM	0	0	0	0	0	0	0	0	0	0	0
04:30 PM	1	0	1	0	0	0	0	0	0	0	1
04:45 PM	1	0	1	0	0	0	0	0	0	0	1
05:00 PM	0	0	0	0	1	1	0	0	0	0	1
Total Volume	2	0	2	0	1	1	0	0	0	0	3
% App. Total	100	0	100	0	100	0	0	0	0	0	100
PHF	.500	.000	.500	.000	.250	.250	.000	.000	.000	.000	.750

**Accurate Counts**  
978-664-2565

N/S Street : Route 110  
E/W Street : Wheeler Street  
City/State : Methuen, MA  
Weather : Cloudy

File Name : 74630001  
Site Code : 74630001  
Start Date : 10/30/2024  
Page No : 28



Peak Hour Analysis From 02:00 PM to 06:45 PM - Peak 1 of 1

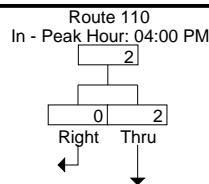
Peak Hour for Each Approach Begins at:

	04:00 PM		04:15 PM		02:00 PM	
+0 mins.	0	0	0	0	0	0
+15 mins.	0	0	0	0	0	0
+30 mins.	1	0	1	0	0	0
+45 mins.	1	0	1	0	1	0
Total Volume	2	0	2	0	0	0
% App. Total	100	0	0	100	0	0
PHF	.500	.000	.500	.000	.250	.250
					.000	.000
						.000

**Accurate Counts**  
978-664-2565

N/S Street : Route 110  
E/W Street : Wheeler Street  
City/State : Methuen, MA  
Weather : Cloudy

File Name : 74630001  
Site Code : 74630001  
Start Date : 10/30/2024  
Page No : 29



### Peak Hour Data

