Memorandum

To: Jennifer Caira & Neil Cronin
Planning & Development,
City of Newton

Date: February 21, 2020

Project #: 10865.03

From: Randall Hart, Principal
Matthew Duranleau, EIT

Re: The Station at Riverside
Response to Transportation Peer Review Comments
Memorandum by Green International, dated February 6, 2020

Vanasse Hangen Brustlin, Inc. (VHB) has prepared the following response to comments received through the peer review of the Station at Riverside application package. Comments were received from Green International Affiliates, Inc. in a memorandum dated February 6, 2020. For ease of review, the comments that were received are outlined below along with the responses.

Major Comments:

Mode Share

Comment 1: Previous comment #20 still applies. No mode split for pedestrian and bicycle trips to/from the site was applied for any of the projected land uses. It is noted that the 2012-2016 U.S. Census data showed that approximately 30% of all Newton residents also work in Newton and of those 30%, approximately 15% either walk or bike to work. This results in approximately 5% of all Newton residents walking or biking to work. **Proponent should provide estimate of the number of pedestrians and bicycles anticipates to enter the site off Grove Street near the transit loop and main entrance under build conditions – doesn't have to be full network.**

a. The revised TIAS gives the following explanation for not applying a mode split for pedestrian and bicycle trips to/from the site: "While sidewalks and bike facilities will be provided to connect the Project with the rest of Newton, the Site is slightly isolated from the surrounding neighborhoods due to Route 128/I-95 located west of the Site, the Woodland Golf Club located south of the Site, the MBTA tracks located west of the Site, and the Charles River located north of the Site. Due to this location, the amount of walking and biking trips may be slightly lower than in other, more connected areas of Newton."
    i. There are residential land uses on Grove Street –apartment/condo complex, with existing pedestrians 30 in the AM, 12 in the PM
b. "It should be noted again that the vehicle mode shares were applied in order to present a conservative assessment of future traffic impacts. The use of the high vehicle mode shares and low transit and walk/bike mode shares was a directive of MassDOT as part of the former approval process to be conservative in assessing project impacts and potential improvements."

Response 1: **For informational purposes, VHB has estimated the number of pedestrian and bicycle trips that are expected to be generated by the Site based on the existing City of Newton mode share. To**

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The bicycle/pedestrian site-generated trips have been estimated using the same trip generation methodology in the TIAS, but assuming a 5% walk/bike mode share for the residential, office, and retail uses (it is still assumed that no one will walk or bike to/from the hotel). Based on that revised mode share, the Project is expected to generate approximately 40 new walk/bike trips (24 entering/16 exiting) during the weekday morning peak hour, 42 walk bike trips (17 entering/25 exiting) during the weekday evening peak hour, and 39 walk/bike trips (21 entering/18 exiting) during the Saturday midday peak hour. Calculations behind these values and a graphic showing the movements of pedestrians and bicyclists to and from the Site are included in the Attachments to this response to comments document. Based on these values, less than one new walk/bike trip per minute is expected to be generated by the Site and these Site-generated walk/bike trips will be accommodated by the proposed pedestrian and bicycle accommodations along Grove Street, along Recreation Road Extension, and at the entrances to the Site at the driveway along Grove Street and at the Transit Green on Grove Street. It should be noted that these Site-generated volumes are based on the revised building program of 243,387 sf office, 617 residential units, 43,241 sf retail, and a 150-room hotel.

Future Build Conditions

Comment 1: We noted the following issues in the internal capture trip credit calculations:

a. The number of trips assigned to the respective land uses in internal capture trips shown in the "Shared Trip Calculations" sheet in the Appendix do not match the new unadjusted vehicle trips for the respective land uses shown in Table 5. **The proponent should revise the "Shared Trip Calculations" sheet in the Appendix to reflect the accurate internal capture credits.**

b. The net site trips table does not reflect the appropriate credits. Applying the internal capture credits (shown in the "Shared Trip Calculations" sheet in the Appendix) and the mode share credits (using the percentages shown in Table 6) to the unadjusted vehicle trips does not match the adjusted site generated vehicle trips shown in Table 7. Table 7 should be expanded to show the number of trip credits applied to internal capture and transit mode split (as separate items). **Table 7 should also be expanded to include weekday and Saturday daily estimates.**

Response 1: **The trips used for internal capture and shown in the "Shared Trip Calculations" sheet are based on person trips, not vehicle trips. To convert the new unadjusted vehicle trips presented in Table 5 into person trips, the vehicle trips were multiplied by vehicle occupancy rates (VORs) based on national data. Similarly, after applying the internal capture and mode share credits, the person trips were converted back into vehicle trips using local VOR data in order to get the adjusted site generated vehicle trips shown in Table 7. The national and local VOR data used for the trip generation are included in the Attachments to this response to comments document. In addition, an expanded Table 7 showing the number of trip credits applied to internal capture**

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and transit mode split and expanded to include weekday and daily Saturday estimates is also included in the Attachments to this response to comments document. It should be noted that these updated Site-generated volumes are based on the revised building program of 243,387 sf office, 617 residential units, 43,241 sf retail, and a 150-room hotel.

Comment 2: Previous comment #29 has been partially addressed. The Future Build w/ Mitigation Site Generated Trip Figures show the trips and traffic volumes at the internal intersection of Main St at Road A. It is noted that the amount of traffic generated by Road A is expected to be significantly less during the peak periods due to the significant decrease in the amount of office space in Building 1 (445.7 kSF in original TIAS vs. 280 kSF in revised TIAS). However, it is noted that the average and 95th percentile queues during the weekday PM peak hour are expected to spill back into the Road A intersection with Main St., blocking vehicle from entering the Office Building Road A and also blocking the Road A approaches from exiting onto Main St. Traffic Signal Warrant was not conducted at this intersection. It is noted that the volumes at the intersection during the weekday AM and PM peak hours meet the volume thresholds defined in Warrant 1 – Eight Hour Vehicular Volume. The weekday PM peak hour volumes also meet the volumes thresholds defined in Warrant 2 – Four Hour Vehicular Volume and meet Warrant 3 – Peak Hour Volume. The Saturday Midday peak hour volumes at the intersection do not meet the thresholds defined in Warrants 1-3 and the weekday AM peak hour volumes do not meet the thresholds defined in Warrants 2-3. **Applicant should consider additional mitigation, such as DO NOT BLOCK THE BOX pavement markings and signage at the Main St / Road A intersection to prevent the vehicle queues along the Main St approach to its signalized intersection with Grove St Extension from spilling back into and blocking the intersection.**

Response 2: **The Proponent will install do not block the box pavement markings and signage at this location. In addition, since the time that the TIA was prepared the development program has been reduced significantly as noted in the Supplemental Memorandum provided to the City.**

Comment 3: Previous comment #33 partially addressed. Signal warrant analysis was conducted at the Grove St / Woodland Rd intersection. It is noted that the 4-hours of traffic count data collected at this intersection exceed the volume thresholds defined in Warrant 1 – Eight Hour Vehicular Volume when using the projected traffic volumes for the 2029 Build Conditions. In addition, the Grove St NB approach is still expected to operate at LOS F under the Build Conditions during the AM and PM peak hours (worsening from LOS E under No-Build Conditions during both peak hours.) **Mitigation measures should be evaluated to mitigate impacts to traffic operations resulting from the proposed project.**

Response 3: **The Proponent will work with the City of Newton to determine if there are any additional mitigation measures that can be implemented at this location, such as new pavement markings or updated signage. It should be noted that the intersection does not meet a signal and already**

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has an overhead all-way stop flashing beacon and two stop signs on each approach, one on each side of the roadway. In addition, the sidewalks are in good shape with ADA-accessible ramps on each crosswalk approach.

Comment 4: Previous comment #35 is less of a concern, 95th percentile queue along the Route 128 SB Off-Ramp approach to the roundabout is no longer expected to back up to the sharp corner along the off-ramp where it splits to separate traffic going to either Grove St or Quinobequin Rd. However, the 95th percentile queues along the Off-Ramp are still expected to double under the proposed roundabout operations under the 2029 Build w/ Mitigation Condition. This could still cause safety concerns if traffic exiting I-95 South does not see the queue around the sharp horizontal curve and thus would likely not have enough time to react and stop in time to avoid a rear-end collision with a vehicle stopped in the queue. **Additional mitigative measures should be considered along the I-95 SB Off-Ramp approach to the proposed roundabout to either reduce vehicle travel speeds approaching the roundabout, increase sight distance along the approach through regrading/vegetation trimming beyond the roadway and/or provide advanced warning for the upcoming roundabout.**

Response 4: **Additional mitigation will be provided along the I-95 SB Off-Ramp approach to the proposed roundabout by trimming/removing vegetation to improve the sight lines and/or providing advanced warning signage. MassDOT will have the final determination on mitigation improvements along the off-ramp. It should be noted that the longer queues along the ramp are due to the removal of the right-turn slip lane from the I-95 SB Off-Ramp to Grove Street eastbound. The removal of the slip lane was requested by MassDOT to improve operations for bicycles along Grove Street and to reduce the speed of vehicles coming off the ramp.**

Comment 5: We have concerns with the proposed traffic operations at the Grove Street / MBTA Site Driveway signalized intersection and the internal intersection at Main St / Road B / Building 9/10 Parking Garage entrance. Particularly during the weekday PM peak hour, when the average and 95th percentile queues along the MBTA Site Driveway (Road B) approach to the signalized intersection with Grove St are expected to spill back into and block the internal intersection at Main St / Road B / Building 9/10 Parking Garage entrance (weekday AM peak hour 95th percentile queues also expected to spill back into the internal intersection). This could cause significant congestion and operational issues along Main Street within the site; particularly at key areas such as near the MBTA access loop and the main entrance/exit to the Building 9/10 Parking Garage. **The proponent should clarify and delineate how MBTA buses will maintain access to the transit plaza during the PM peak when queues are blocking the intersection. Consider holding traffic in the garage or rerouting buses. A signal may be necessary.**

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Response 5: **As discussed, the traffic analysis has been prepared with very conservative assumptions and actual operations are likely to be better than that presented. In addition, the parking garage will be designed with interactive signage to direct motorist to the most appropriate egress locations during peak periods to maximize the egress operations. There will also be attendants present during peak period operations and to the extent it becomes necessary vehicle can be held back or redirected to the western egress to ensure the four-way intersection will not become overburdened. Bus activity during the peak hours is relatively minor with only two buses traveling within the site based on current schedule.**

TDM

Comment 1: Previous comment #43 partially addressed. The TDM does not include any information on adding a shuttle service that provides a connection between the nearby Auburndale MBTA Commuter Rail Station and the project site. However, the TIAS states that "MBTA Bus Route 558 provides a connection between the Site and Auburndale Station for any future residents or workers that commute via the Worcester Line." However, there is no existing stop on MBTA Bus Route 558 at the Auburndale Station. Closest existing bus stop approximately ¼ mile north of the Auburndale Station at the corner of Commonwealth Ave at Melrose St intersection.

Response 1: **The Proponent is researching the feasibility of providing a shuttle service between the Site and Auburndale Station. Discussions are on-going between the Proponent, the City of Newton, and the MBTA.**

Comment 2: Previous comment #48: **The TDM should state that the Proponent will coordinate and work with MassDOT to implement a signage program within the site to direct drivers to regional networks rather than local roadways.**

Response 2: **This comment has been addressed in the most recent submission.**

Comment 3: Previous comment #49: **The TDM should commit to improving transit access to/from the site by integrating Transit Signal Priority (TSP) into the proposed traffic signals to be installed as part of the proposed mitigation.**

Response 3: **The Proponent is committed to integrating Transit Signal Priority into the proposed traffic signal to be installed as part of the proposed mitigation and that will be reflected on all future document and plan submittals.**

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Comment 4: Previous comment #55: There are currently no designated public transit stops proposed on the westerly side of the project site. **The TDM should consider providing a shuttle within the project site that connects the MBTA bus stop near Riverside Station to Buildings 1-4.**

a. Site Plan calls for an "Intercity Bus Drop off Berth" along the east loop of the Road A horseshoe, adjacent to Building 4. Call-out states "Subject to further design coordination with MBTA"

Response 4: **If a shuttle service is implemented that connects the Site with an external destination, such as Auburndale Station, the shuttle will stop on both sides of the Site near the Riverside Station and near Buildings 1-4. Anyone on-Site will be able to use this shuttle between the two on-Site stops. However, the Proponent will not be providing a dedicated shuttle that only travels within the Site, as the distance between Riverside Station and Buildings 1-4 is approximately ¼ mile and the amount of time to walk is less than ten minutes.**

Comment 5: Previous comment #57: The TDM includes directional signage for locating transportation services (transit stop/shuttle stop) and amenities (bicycle parking, regional bicycle routes, and pedestrian walkways). **All proposed wayfinding signage (including locations and sign details) should be shown on the Layout and Materials Plan included in the Civil Plans for the Project.**

Response 5: **The proposed directional/wayfinding signage program is included in the design guidelines document. The ultimate/final directional signage package will be part of a comprehensive signage package that is subject to review and approval by the MBTA.**

Road Safety Audit

Comment 1: The revised TIAS discusses the August 2019 RSA and provides a link to the report; however, the TIAS does not include any discussion of the short, medium, and long-term recommendations for the proposed improvements. **The Applicant should clarify which, if any, of these recommendations they will commit to implementing.**

Response 1: **As part of this project, the Proponent will implement substantial infrastructure improvements around the site and at the Grove Street interchange with Route 128/I-95. The infrastructure improvements will offset existing safety and operational issues and provide much improved access to the Riverside Station MBTA facility. In addition, the Proponent will be constructing a parking garage to accommodate the existing MBTA parking and traffic associated with the project. The infrastructure mitigation package is substantial and unprecedented for a project like this. Traffic/transportation mitigation is expected to be discussed with the City Council at the February 25th Land Use Hearing.**

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Site Plan Comments

Comment 1: Previous comment #61 still applies. The only turning movement provided within the site is for a City Transit Bus turning left from Main St into the Building 9 garage and then onto Road C from the Building 9 garage. Revised TIAS states "Due to the smaller sizes of the retail uses, most deliveries likely will be made by smaller, single-unit trucks." It also states that "Smaller single-unit trucks can easily be accommodated and would typically be on Site for a short period of time." **Figures showing the turning movements of single-unit trucks (SU-40) within the site for truck deliveries and MBTA buses should be provided for all locations that allow heavy vehicle access. In addition, figures showing the turning movements for larger vehicles (WB-67) accessing and egressing the loading docks for Building 1 and emergency vehicle access for a City of Newton ladder fire truck should be provided.**

Response 1: **The Project has been designed to accommodate the truck turning movements of the SU-40 delivery truck. Figures showing these truck turns are included in the Attachments to this response to comments document. The loading at Building 1 was designed for larger vehicles, including WB-40 and WB-50, but not a truck as large as the WB-67. Figures showing the turning movements of the WB-40 to the Building 1 loading and the City of Newton ladder fire truck can be found in the Attachments as well.**

Comment 2: Previous comment #63 has been partially addressed. Site Plan indicates designated on-street handicap parking spaces in front of residential and commercial uses. In addition, the revised TIAS states that "Service and loading locations will be provided for several buildings that contain office space and retail/restaurant establishments, either through loading docks or designated on-street parking locations for service and loading vehicles. Specific service and loading locations will be provided in the interior of Buildings 1, 8, 9, and 10. In addition, there will be adjacent on-street loading areas as well." Loading docks shown on Site Plan for Building 1. On-street loading areas shown for Buildings 5 and 6. **Dimensions and locations should be indicated on the Site Plan for the specific service and loading locations to be provided in the interior of Buildings 1, 8, 9 and 10.**

Response 2: **Loading for Buildings 1, 8, 9, and 10 are located inside the buildings. Ground floor architectural plans showing the locations of the interior loading spaces are included in the Attachments to this response to Comments document. The Site Plans will be updated to label and dimension the interior loading in Buildings 1, 8, 9, and 10.**

Comment 3: Figure 29 of the TIAS shows proposed geo-fencing around the entire pick-up/drop-off areas outside Riverside station. We suggest providing designated areas closer to Riverside Station for ride share pick-up and drop-off than what is currently shown in Figure 29 as the current locations shown in

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Figure 29 are unlikely to be adhered to. **The proponent should propose geo-fencing along Grove Street adjacent to the project site as the proposed cross-section along Grove Street in this area does not allow for safe pick-up/drop-off operations.**

Response 3: **The Proponent will expand the proposed geo-fencing to include Grove Street adjacent to the Site. The updated graphic showing the geo-fencing is included in the Attachments to this response to comments document.**

Comment 4: The pick-up/drop-off areas outside Riverside station have been rearranged to allow for a larger designated area for shuttle and rideshare activities adjacent to Building 7 / Riverside station entrance. However, the only designation for the spaces for buses and shuttle service is signage and a solid white edge line. **Bus shelters, dedicated bus lanes, and clearly delineated spaces should be considered. Bus stop amenities such as shelters, benches, and waiting areas should be clearly outlined on the plans and a queue plan should be provided to show that the available space is sufficient to accommodate the various user groups.**

Response 4: **Because the Proponent is continuing to coordinate with the MBTA to determine the best bus and shuttle routes, locations for bus shelters and benches have yet to be shown on the plans. Once the final locations of the bus stops are selected by Buildings 7, 8, and 9, bus shelters and benches will be added to the Site Plans. In addition, a queue plan will be provided to show that the available space is sufficient to accommodate the various user groups once a final configuration has been confirmed with the MBTA.**

Comment 5: Previous comment #72 has not been addressed. The site plan only shows proposed regulatory and warning signage. **Wayfinding and directional signage should be included in the site plan for review.**

Response 5: **The proposed directional/wayfinding signage program is included in the design guidelines document. The ultimate/final directional signage package will be part of a comprehensive signage package that is subject to review and approval by the MBTA.**

Comment 6: Previous comment #73 has not been addressed. Could only complete limited review of the proposed ramps. **The proponent should submit civil plans for the proposed ramps, and include truck turning diagrams and initial cost estimate. Note included in Civil Plan C-8.1 "Off-Site improvements to be designed by others and are subject to further review and approval by MassDOT/FHWA."**

Response 6: **The engineered design plans for the MassDOT/FHWA on/off ramps will not be prepared until after the Special Permit is approved for the project. These documents are subject to extensive**

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technical review by these agencies. To date, the Proponent has prepared a detailed conceptual plan which has been conceptually approved by MassDOT and FHWA to go forward to design.

Comment 7: Previous comment #75 still applies. **An evacuation route should be provided.**

Response 7: **An evacuation route graphic has been prepared and is included in the Attachments to this response to comments document for reference.**

Comment 8: The Main Street Typical Sections show the Shared Use Path terminating at the internal intersection of Main St at Road A leading to the Office Building (Building 1). The segment of Main St between Road A and Road C shows sidewalk on either side of the road with one side having an 11 ft. minimum width and the other a 12 ft. minimum width. Will bikes be prohibited from traveling along these sidewalks? **The proponent should provide clarification as to how bikes will circulate throughout the site. If bikes are allowed to travel along the 11 ft. and 12 ft. minimum areas labeled as sidewalks between Road A and Road C then these areas should be renamed in the Typical Sections accordingly. If bikes are prohibited to travel along both of these sidewalks, we recommend the proponent consider revising the layout of Main Street to provide designated areas for bicycles.**

Response 8: **Within the Site, the 11-foot and 12-foot sidewalks will be designed for pedestrian use only. Bicyclists going to and coming from specific buildings on-Site will share the roadway with vehicles on Main Street and the road will be designed to encourage slow vehicle speeds. In addition, a two-way shared use path will be located on the north side of Grove Street and the east side of Grove Street Extension traveling around the perimeter of the Site to provide access to the Riverside MBTA Station and the buildings facing Grove Street. The final bicycle accommodations will be designed based on discussions with the City of Newton.**

Comment 9: The Green Line Delivery Route for a WB-67 results in several parking spaces being coned off during rail deliveries.

a. **Are the times when rail deliveries will take place known? Any potential for deliveries to occur during peak parking demand for the MBTA Maintenance Yard?**
b. **Approximately how long are the parking spots anticipated to be coned off?**

Response 9: **This area is not part of the proposed Project and will be managed by the MBTA. The layout shown for parking was a conceptual plan demonstrating how this area could be used by the MBTA. At this time, this conceptual layout does not represent a commitment by the MBTA to provide parking nor is any of this parking required to support the Project.**

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Mitigation

Comment 1: Still no mitigation proposed for Grove Street (north of site), despite existing safety concerns, poor sight distance, impacts to traffic operations as a result of the project, and the close proximity to the site. **Previous comment #6 still applies.**

Response 1: **As part of this project, the Proponent will implement substantial infrastructure improvements around the site and at the Grove Street interchange with Route 128/I-95. The infrastructure improvements will offset existing safety and operational issues and provide much improved access to the Riverside Station MBTA facility. In addition, the Proponent will be constructing a parking garage to accommodate the existing MBTA parking and traffic associated with the project. The infrastructure mitigation package is substantial and unprecedented for a project like this. Traffic/transportation mitigation is expected to be discussed with the City Council at the February 25th Land Use Hearing.**

Comment 2: Figure 27 shows only a painted buffer between the vehicle travel lane and the proposed two-way shared-use path along Grove St between the proposed Grove St / Grove St Extension signalized intersection and the end of the shared-use path at Deforest Street. FHWA guidelines state that when the distance between the edge of the shoulder and shared-use path is less than 5 feet, a suitable physical barrier (min. height of 42") is recommended to reinforce the concept that the path is an independent facility. **It is recommended to propose some type of vertical separation between the edge of the vehicle travel lane and the shared-use path. If the painted buffer width is less than 5 feet, a suitable physical barrier should be proposed between the vehicle travel lane and shared-use path. It is not clear how wide the proposed buffer is.**

Response 2: **The existing Grove Street bridge cross section is sufficient to accommodate a 5' separation from the travel lane to the edge of the shared use path. The current recommended section includes a 3' raised median and a 2' shoulder adjacent to the SB travel lane. This section is pending MassDOT approval.**

Comment 3: All proposed bicycle accommodations terminate at Deforest Street (does provide connection from Site to Lower Falls neighborhood). No separate bicycle accommodations proposed at the proposed roundabout at Grove St at I-95 SB Ramps. **Consider extending shared-use path through the proposed roundabout as that is the most challenging location for bikes. (Don't Give up at the intersection).**

Response 3: **The Proponent is working with the City of Newton to determine the most appropriate form of bicycle accommodations along Grove Street. While discussions are ongoing and the final**

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design of bicycle accommodations on Grove Street west of the Site has not yet been determined, the final design will extend beyond the proposed roundabout.

Comment 4: The proposed radii of 200' and 190' along the Grove St SB approach to the proposed signalized intersection with Grove St extension only meet a design speed of 25 MPH (assuming no superelevation) according to Exhibit 4-9 of the MassDOT Project Development and Design Guide (current posted speed limit is 30 MPH). The proposed radius of 150' along the Grove St NB approach to the proposed signalized intersection with Grove St extension only meets a design speed of 20 MPH. The proposed radius of 180' along the proposed on-ramp to the I-90 C-D Road only meets design speed of 25 MPH w/ superelevation rates > 2.0%. **The proponent should design off-site mitigation to meet MassDOT Design Guidelines, in the event that they do not wish to increase the radii they should apply for a design exception, apply to reduce the speed limit so that the roadway meets the design guidelines, or provide superelevation.**

Response 4: **The project team worked closely with MassDOT staff during the concept development. As the offsite improvements begin the next phase of design development, the project team is committed to meet all MassDOT requirements to the greatest extent practicable including design speed, minimum radius, superelevation, etc. A formal design exception request will be submitted to MassDOT for any appropriate design criteria not met in the final design.**

Comment 5: Previous comment #13 still applies. A gap still remains in the bicycle network traveling to the project site along Washington Street (Route 16) and Grove Street prior to the beginning of the proposed shared-use path at Asheville Rd / Quinobequin Rd. **Consider bicycle accommodation improvements along Washington St (Rt 16) between Comm. Ave and Grove St as well as along Grove St between Washington St and Asheville Rd / Quinobequin Rd to fill the gaps in the bicycle network and improve bicycle connectivity to/from the project site.**

Response 5: **As part of this project, the Proponent will implement substantial infrastructure improvements around the site and at the Grove Street interchange with Route 128/I-95. The infrastructure improvements will offset existing safety and operational issues and provide much improved access to the Riverside Station MBTA facility. In addition, the Proponent will be constructing a parking garage to accommodate the existing MBTA parking and traffic associated with the project. The infrastructure mitigation package is substantial and unprecedented for a project like this. Traffic/transportation mitigation is expected to be discussed with the City Council at the February 25th Land Use Hearing.**

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Minor Comments:

Introduction

Comment 1: Discrepancy in the total SF of office space stated in TIAS dated 12/2019 vs. latest Site Plan dated 12/9/2019

a. TIAS states 280,000 SF of leasable office space vs. 243,387 SF GFA shown in the Site Plan.
    i. **The SF stated in the TIAS is greater than the SF stated in Site Plan; therefore, the TIAS is expected to provide a conservative analysis as it relates to trip generation and impacts to traffic operations.**

Response 1: **A revised memorandum titled "Program Modification Traffic Generation/Analysis (key locations)" and dated February 6, 2020 was completed by VHB and provides traffic analyses at the key internal locations based on the revised building program of 243,387 sf. A hard copy of this memorandum was provided to the City of Newton and the peer reviewer on February 6, 2020 and a digital copy is included in the Attachments to this response to comments document.**

Comment 2: Discrepancy in the total number of residential units stated in the TIAS vs. latest Site Plan

a. TIAS states 600 residential units vs. 617 residential units shown in the Site Plan
    i. **Results in underestimated trip generation for the proposed residential land use**

Response 2: **As stated in the response to Comment 1, a revised memorandum was completed by VHB and provides traffic analyses at the key internal locations based on the revised building program of 617 residential units. A hard copy of this memorandum was provided to the City of Newton and the peer reviewer on February 6, 2020. However, as the interior design of the buildings progress, the total number of units in each building continues to change slightly based on the square footage of each unit. The most recent unit count is at 579 residential units, but that is subject to change as well. The analyses presented in the updated memorandum for 617 residential units can be considered an "upper range" of the number of units that may be built and provides a conservative estimate if the actual number of units ends up being before 617.**

Comment 3: **Very minor difference in the total number of parking spaces stated in TIAS vs. latest Site Plan (only a difference of 3 total parking spaces, expected to be negligible).**

Response 3: **Like the residential unit count, the total number of parking spaces continues to be adjusted as the interior parking garage is designed and as the curb designations are assigned along the Site Main Street. However, no major reductions or additions to the parking supply are expected,**

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only minor tweaks to the final number. A final parking count will be provided to the peer reviewer once it is confirmed.

Comment 4: Study still only used a single peak hour for the entire large study area despite multiple regions with different behavior patterns and peak periods. **Previous comment #10 still applies requesting that cluster peak hours should be used, at a minimum.**

Response 4: **A single peak hour was initially used to provide a consistent analysis throughout the study area. However, cluster peak hours have been identified by VHB to determine the impact they would have on the existing conditions traffic volume networks. The study area intersections were broken into six clusters based on different areas within the study area and the peak hours for each cluster have been identified as well as the difference between each cluster peak hour and the network peak hours. A summary table of the cluster peak hours is included in the Attachments to this response to comments document. During the most critical analysis periods during the weekday morning and weekend evening peak periods, each cluster peak hour is either the same as the network peak hour or within one-percent or within two-percent of the network peak hour based on the total approach volumes, respectively. While using the cluster peak hours would result in slightly higher existing volumes at some study area intersections, since the difference in volumes at all clusters is less than one-percent during the weekday morning and less than two-percent during the weekday evening, the effect in using an overall network peak hour instead of cluster peak hours is very minimal. It is expected that the conservative nature of the analyses more than compensates for the minimal effect of using a network peak hour instead of cluster peak hours.**

Mode Share

Comment 1: The proponent did not provide an estimate for the number of trips anticipated to utilize rideshare facilities as suggested in previous comment #21. However, the proponent did discuss rideshare and gave the reasons shown below as to why it is unknown what percentage of trips will be done via transportation network companies (TNCs). **While we don't completely agree that a higher percentage of TNC Trips will be made to the site during the off-peak hours, we acknowledge that it is difficult to forecast the share of TNC trips into the future as there is not currently a standard industry procedure nor is there sufficient data available to accurately forecast TNC Trips into the future.**

Response 1: **No response is necessary.**

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Signalized Intersection Capacity Analysis

Comment 1: To address previous comment #7, the Proponent states that signal timings used for the analysis were determined based on field measurements for the majority of the study area intersections, with record plans used for the recently reconstructed intersections in Auburndale Village.

a. The following signal timings used for the capacity analysis were still found to be inconsistent with the controller timings and latest record plans:

i. 20.) Central St. at Auburn St.

1. Grove St / Auburn St NB & SB approach total splits (green + yellow + red) were observed in the controller to be 25 seconds. The Synchro timings used total splits of 35.2 seconds for these approaches.
2. The Central St / Auburn St EB & WB approach total splits were observed in the controller to be 15 seconds. The Synchro timings used total splits of 22.3 seconds for these approaches.

ii. 27.) Washington St. at Comm. Ave

1. Comm. Ave exclusive left-turn phases shown as lag phases in controller and filed observations but are still analyzed in Synchro as lead phases.
2. Phasing sequence in controller showed concurrent pedestrian phasing. Synchro analyzed the intersection with an exclusive ped. phase.

Response 1: **Updated capacity analyses have been conducted at these locations for the 2019 Existing Conditions, 2029 Build Conditions, and 2029 Build Conditions with the revised signal timings as identified by the peer reviewer. A summary of the capacity analyses and the capacity analysis worksheets are included in the Attachments to this memorandum. Based on the updated capacity analyses with the revised signal timings, the impacts on each intersection due to the Project between the 2029 No Build Conditions and the 2029 Build Conditions are still expected to be negligible.**

Future Build Conditions

Comment 1: Previous comment #24 still applies. Regression equations were used to calculate the site generated vehicle trips for the residential land use even though all R^2 values are below 0.75. The average rates for this land use provide a more conservative analysis (18 & 17 more total vehicle trips in AM and PM peak hour, respectively.) **It is recommended that the proponent use average rates rather than the regression equation for the residential land use.**

Memorandum

Response 1: **While the R^2 values are below 0.75 for the residential land use, the regression equations were used to calculate the site generated vehicle trips because there are more than 20 data point provided for the mid-rise residential land use code in the ITE Trip Generation Manual. As illustrated in Figure 4.2 of the ITE Trip Generation Handbook, it is applicable to use the fitted curve equation when there are more than 20 data points for a land use, regardless of the R^2 value.**

Comment 2: Previous comment #32 has not been addressed. The Beacon St approach to its signalized intersection with Washington St still operates at LOS F under Existing, No-Build, and Build Conditions during the AM and PM peak hours. **The revised TIAS acknowledges the poor operations at the intersection but states that the intersection is expected to operate with failing LOS with and without the Project, and the Project is not expected to noticeably worsen operations beyond the current failing conditions. Agree, impacts are negligible, and the Project is not expected to generate significant amounts of traffic to the intersection during the peak analysis periods. Increases in delay and queue lengths resulting from the Project are negligible from the 2029 No-Build to 2029 Build Conditions.**

Response 2: **As part of this project, the Proponent will implement substantial infrastructure improvements around the site and at the Grover Street interchange with Route 128/I-95. The infrastructure improvements will offset existing safety and operational issues and provide much improved access to the Riverside Station MBTA facility. In addition, the Proponent will be constructing a parking garage to accommodate the existing MBTA parking and traffic associated with the project. The infrastructure mitigation package is substantial and unprecedented for a project like this. Traffic/transportation mitigation is expected to be discussed with the City Council at the February 25th Land Use Hearing.**

Comment 3: Previous comment #34 still applies. During the weekday AM and PM peak hours under the 2029 Build Conditions, the Grove St SB 95th percentile queue lengths at its signalized intersection with the Riverside Office Building Center Driveway (Study intersection 6) are 361 ft. and 307 ft., respectively. These queues will spill back and block the Riverside Office Building North Driveway approach which is located approximately 150 ft. north of Study Intersection 6. This could cause significant queuing along the Riverside Office Building North Driveway approach if vehicles cannot exit onto Grove St due to spillback blocking the intersection (concern on this approach is during the PM peak hour when there are 140 exiting cars from the driveway onto Grove St). This could also cause grid lock along Grove St from preventing cars from entering the Riverside Office North Driveway. While we are aware these queueing issues exist at this intersection under Existing and Future No-Build Conditions, the project is expected to generate relatively high amounts of site generated traffic to this approach (96 and 55 trips during the weekday AM and PM peak hours, respectively). **Low-cost mitigation measures**

Memorandum

should be considered such as signal timing improvements at Study Intersection 6 to reduce the 95th percentile queue lengths along the Grove St SB approach. In addition, DO NOT BLOCK the intersection pavement markings and signage should be considered along Grove St at Study Intersection 7.

Response 3: **The Proponent is committed to low-cost mitigation measures at the Riverside Office Park driveway intersections with Grove Street, such as funding signal timing improvements at the Riverside Office Building Center Driveway intersection with Grove Street and installing DO NOT BLOCK the intersection pavement markings and signage at the Riverside Office Building North Driveway intersection with Grove Street.**

Comment 4: Previous comment #36 has been partially addressed. Signal warrant analysis was completed at the intersection of Washington St at I-95 NB Ramps. In addition, this intersection was included in the August 2019 Road Safety Audit (RSA). However, the TIAS does not indicate any proposed mitigation at this intersection. The intersection is currently unsignalized and operates over capacity with long vehicle delays and queues during both the weekday AM and PM peak hours. Using the 4 hours of available traffic count data, the intersection met the volume thresholds defined by the MUTCD for Warrants 1-3 for all 4 hours. **The Applicant should clarify which, if any, of the recommendations at this intersection stated in the August 2019 RSA they will commit to implementing.**

Response 4: **As part of this project, the Proponent will implement substantial infrastructure improvements around the site and at the Grover Street interchange with Route 128/I-95. The infrastructure improvements will offset existing safety and operational issues and provide much improved access to the Riverside Station MBTA facility. In addition, the Proponent will be constructing a parking garage to accommodate the existing MBTA parking and traffic associated with the project. The infrastructure mitigation package is substantial and unprecedented for a project like this. Traffic/transportation mitigation is expected to be discussed with the City Council at the February 25th Land Use Hearing.**

Comment 5: The TIAS states that proposed roundabout at the I-95/Route 128 SB ramps intersection with Grove St / Asheville Rd will include one circulating lane and each approach will consist of one lane. However, Figures 24-26 show the I-95 SB Off-Ramp approach to the roundabout as a two-lane approach. In addition, Table 24 lists the I-95 SB Off-Ramp approach as "LTR" whereas Table 27 lists the approach as "LT" (indicating there may be a designated right-turn lane; however, a designated right-turn lane was not shown in the Table). **Applicant should provide clarification for the proposed lane configuration along the I-95 SB Off-Ramp approach to the roundabout and adjust all tables, figures and analysis as needed to be consistent throughout the TIAS.**

Memorandum

Response 5: **The I-95 SB off-ramp will have a single-lane approach to the roundabout at Grove Street. Figures 24-26 were illustrating a single-lane approach with a shoulder, but VHB agrees that it is unclear in the figures if the approach is two lanes, or a single lane with a shoulder. All future graphics will be revised to more clearly show a single-lane approach. In addition, Table 27 has the incorrect labeling that was carried over from a previous version. The I-95 SB Off-Ramp approach to the intersection should be labeled as "LTR" for left-through-right instead of "LT" for left-through.**

TDM

Comment 1: Previous comment #44.: The Applicant should clarify whether or not they commit to implementing parking prices for parking on-site for non-residential uses. **More detailed information should be provided as to what options will be available for the on-site parking costs.**

Response 1: **Parking pricing for the Non-MBTA and non-residential users will be subject to market adjustments to ensure parking availability. Projections for pricing have not yet been developed**

Comment 2: Previous comment #52: **All electric car charging station locations should be identified on a Site Plan once the number of stations are determined.**

Response 2: **EV parking/charging locations are not yet determined but the project is committed to providing 10% of the total non-MBTA parking spaces as EV parking/charging locations.**

Comment 3: Previous comment #56 partially applies: **The TDM should list specific TMAs that they will reach out to. Consider requiring the project's office tenants to join a TMA.**

Response 3: **The Proponent plans to join the 128 Business Council and has been in discussion with representatives from the 128 Business Council regarding the TDM plan to date.**

Comment 4: Previous comment #60: **The Ongoing Monitoring and Reporting Plan should include monitoring employee, resident, and consumer travel by mode.**

Response 4: **At the February 6th meeting between the Proponent, City of Newton, and the Peer Consultant, the City suggested that monitoring of employee, resident, and consumer travel by mode may be required for two years. Assuming that the overall traffic monitoring for those two years shows results that thee project is at or below the projection, then additional mode monitoring would not be required.**

Memorandum

Comment 5: The TDM Plan states the first Monitoring and Reporting Plan will be submitted within 30 days of the 18-month anniversary of the issuance of the First Certificate of Occupancy and subsequent Plans will be submitted in 18-month increments. The City's Ordinance No. B-46 states "Monitoring of vehicle trips shall begin within 12 months of full occupancy of each phase, or earlier if requested by the Director of Planning and Development and Commissioner of Public Works and continue annually for 2 years following final build-out." **The Proponent should revise the Monitoring and Reporting Plan such that the first Plan is to be submitted within 12 months of full occupancy and the subsequent Plans will be submitted in 12-month increments.**

Response 5: **The Monitoring and Reporting Plan will be revised accordingly.**

Transit Capacity Analysis

Comment 1: **The future transit capacity shown in the table and chart do not match the capacity described in the document. This should be revised for consistency and accuracy.**

Response 1: **The charts have been updated to reflect the expected future capacity of the Green Line. The revised transit capacity charts are included in the Attachments to this response to comments document.**

Additional Information Request

Comment 1: The MBTA Green Line capacity analysis completed in VHB's Transit Capacity Evaluation was based on MBTA Fall 2018 Green Line Load data. **Can VHB or MBTA provide the Fall 2018 Green Line Load data?**

Response 1: **The Fall 2018 Green Line Load data will be shared with the peer reviewer. This data (an Excel file) is being submitted electronically.**

Comment 2: **The proponent should provide VISSIM and synchro files for review.**

Response 2: **The proponent will provide both as they become available.**

Attachments

Major Comments

- Mode Share Comment 1
  - Pedestrian and Bicycle Trip Generation Calculations
  - Pedestrian and Bicycle Trip-Generated Networks
- Future Build Conditions Comment 1
  - Expanded Trip Generation Calculations
  - Vehicle Occupancy Rate Data
- Site Plan Comment 1
  - SU-40 Truck Turning Movement Diagrams
  - Building 1 Loading Truck Turning Movement Diagrams
  - Fire Truck Turning Movement Diagrams
- Site Plan Comment 2
  - Interior Loading Plans
- Site Plan Comment 3
  - Revised TNC Geo-Fencing Graphic
- Site Plan Comment 7
  - Evacuation Route Graphic

Attachments

Minor Comments

- Introduction Comment 1
  - Program Modification Traffic Generation/Analysis Memorandum
- Introduction Comment 4
  - Cluster Peak Hour Summary
- Signalized Intersection Capacity Analysis Comment 1
  - Revised Signalized Capacity Analyses Summary Table
  - Revised Signalized Capacity Analyses Worksheets
- Transit Capacity Analysis Comment 1
  - Updated Transit Capacity Charts

Major Comments – Mode Share Comment 1

Pedestrian and Bicycle Trip Generation Calculations

Pedestrian and Bicycle Trip-Generated Networks

TRIP GENERATION SUMMARY - FULL BUILD (WALK/BIKE TRIPS)

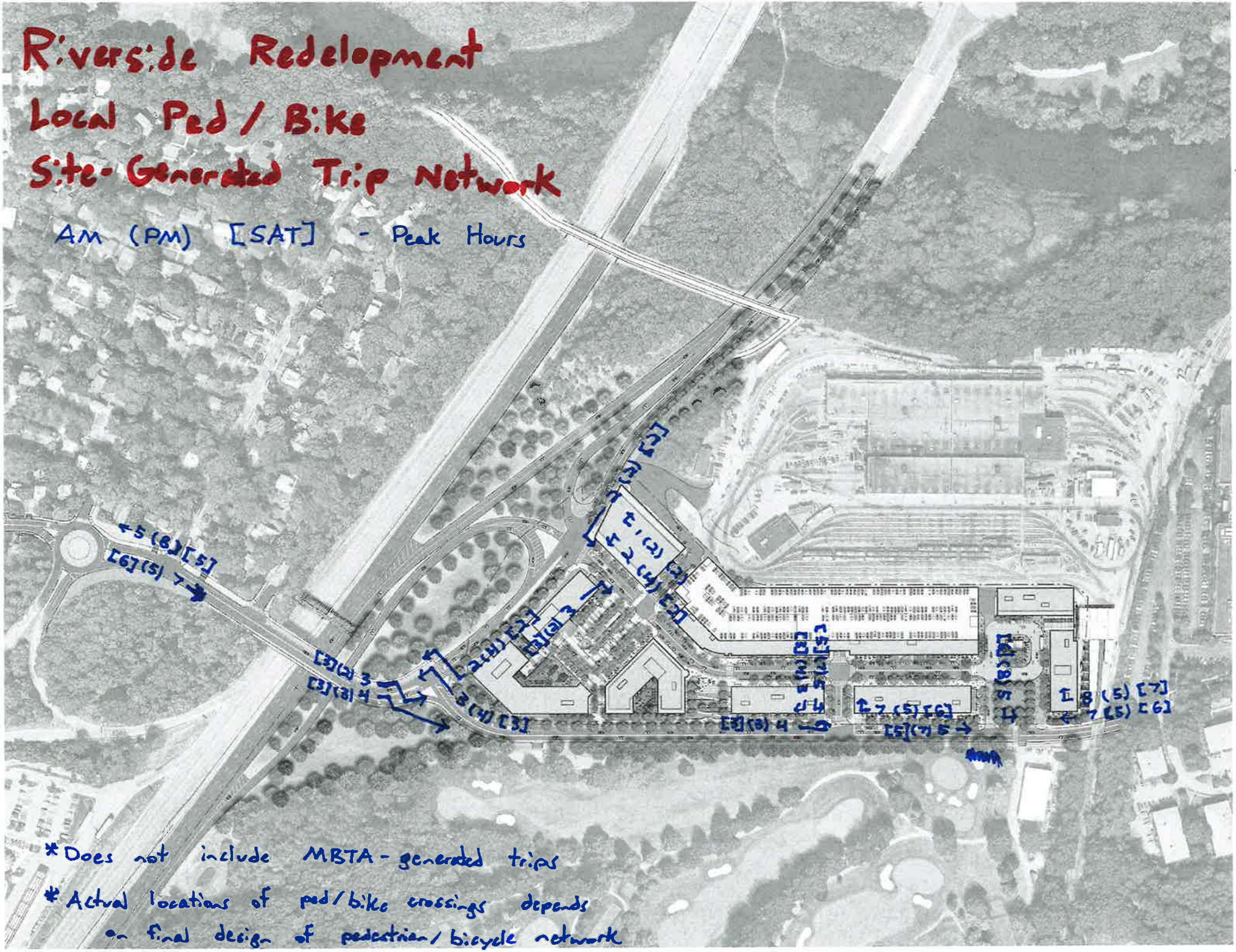
	Full Build																				Total
	Residential [1]					Office [2]					Hotel [3]					Retail [4]					
LUC SIZE	Gross Trips	Gross Person Trips	Internal Capture [5]	Net Person Trips	Walk/Bike Trips [6]	Gross Trips	Gross Person Trips	Internal Capture [5]	Net Person Trips	Walk/Bike Trips	Gross Trips	Gross Person Trips	Internal Capture [5]	Net Person Trips	Walk/Bike Trips	Gross Trips	Gross Person Trips	Internal Capture [5]	Net Person Trips	Walk/Bike Trips	Net New Walk/Bike Trips
		1.18			5%		1.18			5%		1.82			0%		1.82			5%	
Weekday Daily																					
Enter	1,680	1,983	370	1,613	81	1,257	1,484	93	1,391	70	633	1,153	370	783	-	1,700	3,094	680	2,414	121	**272**
Exit	1,680	1,983	278	1,705	85	1,257	1,484	184	1,300	65	633	1,153	278	875	-	1,700	3,094	773	2,321	116	**266**
Total	3,361	3,966	648	3,318	166	2,514	2,968	277	2,691	135	1,267	2,306	648	1,658	-	3,400	6,188	1,453	4,735	237	**538**
Weekday Morning Peak Hour																					
Enter	53	62	1	61	3	220	259	22	237	12	41	75	-	75	-	108	196	21	175	9	**24**
Exit	151	178	6	172	9	36	42	12	30	2	29	52	15	37	-	66	120	11	109	5	**16**
Total	204	240	7	233	12	255	301	34	267	14	70	127	15	112	-	173	316	32	284	14	**40**
Weekday Evening Peak Hour																					
Enter	155	183	77	106	5	42	50	11	39	2	44	80	18	62	-	140	255	51	204	10	**17**
Exit	99	117	35	82	4	223	263	25	238	12	42	77	5	72	-	152	277	92	185	9	**25**
Total	254	300	112	188	9	265	313	36	277	14	86	157	23	134	-	292	532	143	389	19	**42**
Saturday Daily																					
Enter	1,146	1,353	452	901	45	269	317	48	269	13	574	1,045	351	694	-	2,650	4,823	901	3,922	196	**254**
Exit	1,146	1,353	434	919	46	269	317	82	235	12	574	1,045	397	648	-	2,650	4,823	839	3,984	199	**257**
Total	2,293	2,706	886	1,820	91	538	634	130	504	25	1,148	2,090	748	1,342	-	5,300	9,646	1,740	7,906	395	**511**
Saturday Midday Peak Hour																					
Enter	130	154	72	82	4	70	82	12	70	4	60	110	19	91	-	166	302	50	252	13	**21**
Exit	136	160	41	119	6	59	70	15	55	3	47	86	6	80	-	153	279	91	188	9	**18**
Total	266	314	113	201	10	129	152	27	125	7	108	196	25	171	-	319	581	141	440	22	**39**

1 Trip generation estimate based on ITE LUC 221 (Mid-Rise Residential), using regression equations.
2 Trip generation estimate based on ITE LUC 710 (Office), using regression equations for weekday and average rates for Saturday.
3 Trip generation estimate based on ITE LUC 310 (Hotel), using regression equations.
4 Trip generation estimate based on ITE LUC 820 (Shopping Center), using regression equations.
5 Internal capture rates based on NCHRP Report 684, Saturday midday rates assumed to be the same was weekday evening rates
6 Walk/Bike mode share of 5% based on City of Newton Census Data


Riverside Redevelopment
Site-Generated Ped/Bike Trips Peak Hours
AM (PM) [SAT]
Enter 24 (17) [21]
Exit 16 (25) [18]
Total 40 (42) [39]
Rec Road Ext.
to/from north
10%
2 (2) [2]
[2] (2) 1
Grove St. to/from west
30%
5 (8) [5]
[6] (5) 7
60%
Grove St. to/from east
15 (10) [13]
[11] (15) 10
Regional Ped/Bike Dist.
* Does not include MBTA-generated trips
* Assume all peds/bikes come from Newton, Wellesley, or Weston and use local roads/paths
→ Assume Trip Distribution is 60% to/from Grove Street East, 30% to/from Grove Street West, 10% to/from Rec Road Ext.
*Based on density of residential/commercial uses within walking/biking distance

Riverside Redelopment
Local Ped / Bike
Site-Generated Trip Network

AM (PM) [SAT] - Peak Hours



* Does not include MBTA-generated trips
* Actual locations of ped/bike crossings depends on final design of pedestrian/bicycle network

Major Comments – Future Build Conditions Comment 1

Expanded Trip Generation Calculations

Vehicle Occupancy Rate Data

TRIP GENERATION SUMMARY

	Residential [1]						Office [2]						Hotel [3]					Retail [4]							TOTAL				
LUC SIZE	Gross Trips	Gross Person Trips [5]	Internal Capture [6]	Net Person Trips	Vehicle [7] Trips	Transit [8] Trips	Gross Trips	Gross Person Trips [5]	Internal Capture [6]	Net Person Trips	Vehicle [7] Trips	Transit [8] Trips	Gross Trips	Gross Person Trips [5]	Internal Capture [6]	Net Person Trips	Vehicle [7] Trips	Gross Trips	Gross Person Trips [5]	Internal Capture [6]	Net Person Trips	Vehicle [7] Trips	Pass-By [9] Trips	Net Vehicle Trips	Total Net Vehicle Trips	EX Hotel Vehicle Trips [10]	New New Vehicle Trips	Pass-By	New Transit Trips
Weekday Daily																													
Enter	1,680	1,983	370	1,613	1,071	403	1,257	1,484	93	1,391	1,180	70	633	1,153	370	783	430	1,700	3,094	680	2,414	1,326	325	1,001	3,682	430	**3,252**	**325**	**473**
Exit	1,680	1,983	278	1,705	1,132	426	1,257	1,484	184	1,300	1,103	65	633	1,153	278	875	481	1,700	3,094	773	2,321	1,275	325	950	3,666	481	**3,185**	**325**	**491**
Total	3,361	3,966	648	3,318	2,203	829	2,514	2,968	277	2,691	2,283	135	1,267	2,306	648	1,658	911	3,400	6,188	1,453	4,735	2,601	650	1,951	7,348	911	**6,437**	**650**	**964**
Weekday Morning Peak Hour																													
Enter	53	62	1	61	40	15	220	259	22	237	201	12	41	75	-	75	41	108	196	21	175	96	20	76	358	45	**313**	**20**	**27**
Exit	151	178	6	172	114	43	36	42	12	30	25	2	29	52	15	37	20	66	120	11	109	60	20	40	199	45	**154**	**20**	**45**
Total	204	240	7	233	154	58	255	301	34	267	226	14	70	127	15	112	61	173	316	32	284	156	40	116	557	90	**467**	**40**	**72**
Weekday Evening Peak Hour																													
Enter	155	183	77	106	70	27	42	50	11	39	33	2	44	80	18	62	34	140	255	51	204	112	36	76	213	50	**163**	**36**	**29**
Exit	99	117	35	82	54	21	223	263	25	238	202	12	42	77	5	72	40	152	277	92	185	102	36	66	362	35	**327**	**36**	**33**
Total	254	300	112	188	124	48	265	313	36	277	235	14	86	157	23	134	74	292	532	143	389	214	72	142	575	85	**490**	**72**	**62**
Saturday Daily																													
Enter	1,146	1,353	452	901	598	225	269	317	48	269	228	13	574	1,045	351	694	381	2,650	4,823	901	3,922	2,155	543	1,612	2,819	381	**2,438**	**543**	**238**
Exit	1,146	1,353	434	919	610	230	269	317	82	235	199	12	574	1,045	397	648	356	2,650	4,823	839	3,984	2,189	543	1,646	2,811	356	**2,455**	**543**	**242**
Total	2,293	2,706	886	1,820	1,208	455	538	634	130	504	427	25	1,148	2,090	748	1,342	737	5,300	9,646	1,740	7,906	4,344	1,086	3,258	5,630	737	**4,893**	**1,086**	**480**
Saturday Midday Peak Hour																													
Enter	130	154	72	82	54	21	70	82	12	70	59	4	60	110	19	91	50	166	302	50	252	138	31	107	270	30	**240**	**31**	**25**
Exit	136	160	41	119	79	30	59	70	15	55	47	3	47	86	6	80	44	153	279	91	188	103	31	72	242	25	**217**	**31**	**33**
Total	266	314	113	201	133	51	129	152	27	125	106	7	108	196	25	171	94	319	581	141	440	241	62	179	512	55	**457**	**62**	**58**

1 Trip generation estimate based on ITE LUC 221 (Mid-Rise Residential), using regression equations for 617 residential units.
2 Trip generation estimate based on ITE LUC 710 (Office), using regression equations for weekday and average rates for Saturday for 243,387 sf.
3 Trip generation estimate based on ITE LUC 310 (Hotel), using regression equations for 150 rooms.
4 Trip generation estimate based on ITE LUC 820 (Shopping Center), using regression equations for 43,241 sf.
5 Gross Person Trips developed based on national VOR data from the 2017 National Household Travel Survey (USDOT FHWA).
6 Internal capture rates based on NCHRP Report 684, Saturday midday rates assumed to be the same was weekday evening rates.
7 Converted back into vehicle trips based on local VOR data from the City of Newton Census data and the mode shares used in the 2015 FEIR for The Station at Riverside
8 Transit credits applied based on FEIR for The Station at Riverside, June 2015. (5% transit credit for office and 25% transit credit for residential)
9 Pass-by credit applied based on ITE Trip Generation Handbook data for LUC 820 (34% for weekday evening peak hour, 26% for Saturday midday peak hour, and 25% for all other time periods)
10 Existing hotel trips subtracted out based on peak hour data from Empirical counts. Daily projected data used to subtracted out existing hotel trips to provide a conservative analysis

Riverside
Newton, MA
10865.03

VOR

	ITE Raw Vehicle Trips to Person Trips [1]	Local Person Trips to Vehicle Trips [2]
Workers	1.18	1.12
Residents	1.18	1.13
Retail [3]	1.82	1.82
Personal Errands [4]	1.82	1.82

[1] Based on Summary of Travel Trends, 2017 National Household Travel Survey (Table 16), USDOT FHA

[2] Based on US Census Bureau Journey to Work Data, City of Newton, 2010

[3] National data used for both conversions due to lack of local data

[4] Other Family / Personal Errands used for Hotel category.
National data used for both conversions due to lack of local data

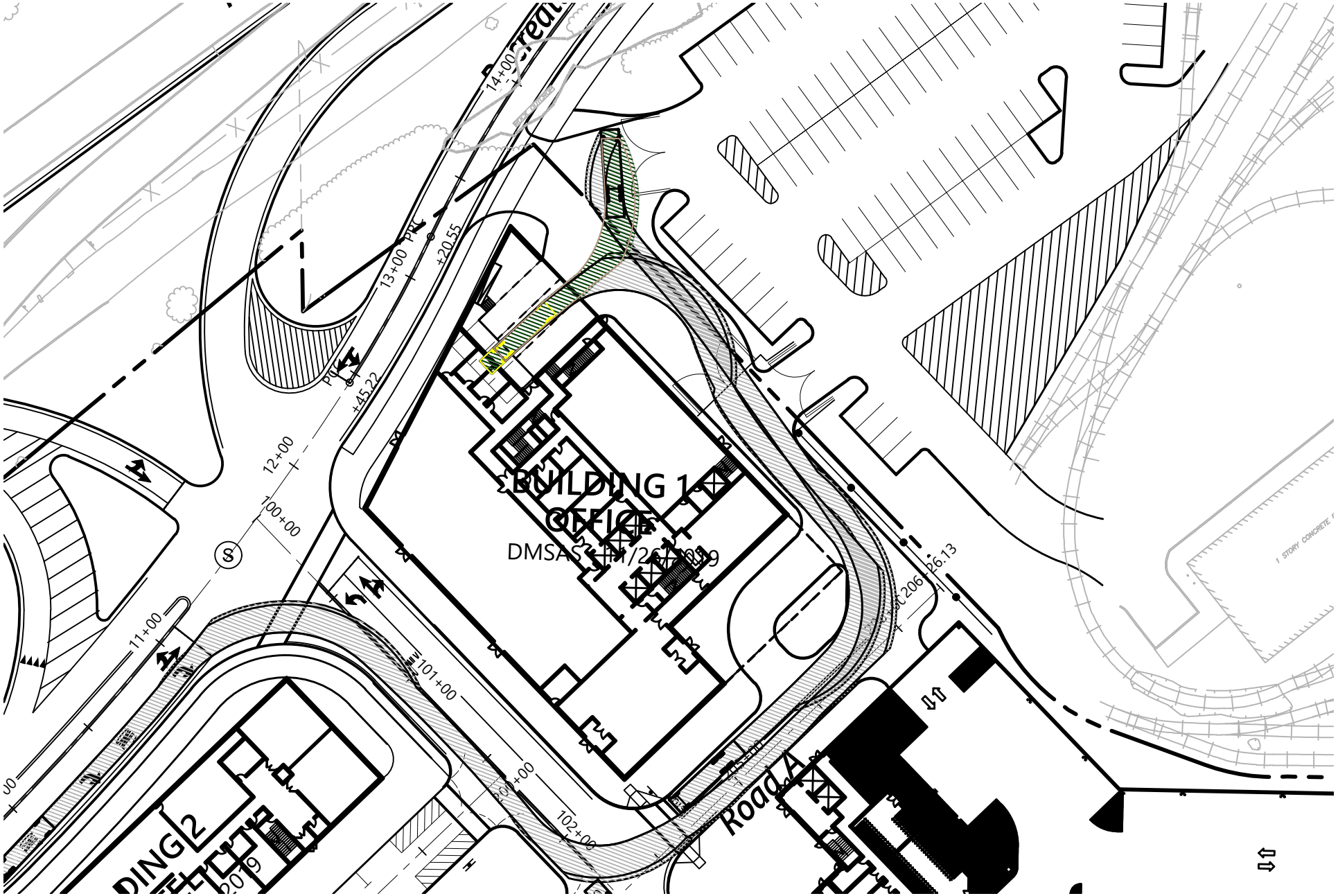
Major Comments – Site Plan Comment 1

SU-40 Truck Turning Movement Diagrams

Building 1 Loading Truck Turning Movement Diagrams

Fire Truck Turning Movement Diagrams

\\vhb\gbl\proj\Wat-TS\10865.03 Mark Inv Riverside Newto\cad\ld\Eng\Autoturn\AutoTURN-SU-40.dwg

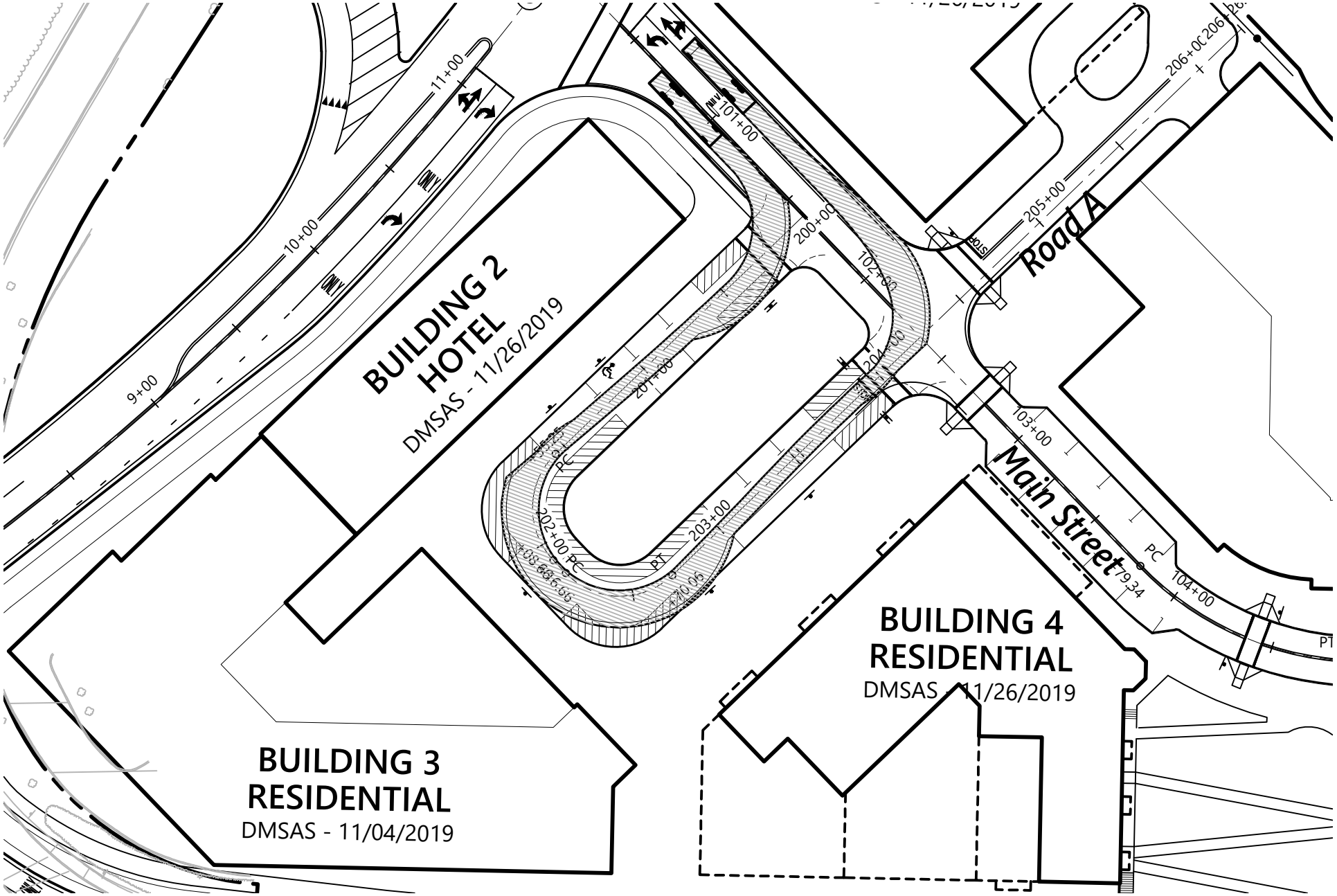


0 30 60 120 Feet

Riverside
SU-40 Building 1
Grove Street
Newton, Massachusetts

Figure 1

February 2020



0 30 60 120 Feet

Riverside
SU-40 Buildings 3/4 Driveway
Grove Street
Newton, Massachusetts

Figure 1

February 2020

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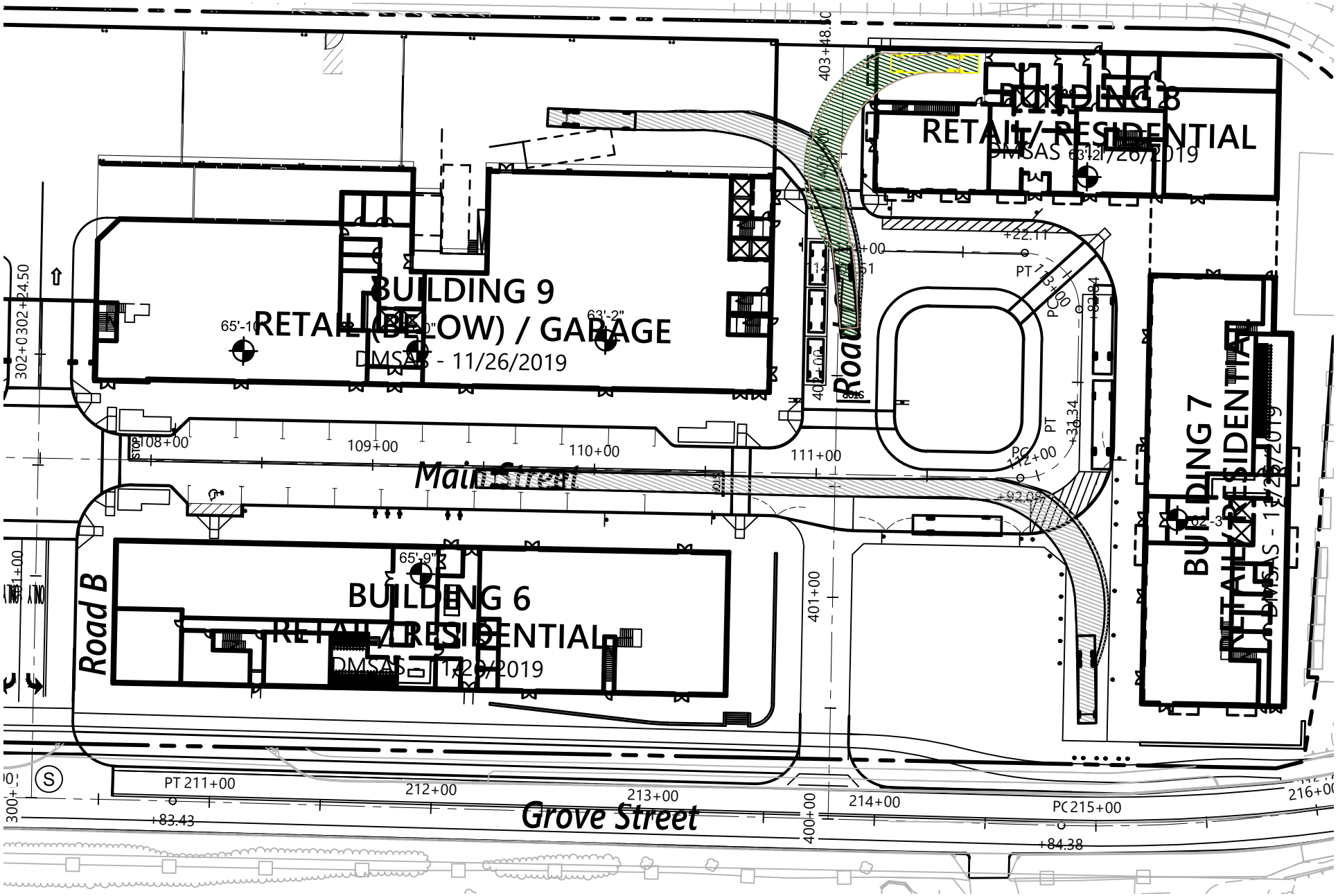
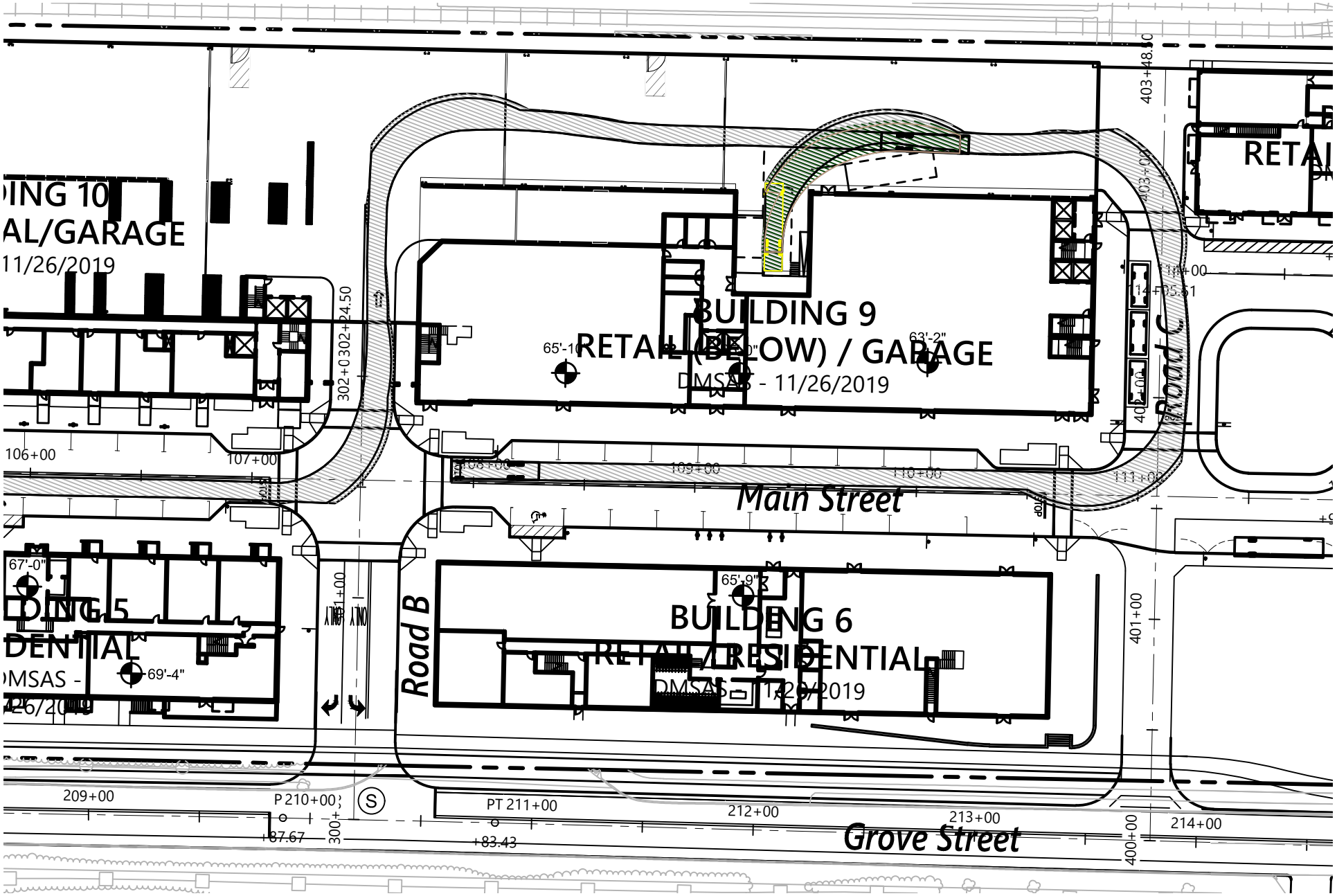


0 30 60 120 Feet

Riverside
SU-40 Buildings 7 and 8
Grove Street
Newton, Massachusetts

Figure 4

February 2020

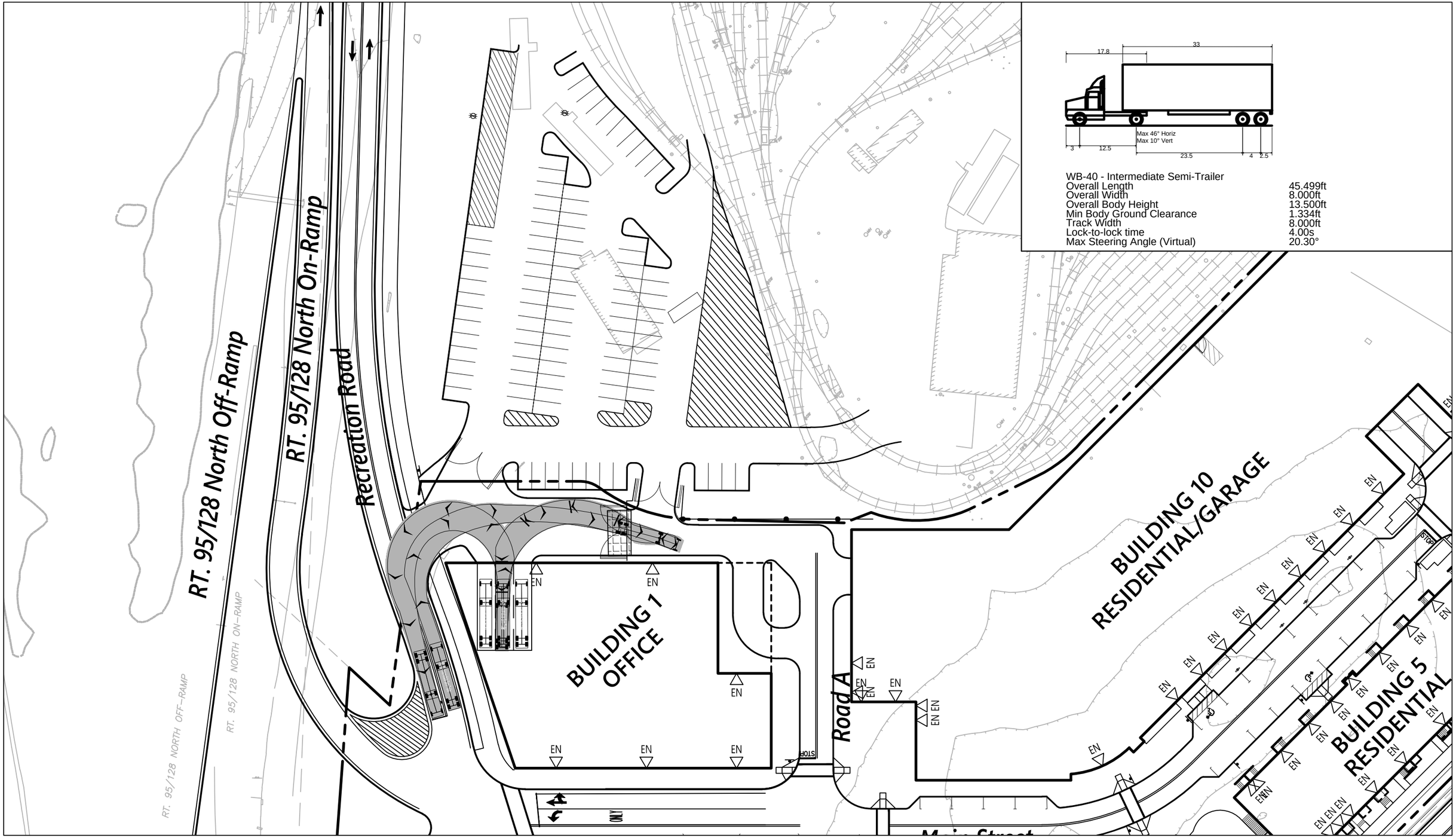


0 30 60 120 Feet

Riverside
SU-40 Building 9
Grove Street
Newton, Massachusetts

Figure 3

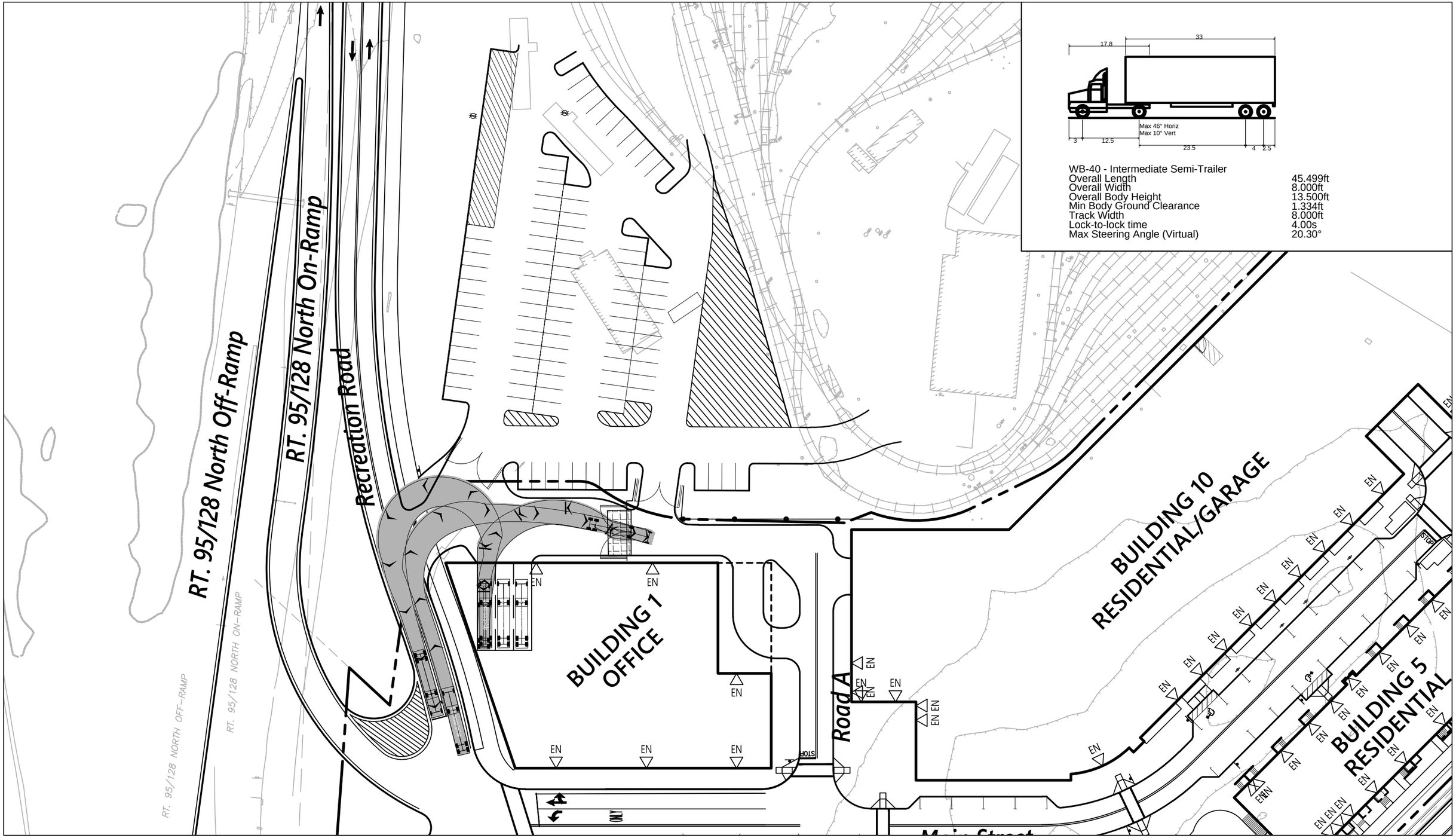
February 2020



WB-40 Truck Access
Riverside Development
Grove Street
Newton, Massachusetts

Figure 1

02/11/2020



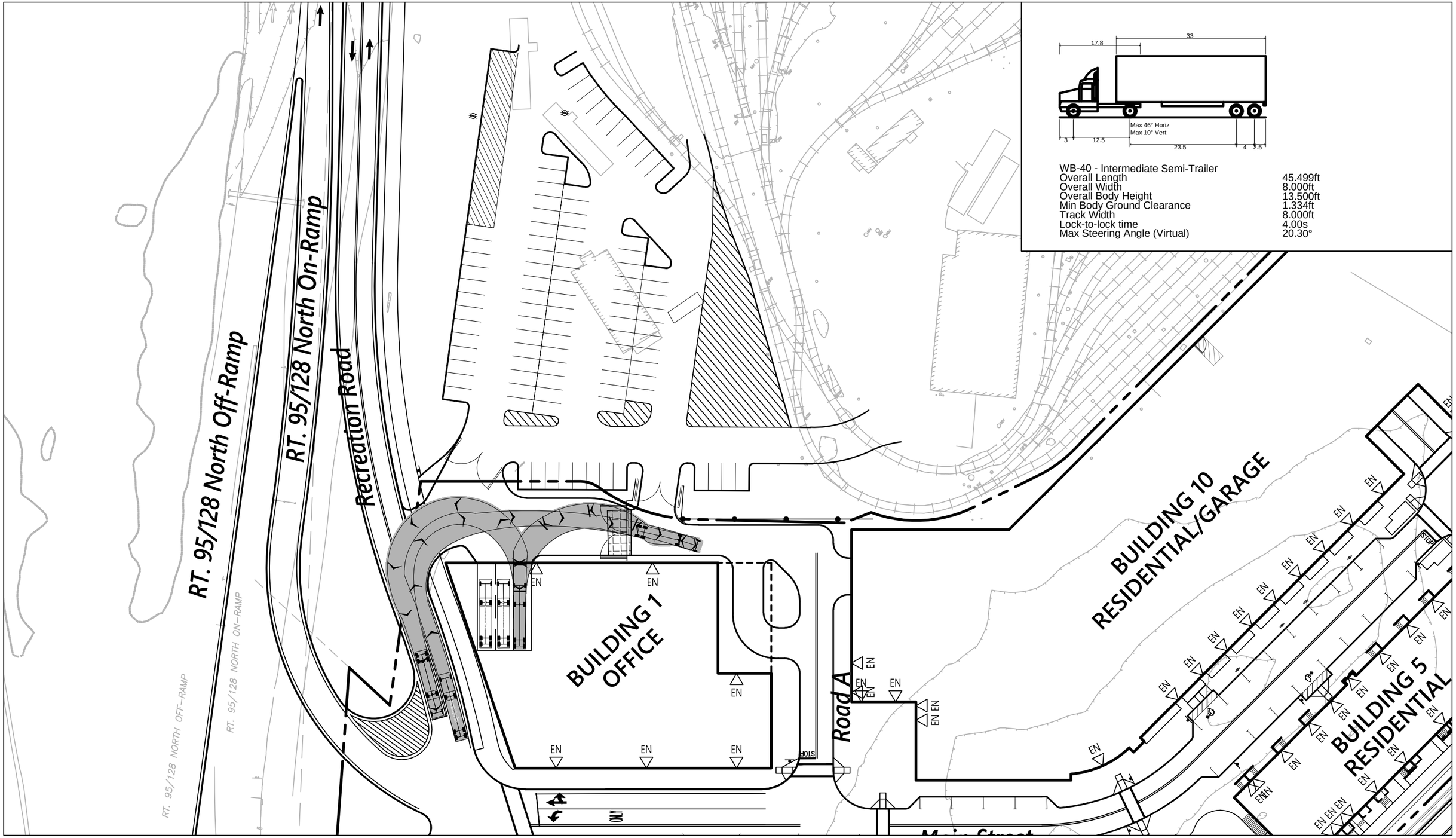
WB-40 - Intermediate Semi-Trailer	
Overall Length	45.499ft
Overall Width	8.000ft
Overall Body Height	13.500ft
Min Body Ground Clearance	1.334ft
Track Width	8.000ft
Lock-to-lock time	4.00s
Max Steering Angle (Virtual)	20.30°

0 30 60 120Feet

WB-40 Truck Access
Riverside Development
Grove Street
Newton, Massachusetts

Figure 1

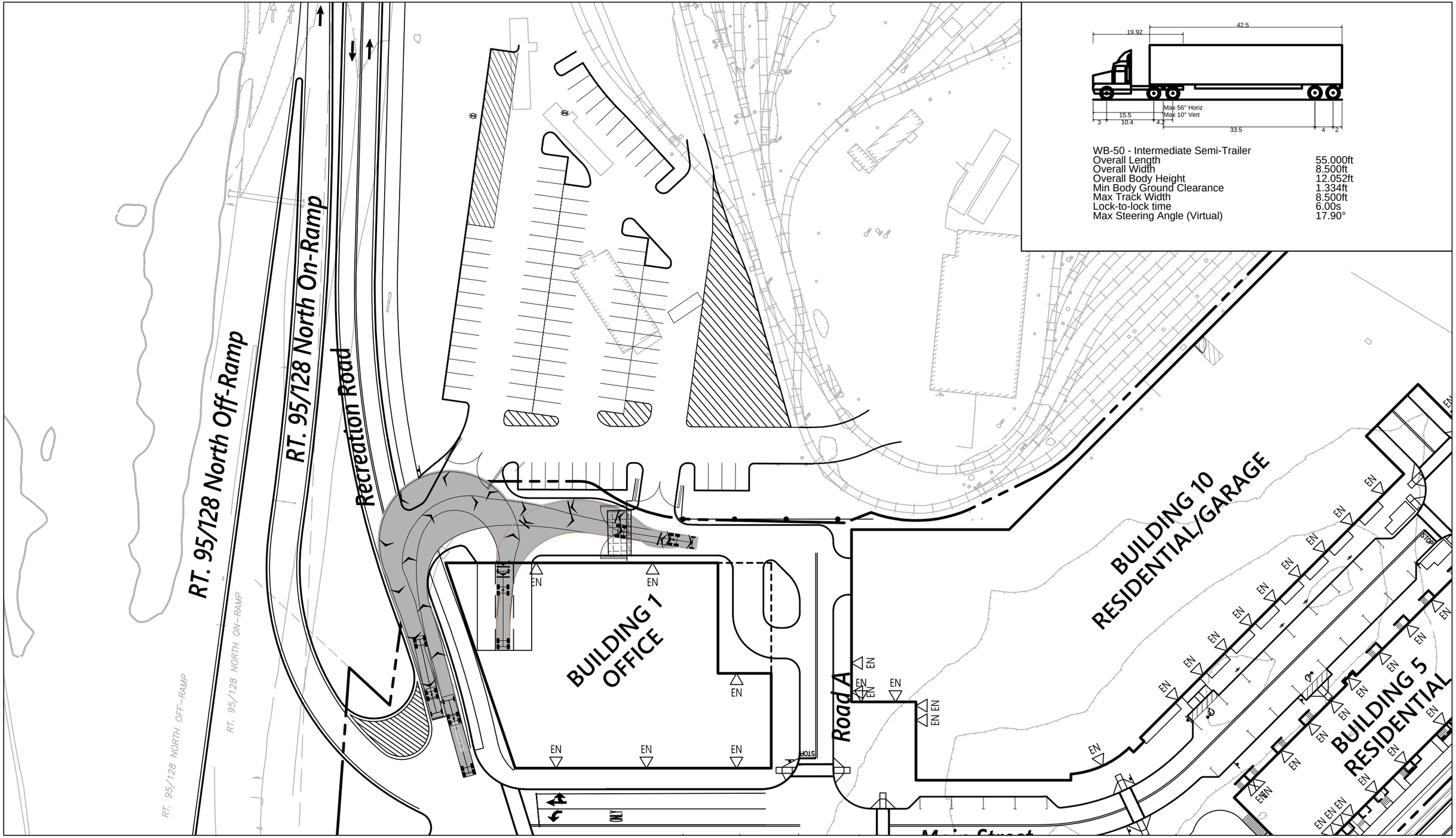
02/11/2020



WB-40 Truck Access
Riverside Development
Grove Street
Newton, Massachusetts

Figure 3

02/11/2020

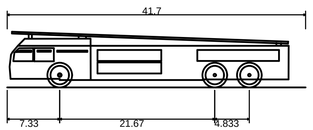


0 30 60 120 Feet

WB-50 Truck Access
Riverside Development
Grove Street
Newton, Massachusetts

Figure 4

02/11/2020



Newton Fire	
Overall Length	41.700ft
Overall Width	9.810ft
Overall Body Height	7.788ft
Min Body Ground Clearance	1.038ft
Track Width	9.810ft
Lock-to-lock time	6.00s
Curb to Curb Turning Radius	37.000ft

Fire Truck Template

N.T.S. LD

vhb.com
vhb
101 Walnut Street
PO Box 9151
Watertown, MA 02471
617.924.1770

0 30 60 120Feet

Riverside Station

Grove Street
Newton, Massachusetts

No.	Revision	Date	Appvd.

Designed by | Checked by

Issued for | Date

1/23/2020

Not Approved for Construction

Drawing Title

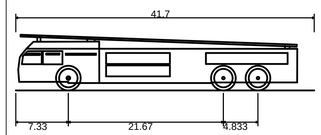
Fire Equipment Access Plan Entrance

Drawing Number

C-1

Sheet 1 of 4

Project Number 10865.03



Newton Fire	
Overall Length	41.700ft
Overall Width	9.810ft
Overall Body Height	7.788ft
Min Body Ground Clearance	1.038ft
Track Width	9.810ft
Lock-to-lock time	6.00s
Curb to Curb Turning Radius	37.000ft

Fire Truck Template

N.T.S. LD

vhb.com
vhb
101 Walnut Street
PO Box 9151
Watertown, MA 02471
617.924.1770

0 30 60 120Feet

Riverside Station

Grove Street
Newton, Massachusetts

No.	Revision	Date	Appvd.

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1/23/2020

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Drawing Title

Fire Equipment Access Plan Exit

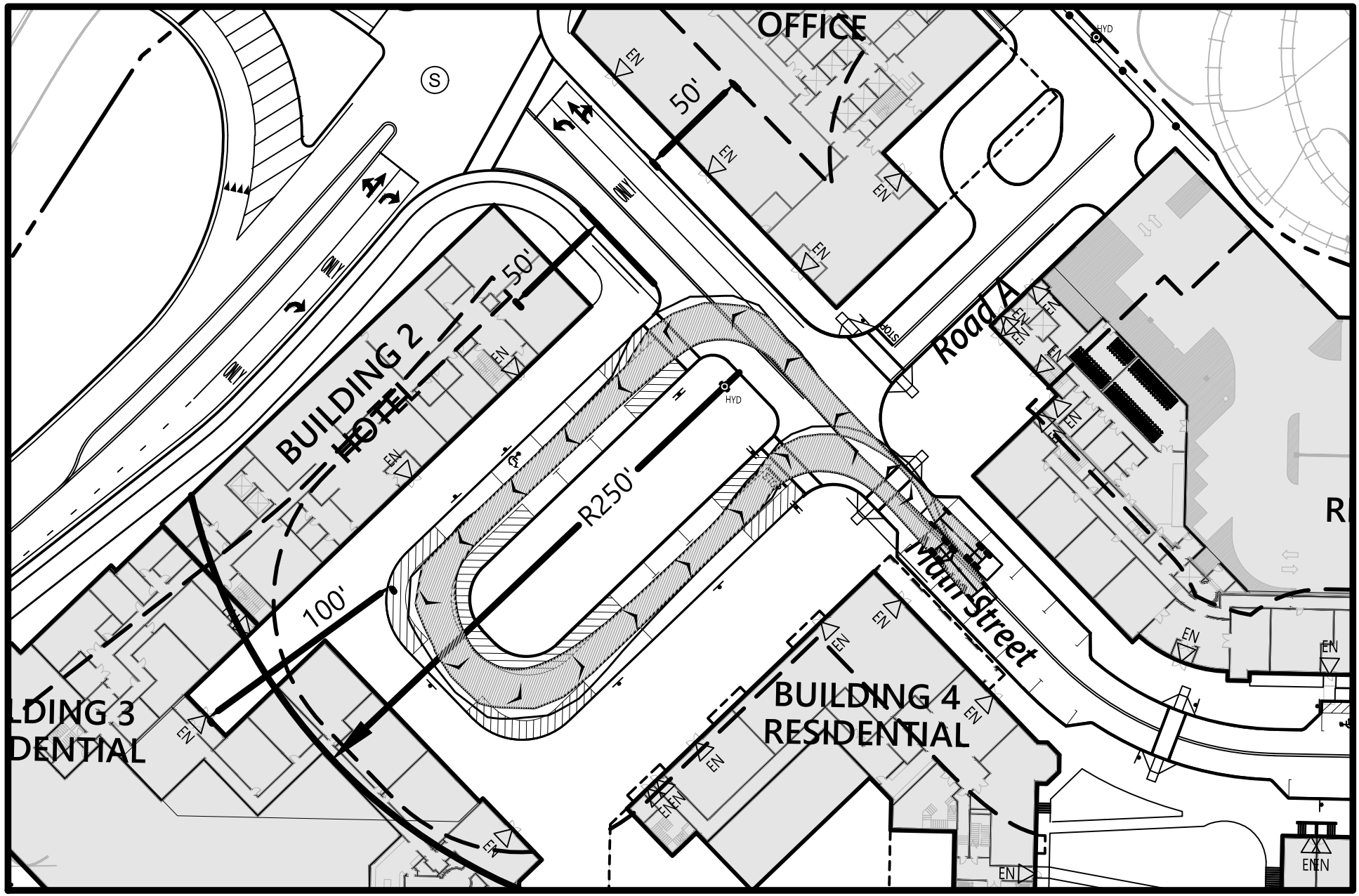
Drawing Number

C-2

Sheet 2 of 4

Project Number 10865.03

Progress Print For Review Only February 11, 2020



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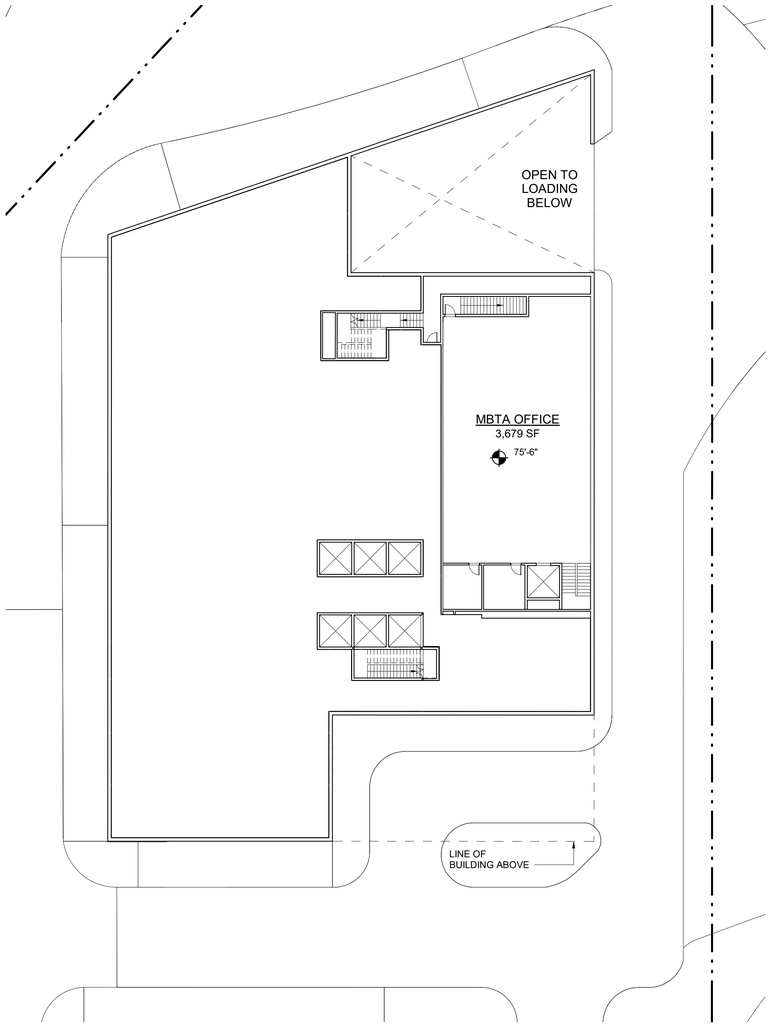
Riverside
Newton Fire Truck Driveway
Grove Street
Newton, Massachusetts

Figure 1

January 2020

Major Comments – Site Plan Comment 2

Internal Loading Plans



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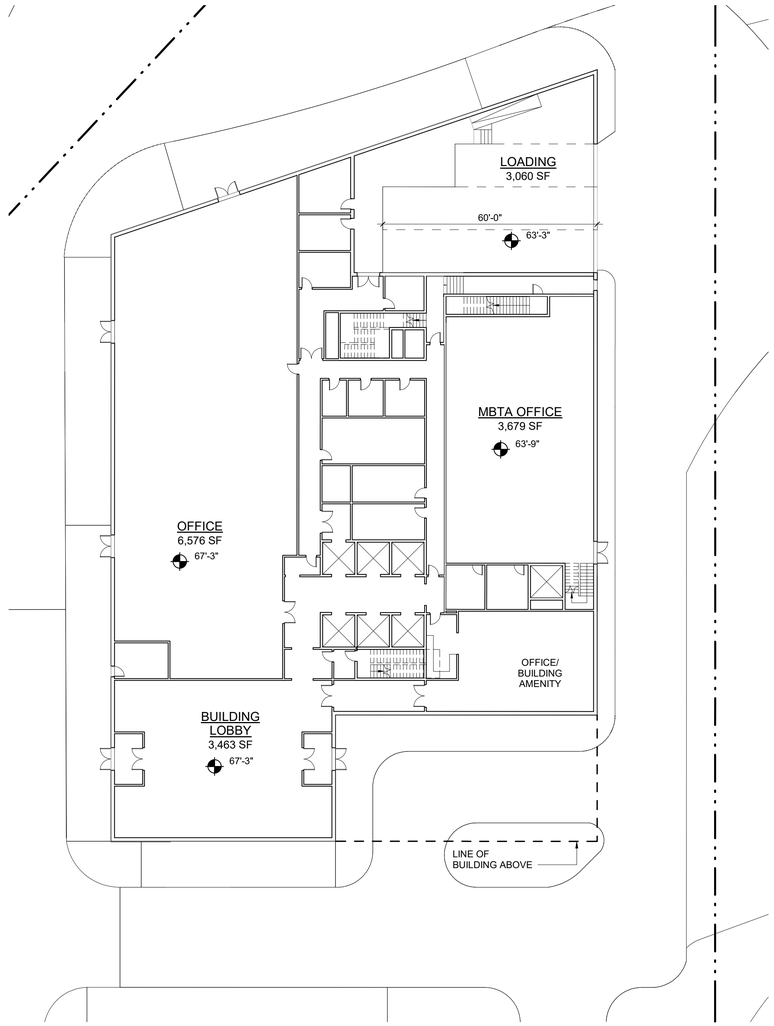

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Riverside Master Plan - Newton, MA

Grove Street, Newton, Massachusetts

No.	Revision	Date	Appvd.
2	REVISED BLDG PROGRAM	09/06/2019	

Designed by | Checked by

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12/03/19

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Drawing Title

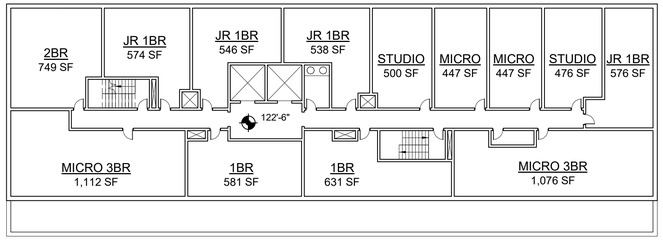
BUILDING 1 - OFFICE PLANS - LEVELS 1-1.5

Drawing Number

A-1.01

Sheet 31 of 45

Project Number
10865.03



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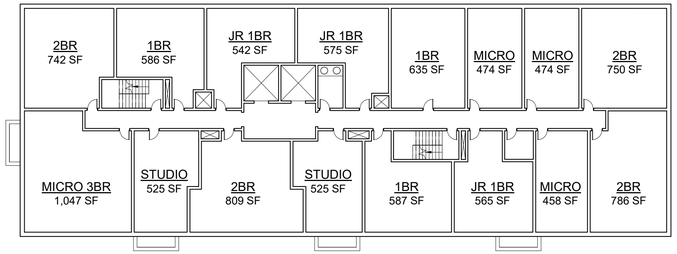

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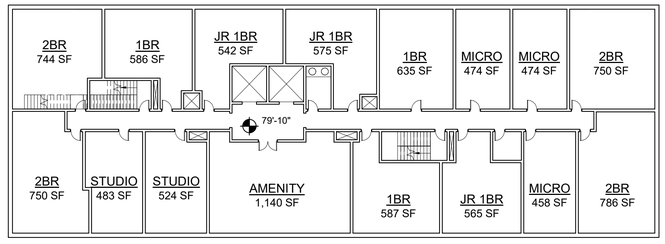

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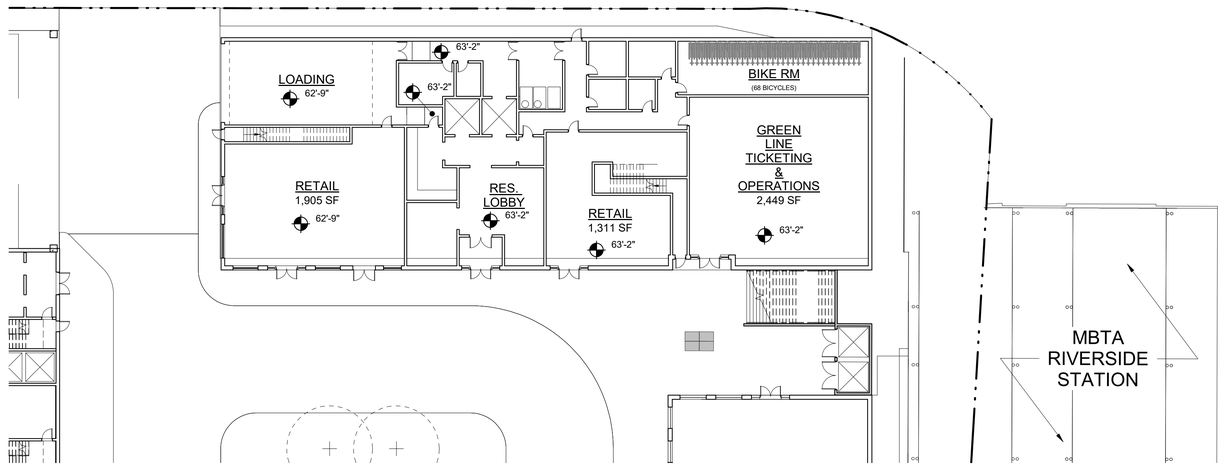

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Riverside Master Plan - Newton, MA

Grove Street, Newton, Massachusetts

No.	Revision	Date	Appvd.
2	REVISED BLDG PROGRAM	09/06/2019	

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Drawing Title

BUILDING 8 - PLANS

Drawing Number

A-8.01

Sheet of

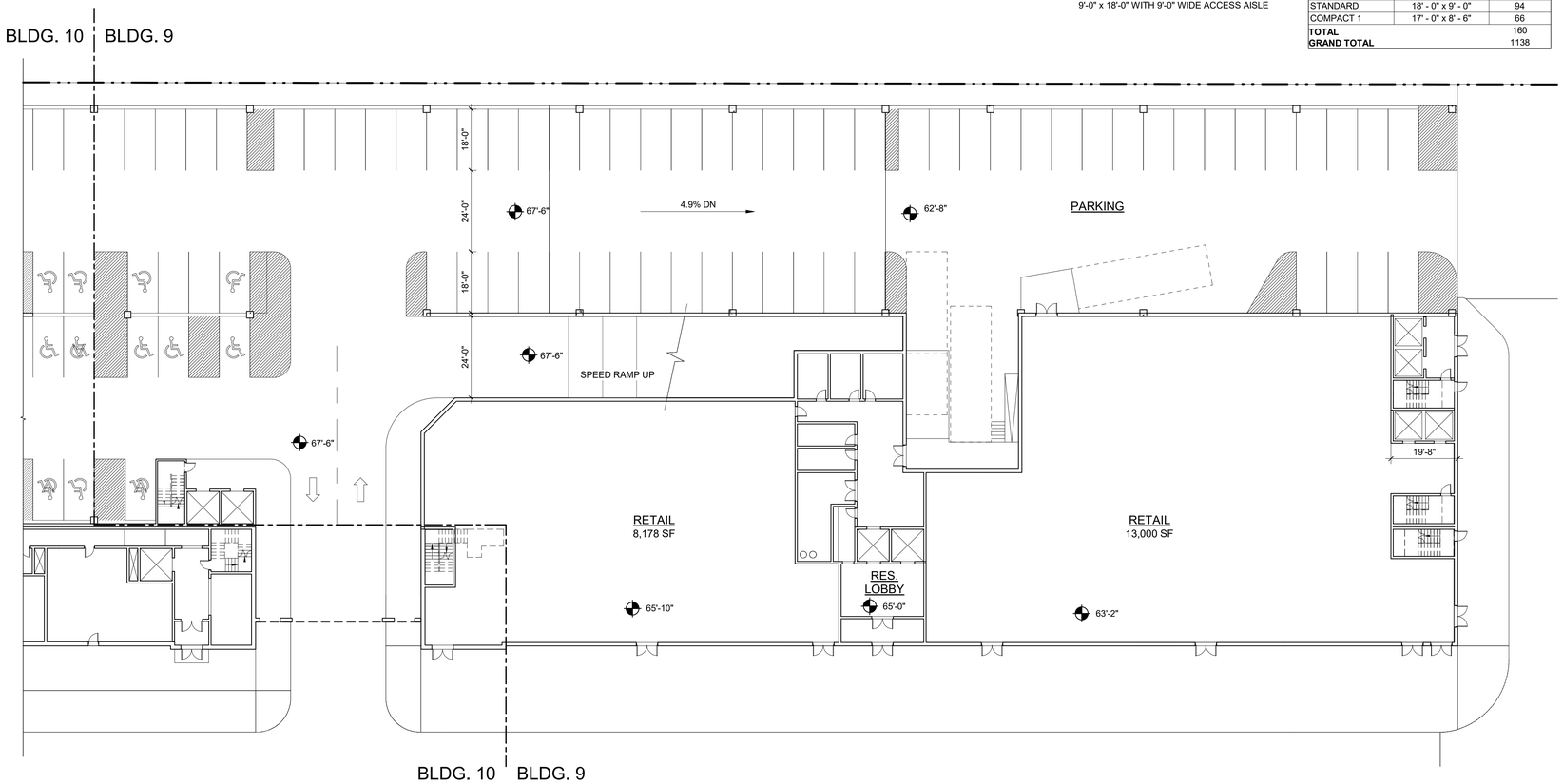
Project Number
10865.03

PARKING SCHEDULE - BUILDING 9		
PARKING TYPE	STALL SIZE	COUNT
Level 1		
STANDARD	18' - 0" x 9' - 0"	63
ACCESSIBLE	18' - 0" x 9' - 0"	5
ACC. VAN	18' - 0" x 9' - 0"	1
TOTAL		69
Level 2		
STANDARD	18' - 0" x 9' - 0"	92
COMPACT 1	17' - 0" x 8' - 6"	19
TOTAL		111
Level 3		
STANDARD	18' - 0" x 9' - 0"	113
COMPACT 1	17' - 0" x 8' - 6"	39
ACCESSIBLE	18' - 0" x 9' - 0"	4
ACC. VAN	18' - 0" x 9' - 0"	4
TOTAL		160
Level 4		
STANDARD	18' - 0" x 9' - 0"	83
COMPACT 1	17' - 0" x 8' - 6"	68
ACCESSIBLE	18' - 0" x 9' - 0"	7
TOTAL		158
Level 5		
STANDARD	18' - 0" x 9' - 0"	85
COMPACT 1	17' - 0" x 8' - 6"	68
ACCESSIBLE	18' - 0" x 9' - 0"	5
TOTAL		158
Level 6		
STANDARD	18' - 0" x 9' - 0"	93
COMPACT 1	17' - 0" x 8' - 6"	68
TOTAL		161
Level 7		
STANDARD	18' - 0" x 9' - 0"	93
COMPACT 1	17' - 0" x 8' - 6"	68
TOTAL		161
Level 8		
STANDARD	18' - 0" x 9' - 0"	94
COMPACT 1	17' - 0" x 8' - 6"	66
TOTAL		160
GRAND TOTAL		1138

NOTE:

ACCESSIBLE STALL WIDTH:
9'-0" x 18'-0" WITH 5'-0" WIDE ACCESS AISLE

VAN ACCESSIBLE STALL WIDTH:
9'-0" x 18'-0" WITH 9'-0" WIDE ACCESS AISLE



LEVEL 1
SCALE: 1" = 20'-0"

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Riverside Master Plan - Newton, MA

Grove Street, Newton, Massachusetts

No.	Revision	Date	Appvd.
2	REVISED BLDG PROGRAM	09/06/2019	

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Drawing Title

BUILDING 9 - LEVEL 1 PLAN

Drawing Number

A-9.01

Sheet of

Project Number
10865.03

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Major Comments – Site Plan Comment 3

Revised TNC Geo-Fencing Graphic

Figure 4.29
TNC (Uber/Lyft) Pick-Up Locations

Riverside Development
Newton, Massachusetts

Major Comments – Site Plan Comment 7

Evacuation Route Graphic

Evacuation Route

Riverside Development
Newton, Massachusetts

Minor Comments – Introduction Comment 1

Program Modification Traffic Generation/Analysis Memorandum

Memorandum

To: City of Newton

Date: February 6, 2020

Project #: 10865.03

From: Randall C. Hart, Principal

Matthew Duranleau, EIT

Re: Riverside Redevelopment
Program Modification Traffic Generation/Analysis (key locations)
Newton, Massachusetts

VHB, on behalf of Mark Development (The Proponent) has prepared a traffic generation memorandum and operational analysis to reflect some minor changes to the development program. The size of the overall project has been reduced since the December 2019 Traffic Impact and Access Study (TIAS) was prepared and submitted to the City of Newton. Since the changes in program are relatively minor, and less from an overall program perspective, the December 2019 TIAS is not being updated but we have prepared this supplemental memorandum to provide traffic generation and operational analysis at key internal and external intersections with the revised program in mind. In addition, since the time of the December 2019 TIA preparation, the project has added a limited access driveway to the north of Building 1 along Recreation Road. This driveway will accommodate deliveries to Building 1 and access to the Rail Yard for employees and deliveries exclusively with no connection to the Site proper.

Based on discussions with the City and to be responsive to concerns expressed by the public, the project program is being modified (reduced) in scale. The Project initially included include approximately 1.47 million gross square feet (sf) of development, which was described in detail in the March 2019 Transportation Impact and Access Study. The revised project as of December 2019 was to include approximately 1.025 million gross sf of development, which consisted of 280,000 sf of office space, 600 residential units, 52,000 sf of retail/restaurant, and a 150-key hotel. Since that time, the site buildings have been refined and now includes 243,388 sf of office space, 617 Residential units, 43,241 sf of retail/restaurant space, and a 150-key hotel. In addition, a new driveway has been proposed since the December 2019 TIAS that will be located off Recreation Road Extension just north of Building 1 and will be limited allowing only access to the MBTA Maintenance Yard and for deliveries to building 1.

The overall reduction in program and slight site refinements is relatively minor and doesn't warrant a full update of the TIAS. However, for the benefit of understanding operations, this supplemental memorandum has been prepared. It should be noted that this memorandum also supersedes the Project Modification Traffic Generation memorandum by VHB dated September 3, 2019. The calculations for the square footage of each land use has changed since that date, and this memorandum reflects the most up-to-date square footage for each land use which are consistent with the project submission made to the City.

A revised Site Plan is included in the Attachments to this memorandum and the proposed changes in the building program are summarized in Table 1.

Table 1 Riverside Redevelopment Changes in Building Program

Land Use	Existing Site	March 2019 TIAS Building Program [a]	December 2019 TIAS Building Program [b]	December 2019 Updated Building Program	Change in Building Program (Dec 2019 TIAS to Memo)
Hotel	194 rooms	194 rooms	150 rooms	**150 rooms**	**n/a**
Office [c]	n/a	550,000 sf	280,000 sf	**243,388 sf**	**- 36,612 sf**
Residential	n/a	675 units	600 units	**617 units**	**+ 17 units**
Retail/Restaurant	n/a	64,609 sf	52,000 sf	**43,241 sf**	**- 8,759 sf**
Parking Spaces	960 [d]	2,866 spaces	2,038 spaces	**2,038 spaces**	**n/a**

a Building Program as outlined in March 2019 TIAS for the Station at Riverside Development.
b Building Program as outlined in December 2019 TIAS for the Station at Riverside Development.
c Does not include approximately 10,000 sf of office space for MBTA uses on-site today and included in the future development.
d Existing parking space count only includes MBTA parking spaces.

As shown in Table 1, the revised building program results in 36,612 less square feet of total proposed office space, 17 additional proposed residential units, and 8,759 less square feet of proposed retail/restaurant space on-Site than previously proposed in the December 2019 TIAS.

An analysis of the revised program is presented below:

Trip Generation Summary

To assess the changes that would be expected as a result of the program modifications, traffic generation projections have been prepared for the revised program. The rate at which any development generates traffic is dependent upon the size, location, and concentration of surrounding developments. As mentioned previously, the Project is comprised of office, residential, hotel, and retail use. The ITE *Trip Generation Manual*[1] categorizes these land uses and provides weekday daily, weekday morning peak hour, weekday evening peak hour, Saturday daily, and Saturday midday peak hour unadjusted vehicle trip generation estimates for each use. The trip generation estimates for the proposed uses were projected using Land Use Code (LUC) 221 (Mid-Rise Residential), LUC 310 (Hotel), LUC 710 (General Office Building), and LUC 820 (Shopping Center).

The change in total site-generated vehicle trips with the building program is summarized below in Table 2 and a breakdown of the detailed trip generation analyses for the revised building program as requested by the City of Newton Planning Department is described in the following sections.

1 Trip Generation Manual, 10th Edition, Institute of Transportation Engineers, Washington, D.C., 2017.

Table 2 Total Site-Generated Vehicle Trip Generation Comparison

			December 2019 TIAS Building Program		Revised Building Program		
Time Period	Direction	Existing Hotel / MBTA Trips [a]	Total Unadjusted Trips [b]	Total Net New Trips [c]	Total Unadjusted Trips [d]	Total Net New Trips [e]	Total Net New Trip Difference
Weekday Morning	Enter	295	460	**351**	421	**313**	- 38
Peak Hour	Exit	170	286	**157**	281	**154**	- 3
	Total	465	746	**508**	702	**467**	- 41
Weekday Evening	Enter	200	406	**173**	382	**163**	- 10
Peak Hour	Exit	270	575	**369**	516	**327**	- 42
	Total	470	981	**542**	898	**490**	- 52
Saturday Midday	Enter	255	462	**266**	426	**240**	- 26
Peak Hour	Exit	120	427	**235**	396	**217**	- 18
	Total	375	889	**501**	822	**457**	- 44

a Based on empirical counts conducted by VHB; from Table 4 in the December 2019 Station at Riverside Redevelopment TIAS.
b Unadjusted trip generation estimates based on ITE Trip Generation Manual; from Table 5 in the December 2019 Station at Riverside Redevelopment TIAS (does not included MBTA-generated or trips).
c Total Net New trip generation estimate including credits for mode share, internal capture, pass-by, and existing trips; from Table 8 in the December 2019 Station at Riverside Redevelopment TIAS.
d Unadjusted trip generation estimates based on ITE Trip Generation Manual; as described in Table 4 in this memorandum (does not include MBTA-generated trips but does include Hotel-generated trips).
e Total Net New trip generation estimate for entire building program and including credits for mode share, internal capture, pass-by, and existing trips; as described in Table 6 in this memorandum.

As shown in Table 2, the revised building program as compared to the previous building program will result in 41 fewer new vehicle trips (-38 entering / -3 exiting) during the weekday morning peak hour, 52 fewer new vehicle trips (-10 entering / -42 exiting) during the weekday evening peak hour, and 44 fewer new vehicle trips (-26 entering / -18 exiting) during the Saturday midday peak hour.

Project-Generated Trips

Estimating future conditions volumes for the Site involved a review of the existing development on those parcels, along with the additional trip generation expected from the Project development.

Existing Site-Generated Traffic

The planned development parcels currently are occupied by the Hotel Indigo, which features 194 hotel rooms and an on-site restaurant, and a commuter park and ride, kiss and ride, and pick-up / drop-off loop for the MBTA Riverside Station featuring approximately 960 parking spaces. The vehicular Site trip generation for the weekday morning and

weekday evening peak hours under existing conditions was estimated based on turning movement counts conducted at the two Site driveways. Table 3 summarizes the Project-related trips for the existing uses on Site.

Table 3 Existing Site Trip Generation

	Hotel	MBTA Station	Total Vehicle Trips
Weekday Morning Peak Hour			
Enter	45	250	**295**
Exit	45	125	**170**
Total	90	375	**465**
Weekday Evening Peak Hour			
Enter	50	150	**200**
Exit	35	235	**270**
Total	85	385	**470**
Saturday Midday Peak Hour [c]			
Enter	30	225	**255**
Exit	25	95	**120**
Total	55	320	**375**

Based on turning movement counts conducted by VHB in June 2018, October 2018, and September 2019.

As shown in Table 3, the Site under existing conditions currently generates approximately 465 vehicular trips (295 entering / 170 exiting) during the weekday morning peak hour, 470 vehicular trips (200 entering / 270 exiting) during the weekday evening peak hour, and 375 vehicular trips (255 entering / 120 exiting) during the Saturday midday peak hour. It should be noted that the existing Site also contains the Riverside MBTA maintenance yard and supporting facilities, but it was assumed that the maintenance yard generated negligible trips during the weekday morning, weekday evening, and Saturday midday peak hours.

It is expected that the existing MBTA Station-generated vehicular trips will continue to be generated by the Site under future conditions. A parking garage with approximately 960 parking spaces for commuters and a pick-up / drop-off loop near the station entrance will be provided on Site to accommodate the commuters that use the Riverside MBTA Station today. Thus, the existing MBTA Station-generated vehicle trips presented in Table 3 have been included in all future total Project-generated vehicular trip calculations.

While the site under existing conditions contains a 194-room hotel, the proposed building program includes a 150-room hotel, which is 44-rooms fewer than the existing hotel. Therefore, it is expected that the proposed hotel will generate a different number of peak hour trips than the existing hotel. To be consistent with the analysis for the rest of the proposed building program, ITE data was used to project the future number of hotel trips as opposed to the existing driveway counts.

Unadjusted Project-Generated Traffic

The proposed development will consist of a mixture of residential, office, hotel, and supporting retail uses. Specifically, the Site is proposed to include approximately 617 residential units, 243,388 sf of new office space, a 150-room hotel, 43,241 sf of supporting restaurant/retail uses, and 2,038 parking spaces on-Site to accommodate the proposed development and the commuters using the Riverside MBTA Station. Traffic associated with the residential units was estimated using ITE LUC 221 (Mid-Rise Residential), traffic associated with the hotel was estimated using ITE LUC 310 (Hotel), traffic associated with the office space was estimated using ITE LUC 710 (General Office Building), and traffic

associated with the retail uses was estimated with ITE LUC 820 (Shopping Center). As noted previously, traffic associated with the MBTA station was estimated based on the observed existing Site-generated vehicular trips.

Approximately 7,500 sf of additional office space will also be built and be dedicated office space for the Riverside MBTA. This space will replace existing office space that is currently housed within the rail yard. Those buildings will be eliminated. As this small portion of office space will not be considered a new use and will replace existing office on-Site, it is not included in the 243,388 sf of office space and is not reflected in the proposed Site-generated volumes.

It should be noted that the retail uses are expected to be smaller, Main Street style businesses catering to the residential and office space on-Site and the adjacent neighborhoods as opposed to large big-box style retail stores. Potential uses will may include eating establishments, coffee shops, pharmacies, convenience stores, or gallery uses. The service style retail that would serve the uses on site are not expected to draw heavily from the community like a shopping center would. While these do not fit the exact description of a traditional ITE "Shopping Center", retail traffic was estimated using this land use code, which results in an overly conservative analysis.

The unadjusted new vehicle trip estimates are presented in Table 4 and trip generation worksheets are included in the Attachments.

Table 4 Project Trip Generation – New Unadjusted Vehicle Trips

	Hotel [a]	Residential [b]	Office [c]	Retail [d]	Total New Unadjusted Vehicle Trips [e]
Weekday Daily					
Enter	*633*	1,680	1,257	1,700	**4,637**
Exit	*633*	1,680	1,257	1,700	**4,637**
Total	*1,366*	3,360	2,514	3,400	**9,274**
Weekday Morning Peak Hour					
Enter	*41*	53	220	108	**381**
Exit	*29*	151	36	66	**253**
Total	*70*	204	256	174	**634**
Weekday Evening Peak Hour					
Enter	*44*	155	42	140	**337**
Exit	*42*	99	223	152	**474**
Total	*86*	254	265	292	**811**
Saturday Daily					
Enter	*574*	1,146	269	2,650	**4,065**
Exit	*574*	1,146	269	2,650	**4,065**
Total	*1,148*	2,292	538	5,300	**8,130**
Saturday Midday Peak Hour					
Enter	*60*	130	70	166	**366**
Exit	*47*	136	59	153	**348**
Total	*107*	266	129	319	**714**

a Based on ITE LUC 310 (Hotel) for 150 rooms; Not included as "new" trips as the existing Site contains a 194-room hotel.
b Based on ITE LUC 221 (Mid-Rise Residential) for 617 residential units.
c Based on ITE LUC 710 (General Office Building) for 243,388 sf
d Based on ITE LUC 820 (Shopping Center) for 43,241 sf
e Sum of unadjusted residential, office, and retail trips. Does not include unadjusted hotel trips as hotel-generated trips are already generated under existing conditions and therefore are not included as "new" trips to the Site.
Note: MBTA Station generated trips are already generated under existing conditions and therefore are not included as "new" trips to the Site.

Person Trips

The unadjusted vehicle trips are converted into person trips by applying the average vehicle occupancy (AVO) of 1.18 for residential and office trips and of 1.82 for retail and hotel trips, as outlined by the U.S. Department of Transportation[2]. The unadjusted vehicle trips were converted into person trips in order to apply internal capture credits and applicable mode share credits, as described below. Applying these credits to person trips allows for estimates to be made for the total number of Site-generated transit users, walkers, and bicyclists in addition to the total number of Site-generated vehicles.

[2] Summary of Travel Trends: 2017 National Household Survey, US Department of Transportation, Federal Highway Administration, Washington D.C., 2017

Internal Capture Trips

Since the proposed development is a mixed-use project, the trip generation characteristics of the Site will be different from a single-use project. Some of the traffic to be generated by the proposed development will be contained on site as "internal" or "shared vehicle" trips. For example, workers at the office space on Site may patron the retail shops after work, or residents who live in the development may also work in the office on Site. While these shared trips represent new traffic to the individual uses, they would not show up as new vehicle trips on the surrounding roadway network.

As described in the ITE Trip Generation Handbook[3] "because of the complementary nature of these land uses, some trips are made among the on-site uses. This capture of trips internal to the site has the net effect of reducing vehicle trip generation between the overall development site and the external street system (compared to the total number of trips generated by comparable land uses developed individually on stand-alone sites) an internal capture rate can generally be defined as the percentage of total person trips generated by a site that are made entirely within the site. The trip origin, destination, and travel path are all within the site."

Based on the methodology outlined in the ITE Trip Generation Handbook, internal capture rates were applied to the gross person trips. Internal capture worksheets are included in the Attachments to this memorandum.

Mode Share

The Project is conveniently located at the Riverside MBTA Station, providing direct access to both the MBTA Green Line and several MBTA bus routes, local shuttles, etc. and making it a true Transit Oriented Development. Mode shares for the proposed development were assigned in the December 2019 TIAS based on research and previously submitted traffic studies. Table 5 provides a summary of the projected mode shares by land use.

Table 5 Project Mode Share

Use	Vehicle	Transit	Walk/Bike
Residential	75%	25%	0%
Office	95%	5%	0%
Retail	100%	0%	0%

It should be noted again that the vehicle mode shares were applied in order to present a conservative assessment of future traffic impacts. The use of the high vehicle mode shares and low transit and walk/bike mode shares was a directive of MassDOT as part of the former approval process to be conservative in assessing project impacts and potential improvements.

Overall, the following conservative assumptions were made throughout the trip generation process to evaluate the traffic impacts on the regional roadway network:

- Use of LUC 820 (Shopping Center) for retail when service style is primarily what will be present.
- High vehicle mode share assumptions for Office
- High vehicle mode share assumption for Residential
- No non-vehicular mode share application for Retail
- No mode share for bicycles and pedestrians

3 Trip Generation Handbook, 3rd Edition, Institute of Transportation Engineers, Washington, D.C., 2017.

In the December 2019 TIAS, a transit analysis was introduced that discusses the impact the project will have on transit operations in the vicinity. The transit analysis has been conducted using both the mode shares shown above and a second set of mode shares (more realistic) that would be considered more conservative from a transit-analysis viewpoint. Application of a more realistic mode shares that are likely to be realized will better assess the potential impacts to the MBTA.

The mode shares discussed above were applied to the net-new person trips to generate the adjusted Project trips by mode. The local average vehicle occupancy, based US Census data for each primary use, was then applied to the vehicle mode to reflect the number of vehicle trips generated by the Site.

Pass-By Trips

While the ITE rates provide estimates for all the traffic associated with each land use, not all of the traffic generated by the Project will be new to the area roadways. A portion of the vehicle-trips generated by the retail land use will likely be drawn from the traffic volume roadways adjacent to the Project Site. For example, someone traveling on Grove Street may choose to deviate from their original travel path to visit the site retail, before heading back to continue to their final destination. For this evaluation, ITE pass-by rates for LUC 820 (Shopping Center) were utilized for the retail trip generation and applied to existing trips on Grove Street. Specifically, 34-percent and 26-percent of the retail trip generation was assumed to be drawn from the surrounding roadway network during the weekday evening and Saturday midday peak hours, respectively, as outlined in the ITE Trip Generation Handbook. For all other time periods studied, a 25-percent pass-by rate was assumed.

Project-Generated Trips

As described above, internal capture credit, mode share credit, and pass-by credit for the retail portion of the Project was applied to the unadjusted new vehicle trips presented in Table 4 to develop the net new trips expected to be generated by the Site. Table 6 presents the Project-generated net new vehicle peak hour trips by land use and Table 7 presents the Project-generated net new peak hour trips by mode.

Table 6 Project-Generated Peak-Hour Vehicle Trips by Use

	Residential [a]	Hotel [b]	Office [c]	Retail [d]	Total Net Vehicle Trips [e]	Existing Hotel Trips [f]	Total Net New Vehicle Trips [g]	Pass-By [h]	Existing MBTA Trips [i]	Total Site-Generated Vehicle Trips [j]
Weekday Morning										
Enter	40	41	201	76	**358**	-45	**313**	20	250	**628**
Exit	114	20	25	40	**199**	-45	**154**	20	125	**344**
Total	154	61	226	116	**557**	-90	**467**	40	375	**972**
Weekday Evening										
Enter	70	34	33	76	**213**	-50	**163**	36	150	**399**
Exit	54	40	202	66	**362**	-35	**327**	36	235	**633**
Total	124	74	235	142	**575**	-85	**490**	72	385	**1,032**
Saturday Midday										
Enter	54	50	59	107	**270**	-30	**240**	31	225	**526**
Exit	79	44	47	72	**242**	-25	**217**	31	95	**368**
Total	133	94	106	179	**512**	-55	**457**	62	320	**894**

a Residential vehicle trips with internal capture and mode share credits applied.
b Hotel vehicle trips with internal capture and mode share credits applied (does not include removal of existing hotel trips).
c Office vehicle trips with internal capture and more share credits applied.
d Retail vehicle trips with internal capture and pass-by credits applied.
e Sum of columns a through d.
f Existing Hotel Indigo trips based on traffic counts conducted by VHB in October 2018.
g Sum of columns e and f.
h Pass-by Credits of 25%, 34%, and 26% applied to weekday morning, weekday evening, and Saturday midday peak hour retail trip generation, respectively.
i MBTA Station trips based on traffic counts conducted by VHB in June 2018.
j Sum of columns e, h, and i.

As shown in Table 6, the Project is expected to generate a total of 972 vehicle trips (628 entering / 344 exiting) during the weekday morning peak hour, 1,032 vehicle trips (399 entering / 633 exiting) during the weekday evening peak hour, and 894 vehicle trips (526 entering / 368 exiting) during the Saturday midday peak hour. However, these totals include traffic already generated on-Site by the hotel and the MBTA station and pass-by trips that will not be added as new trips to the roadway. After considering the existing traffic generation and the pass-by trips, the Project will result in an additional 467 vehicle trips (313 entering / 154 exiting) to the roadway network during the weekday morning peak hour, 490 vehicle trips (163 entering / 327 exiting) during the weekday evening peak hour, and 457 vehicle trips (240 entering / 217 exiting) during the Saturday midday peak hour.

As discussed previously, the Site currently contains a 194-room hotel and the proposed revised building program includes a 150-room hotel (which is a reduction of 44 rooms from existing). The trip generation analyses summarized above include this reduction of hotel rooms on-Site, as the proposed hotel is expected to generate trips at a different rate than the existing hotel. The proposed hotel trip generation is based on ITE data to be consistent with the rest of the development trip generation while the existing hotel trip generation is based on driveway counts conducted by VHB in October 2018 and September 2019.

Table 7 below summarizes the Project-generated net new peak hour trips by mode.

Table 7 Net New Project-Generated Peak-Hour Trips by Mode

	Net New Vehicle Trips [a]	Net New Transit Trips
Weekday Morning Peak Hour		
Enter	313	27
Exit	154	45
Total	467	72
Weekday Evening Peak Hour		
Enter	163	29
Exit	327	33
Total	490	62
Saturday Midday Peak Hour		
Enter	240	25
Exit	217	33
Total	457	58

a Net vehicle trips not including pass-by trips associated with the retail portion.
Note: Hotel and MBTA Station generated trips are already generated on-Site under existing conditions and therefore are not included as "new" trips to the Site.

As shown in Table 7, the Project is expected to generate between 58 and 72 new transit trips during the weekday morning, weekday evening, and Saturday midday peak hours and between 457 and 490 net new vehicular trips during the same peak hours. As stated in the TIAS, while the Project is likely to generate walk/bike trips in line with existing office and residential uses in the City of Newton, to provide a conservative analysis and to be consistent with the 2015 MEPA filing for the previous iteration of the Project, no credit was applied for walk/bike trips to and from the Site.

Build Traffic Volumes

The project-related traffic volumes for the Build Condition are assigned to the study area roadway network based on the trip distribution patterns discussed in the TIAS. The assigned volumes are then added to the 2029 No-Build peak hour traffic volume networks to develop the 2029 Build Condition weekday morning, weekday evening peak hour, and Saturday midday traffic volume networks. Traffic volume networks for the 2029 Build Condition with Mitigation at key intersections for the weekday morning, weekday evening, and Saturday midday peak hours, respectively are included in the Attachments to this memorandum.

Traffic Operations

For the purpose of demonstration future traffic operations at key internal and external locations with the revised program traffic volumes, updated operational analyses have been performed for the following locations:

- Main Street at Grove Street Driveway/Garage Entrance
- Main Street at Road A
- Grove Street at Grove Street Driveway (Signalized)
- Grove Street at Grove Street Extension (Signalized)
- Route 128/I-95 NB Off Ramp at Grove Street/Main Street/Recreation Road (Signalized)

- Grove Street at Route 128/I-95 SB Off Ramp with Ashville Road (Roundabout)
- Recreation Road Extension at MBTA Yard Driveway

For this assessment, future Build year 2029 with mitigation were analyzed during the three critical peak hour periods; weekday morning peak hour, weekday evening peak hour, and Saturday midday peak hour periods. The signalized and unsignalized intersections were analyzed with Synchro software and the roundabout intersection was analyzed with Sidra software. To provide a comparison, the 2029 Build Conditions with mitigation based on the updated building program has been compared against the 2029 No Build Conditions and the 2029 Build Conditions with mitigation as presented in the December 2019 TIAS.

Table 8 presents the capacity analyses for the signalized study area intersections and the capacity worksheets are included in the Attachments to this memorandum.

Table 8 Signalized Intersection Capacity Analysis with Mitigation

	2029 No-Build Conditions					2029 Build Cond (Dec 2019 TIAS)					2029 Build Cond (Updated Program)				
				Vehicle Queues					Vehicle Queues					Vehicle Queues	
Location	**v/c[1]**	**Delay[2]**	**LOS[3]**	**50th[4]**	**95th[5]**	**v/c**	**Delay**	**LOS**	**50th**	**95th**	**v/c**	**Delay**	**LOS**	**50th**	**95th**
Grove Street at Grove Street Extension															
Weekday Morning															
Grove Street (from East) WB L						0.55	24	C	83	188	0.54	23	C	81	184
Grove Street (from East) WB R						0.08	10	A	8	32	0.08	9	A	8	31
Grove Street (from West) NB T	*Intersection Does Not Exist Under 2029 No Build Conditions*					0.67	23	C	132	277	0.65	22	C	123	259
Grove Street (from West) NB R						0.57	7	A	80	127	0.58	7	A	80	128
Grove Street Extension SB L						0.33	9	A	21	63	0.33	9	A	21	62
Grove Street Extension SB T						0.12	7	A	16	51	0.13	7	A	16	50
Overall							**14**	**B**				**14**	**B**		
Weekday Evening															
Grove Street (from East) WB L						0.76	23	C	158	316	0.76	23	C	157	314
Grove Street (from East) WB R						0.18	6	A	18	50	0.18	6	A	17	50
Grove Street (from West) NB T	*Intersection Does Not Exist Under 2029 No Build Conditions*					0.58	29	C	79	184	0.58	28	C	77	180
Grove Street (from West) NB R						0.15	3	A	14	26	0.16	3	A	15	27
Grove Street Extension SB L						0.37	15	B	35	100	0.37	15	B	35	100
Grove Street Extension SB T						0.34	14	B	61	160	0.32	14	B	58	153
Overall							**18**	**B**				**18**	**B**		
Saturday Midday															
Grove Street (from East) WB L						0.44	18	B	50	120	0.43	17	B	48	113
Grove Street (from East) WB R						0.05	7	A	5	20	0.05	7	A	5	19
Grove Street (from West) NB T	*Intersection Does Not Exist Under 2029 No Build Conditions*					0.58	18	B	78	168	0.55	18	B	71	157
Grove Street (from West) NB R						0.11	3	A	9	18	0.11	3	A	9	19
Grove Street Extension SB L						0.16	7	A	8	26	0.15	7	A	7	26
Grove Street Extension SB T						0.16	7	A	16	46	0.16	7	A	15	45
Overall							**13**	**B**				**12**	**B**		
Grove Street at MBTA Riverside Driveway															
Weekday Morning															
Grove Street EB T						0.79	18	B	118	#351	0.78	18	B	117	#349
Grove Street WB T	*Intersection Under Unsignalized Control Under 2029 No Build Conditions*					0.32	8	A	31	84	0.32	8	A	30	81
Grove Street WB R						0.50	16	B	41	85	0.48	16	B	39	81
Riverside MBTA Driveway SB L						0.55	17	B	48	96	0.54	17	B	47	94
Riverside MBTA Driveway SB R						0.13	11	B	9	26	0.14	11	B	10	28
Overall							**15**	**B**				**15**	**B**		
Weekday Evening															
Grove Street EB T						0.39	10	B	50	125	0.39	10	A	50	123
Grove Street WB T	*Intersection Under Unsignalized Control Under 2029 No Build Conditions*					0.68	16	B	110	#306	0.68	16	B	108	#303
Grove Street WB R						0.54	15	B	57	108	0.55	16	B	57	109
Riverside MBTA Driveway SB L						0.64	18	B	76	138	0.63	18	B	71	131
Riverside MBTA Driveway SB R						0.15	10	B	13	32	0.14	10	B	12	31
Overall							**15**	**B**				**15**	**B**		
Saturday Midday															
Grove Street EB T						0.26	7	A	17	46	0.27	7	A	17	46
Grove Street WB T	*Intersection Under Unsignalized Control Under 2029 No Build Conditions*					0.28	7	A	17	48	0.27	7	A	17	47
Grove Street WB R						0.36	11	B	16	60	0.34	11	B	15	57
Riverside MBTA Driveway SB L						0.36	11	B	18	64	0.36	11	B	17	63
Riverside MBTA Driveway SB R						0.13	9	A	5	25	0.12	9	A	5	24
Overall							**9**	**A**				**9**	**A**		

Table 8 Signalized Intersection Capacity Analysis with Mitigation (Cont.)

	2029 No-Build Conditions					2029 Build Cond (Dec 2019 TIAS)					2029 Build Cond (Updated Program)				
				Vehicle Queues					Vehicle Queues					Vehicle Queues	
Location	**v/c[1]**	**Delay[2]**	**LOS[3]**	**50th[4]**	**95th[5]**	**v/c**	**Delay**	**LOS**	**50th**	**95th**	**v/c**	**Delay**	**LOS**	**50th**	**95th**
I-95/Route 128 NB Off-Ramp / Site Main Street at Grove Street Extension / Recreation Road Extension															
Weekday Morning															
I-95 NB Off-Ramp EB LT	*Intersection Does Not Exist Under 2029 No Build Conditions*					0.70	26	C	127	260	0.69	26	C	122	256
I-95 NB Off-Ramp EB R						0.27	5	A	0	38	0.27	5	A	0	38
Site Main Street WB L						0.25	25	C	30	85	0.24	25	C	27	80
Site Main Street WB TR						0.49	29	C	62	155	0.49	29	C	62	156
Grove Street Extension LT						0.58	31	C	55	130	0.58	31	C	54	130
Grove Street Extension R						0.48	12	B	67	153	0.45	12	B	61	142
Recreation Road Ext. SB LTR						0.37	11	B	18	70	0.36	11	B	17	69
Overall							**20**	**B**				**20**	**B**		
Weekday Evening															
I-95 NB Off-Ramp EB LT	*Intersection Does Not Exist Under 2029 No Build Conditions*					0.81	41	D	202	#404	0.80	39	D	198	#392
I-95 NB Off-Ramp EB R						0.36	8	A	9	64	0.35	7	A	8	61
Site Main Street WB L						0.39	23	C	87	149	0.38	24	C	82	144
Site Main Street WB TR						0.72	31	C	188	295	0.71	32	C	176	284
Grove Street Extension LT						0.70	44	D	96	#201	0.68	42	D	96	#187
Grove Street Extension R						0.24	8	A	41	70	0.24	9	A	41	70
Recreation Road Ext. SB LTR						0.23	19	B	18	58	0.24	19	B	20	61
Overall							**28**	**C**				**28**	**C**		
Saturday Midday															
I-95 NB Off-Ramp EB LT	*Intersection Does Not Exist Under 2029 No Build Conditions*					0.55	23	C	63	169	0.55	23	C	61	161
I-95 NB Off-Ramp EB R						0.22	6	A	0	32	0.22	6	A	0	32
Site Main Street WB L						0.23	19	B	22	72	0.22	19	B	21	68
Site Main Street WB TR						0.43	22	C	45	125	0.42	21	C	43	121
Grove Street Extension LT						0.35	23	C	28	86	0.34	22	C	27	84
Grove Street Extension R						0.39	9	A	39	102	0.36	8	A	35	92
Recreation Road Ext. SB LTR						0.22	14	B	11	52	0.22	13	B	11	50
Overall							**17**	**B**				**16**	**A**		

a volume-to-capacity ratio
b average delay in seconds per vehicle
c level of service
d 50th percentile queue length, measured in feet
e 95th percentile queue length, measured in feet
95th percentile volume exceeds capacity, queue may be longer

As shown in Table 8, the revised building program results in negligible changes in operations in the 2029 Build Conditions with Mitigation to the signalized study area intersections. The three proposed signalized intersections are expected to operate at overall LOS C or better with all individual movements operating at LOS D or better. Maximum queues on the I-95/Route 128 NB Off-Ramp are not expected to exceed 400 feet, which minimizes the potential for the queue to spill back onto the mainline of the interstate. No queue is expected to exceed 350 feet on Grove Street, and therefore no queue will spill back to any upstream signalized intersections. The MBTA Driveway southbound approach to Grove Street is expected to operate at LOS B or better with no queue exceeding 140 feet under the 2029 Build Conditions with Mitigation.

Table 9 presents the capacity analyses for the unsignalized study area intersections and the capacity worksheets are included in the Attachments to this memorandum.

Table 9 Unsignalized Intersection Capacity Analysis with Mitigation

	2029 No-Build Conditions					2029 Build Cond (Dec 2019 TIAS)					2029 Build Cond (Updated Program)				
Location	**D[1]**	**v/c[2]**	**Delay[3]**	**LOS[4]**	**95th Q[5]**	**D**	**v/c**	**Delay**	**LOS**	**95th Q**	**D**	**v/c**	**Delay**	**LOS**	**95th Q**
Site Main Street at Grove Street Driveway / Garage Driveway (All-Way Stop)															
Weekday Morning															
Site Main Street EB LTR						440	0.68	18	C	133	435	0.67	18	C	128
Site Main Street Street WB LTR						40	0.07	10	A	5	40	0.07	10	A	5
Grove Street Driveway NB LTR						205	0.36	12	B	40	195	0.34	12	B	38
Parking Garage Driveway SB LTR						200	0.33	11	B	35	200	0.33	11	B	35
Weekday Evening															
Site Main Street EB LTR	*Intersection Does Not Exist under 2029 No Build Conditions*					400	0.70	22	C	145	390	0.67	19	C	125
Site Main Street Street WB LTR						55	0.12	11	B	20	55	0.12	11	B	10
Grove Street Driveway NB LTR						270	0.52	16	C	73	270	0.50	15	C	70
Parking Garage Driveway SB LTR						345	0.60	17	C	100	320	0.55	15	C	83
Saturday Midday															
Site Main Street EB LTR						390	0.60	15	C	100	375	0.56	14	B	90
Site Main Street Street WB LTR						25	0.04	9	A	3	30	0.05	9	A	5
Grove Street Driveway NB LTR						160	0.27	11	B	28	150	0.25	10	B	25
Parking Garage Driveway SB LTR						220	0.34	11	B	38	200	0.31	10	B	33
Site Main Street at Road A / Buildings 2-3-4 Driveway East															
Weekday Morning															
Site Main Street EB L						245	0.22	9	A	23	215	0.20	9	A	20
Buildings 2-3-4 Driveway NB LTR						15	0.12	36	E	10	15	0.11	32	D	10
Road A SB LR						100	0.39	26	D	45	95	0.33	22	C	35
Weekday Evening															
Site Main Street EB L	*Intersection Does Not Exist under 2029 No Build Conditions*					90	0.10	9	A	8	85	0.09	9	A	8
Buildings 2-3-4 Driveway NB LTR						15	0.16	47	E	13	15	0.12	35	E	10
Road A SB LR						290	0.88	56	F	220	255	0.71	33	D	133
Saturday Midday															
Site Main Street EB L						145	0.12	8	A	10	130	0.11	8	A	10
Buildings 2-3-4 Driveway NB LTR						15	0.08	23	C	5	15	0.07	21	C	5
Road A SB LR						140	0.33	16	C	35	135	0.30	16	C	30
Site Main Street at Buildings 2-3-4 Driveway West															
Weekday Morning															
Site Main Street WB L						2	0.00	9	A	0	2	0.00	9	A	0
Weekday Evening	*Intersection Does Not Exist under 2029 No Build Conditions*														
Site Main Street WB L						5	0.01	9	A	0	5	0.01	9	A	0
Saturday Midday															
Site Main Street WB L						5	0.01	9	A	0	5	0.01	9	A	0

a Demand
b volume-to-capacity ratio
c average delay in seconds per vehicle
d level of service
e 95th percentile queue length, measured in feet

Table 9 Unsignalized Intersection Capacity Analysis with Mitigation

	2029 No-Build Conditions					2029 Build Cond (Dec 2019 TIAS)					2029 Build Cond (Updated Program)				
Location	**D[1]**	**v/c[2]**	**Delay[3]**	**LOS[4]**	**95th Q[5]**	**D**	**v/c**	**Delay**	**LOS**	**95th Q**	**D**	**v/c**	**Delay**	**LOS**	**95th Q**
Grove Street at Hotel Indigo Driveway (NB ONLY) / Woodland Grove Condominiums Driveway															
Weekday Morning															
Grove Street EB L	40	0.04	8	A	3	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Grove Street WB L	1	0.00	11	B	0	1	0.00	9	A	0	1	0.00	9	A	0
Condo Driveway NB LTR	5	0.04	26	D	3	5	0.02	15	C	3	5	0.02	15	C	3
Hotel Indigo Driveway SB LTR	45	0.22	26	D	20	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Weekday Evening															
Grove Street EB L	30	0.05	10	B	3	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Grove Street WB L	1	0.00	9	A	0	1	0.00	8	A	0	1	0.00	8	A	0
Condo Driveway NB LTR	5	0.03	20	C	3	5	0.01	12	B	0	5	0.01	12	B	0
Hotel Indigo Driveway SB LTR	35	0.30	46	E	30	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Saturday Midday															
Grove Street EB L	25	0.02	8	A	3	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Grove Street WB L	1	0.00	8	A	0	1	0.00	8	A	0	1	0.00	8	A	0
Condo Driveway NB LTR	1	0.00	18	C	0	1	0.00	12	B	0	1	0.00	12	B	0
Hotel Indigo Driveway SB LTR	25	0.06	14	B	5	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Recreation Road Extension at MBTA Yard Driveway															
Weekday Morning															
MBTA Yard Driveway WB LR	*Intersection Does Not Exist under 2029 No Build Conditions*					*Intersection Does Not Exist under 2029 Build Conditions with Mitigation under previous building program*					5	0.01	11	B	0
Recreation Road Ext SB L											neg	0.00	0	A	0
Weekday Evening															
MBTA Yard Driveway WB LR											5	0.01	12	B	0
Recreation Road Ext SB L											neg	0.00	0	A	0
Saturday Midday															
MBTA Yard Driveway WB LR											2	0.01	11	B	0
Recreation Road Ext SB L											neg	0.00	0	A	0

a Demand
b volume-to-capacity ratio
c average delay in seconds per vehicle
d level of service
e 95th percentile queue length, measured in feet

As shown in Table 9, the revised building program results in minimal changes in operations at most unsignalized study area intersections in the 2029 Build Conditions with Mitigation. However, at the intersection of Site Main Street at Road A / Buildings 2-3-4 Driveway East, the operations improve notably with the change in building program. The Road A southbound approach improves from LOS D and F during the weekday morning and weekday evening peak hours to LOS C and D, respectively, and the Buildings 2-3-4 Driveway East northbound approach improves from LOS E during the weekday morning peak hour to LOS D. While the change in building program is quite minimal, the slight reduction is just enough to result in notable improvements at this intersection.

Table 10 presents the capacity analyses for the roundabout study area intersection and the capacity worksheets are included in the Attachments to this memorandum.

Table 10 Roundabout Intersection Capacity Analysis with Mitigation

Location	2029 No Build Conditions					2029 Build Cond (Dec 2019 TIAS)					2029 Build Cond (TG Update)				
	D[1]	v/c[2]	Delay[3]	LOS[4]	95th Q[5]	D	v/c	Delay	LOS	95th Q	D	v/c	Delay	LOS	95th Q
Grove Street at I-95/Route 128 SB Ramps / Asheville Road															
Weekday Morning															
Grove Street EB LTR	*Intersection Unsignalized under 2029 No Build Conditions*					632	0.76	20	C	332	626	0.75	20	C	321
Grove Street WB LTR						408	0.37	7	A	49	408	0.37	7	A	49
I-95 SB Off-Ramp NB LTR						479	0.78	28	D	230	463	0.75	25	D	204
Asheville Road SB LTR						17	0.03	5	A	2	17	0.03	5	A	2
Overall								**19**	**C**				**18**	**C**	
Weekday Evening															
Grove Street EB LTR	*Intersection Unsignalized under 2029 No Build Conditions*					278	0.44	12	B	58	278	0.43	12	B	57
Grove Street WB LTR						832	0.79	19	C	251	821	0.78	18	C	239
I-95 SB Off-Ramp NB LTR						234	0.28	7	A	29	234	0.28	7	A	29
Asheville Road SB LTR						9	0.02	8	A	2	9	0.02	8	A	1
Overall								**16**	**C**				**15**	**B**	
Saturday Midday															
Grove Street EB LTR	*Intersection Unsignalized under 2029 No Build Conditions*					234	0.28	7	A	29	234	0.28	7	A	29
Grove Street WB LTR						386	0.36	7	A	46	375	0.35	7	A	44
I-95 SB Off-Ramp NB LTR						370	0.39	8	A	49	353	0.38	8	A	46
Asheville Road SB LTR						17	0.02	5	A	2	17	0.02	5	A	2
Overall								**8**	**A**				**7**	**A**	

Source: analyzed with Sidra 8 software.

a Demand
b volume-to-capacity ratio
c average total delay, in seconds per vehicle
d level of service
e 95th percentile queue length, measured in feet

As shown in Table 10, the revised building program results in negligible changes in operations in the 2029 Build Conditions with Mitigation to the study area intersection under roundabout control. While the overall LOS during the weekday evening peak period dropped from LOS C to LOS B due to the change in building program, the overall delay only decreased by one second as the intersection was on the cusp of LOS B/C under the previous building program. The northbound approach from the I-95/Route 128 SB off-ramp is expected to operate at LOS D during the weekday morning peak period and LOS A during the weekday evening and Saturday midday peak periods with the maximum queue of approximately 205 feet during the morning peak hour.

Conclusion

VHB has developed a memorandum to supplement the trip generation and capacity analyses presented in the December 2019 TIAS. Since the development of the December 2019 TIAS, the building program has changed slightly for the Riverside redevelopment project resulting in slightly more residential units and less office and retail space than presented in the TIAS. In addition, a new Site driveway has been proposed for the MBTA Maintenance Yard off Recreation Road Extension, removing that traffic from the new Site roadways. As shown in the analyses presented in this memorandum, the slight change in building program has a minimal impact on trip generation and overall operations at key study area intersections.

Attachments

- Revised Site Plan
- Unadjusted ITE Trip Generation Worksheets
- Shared Trip Calculations
- Build with Mitigation Traffic Volume Networks
- Capacity Analysis Worksheets

ITE TRIP GENERATION WORKSHEET
(10th Edition, Updated 2017)

PROPOSED REVISED BUILDING PROGRAM - DECEMBER 2019

LANDUSE: Hotel
LANDUSE CODE: 310
ETTING/LOCATION: General Urban/Suburban
JOB NAME: **Riverside Redevelopment**
JOB NUMBER: **10865.03**

Independent Variable --- Number of Rooms

150 rooms

WEEKDAY

RATES:

	# Studies	R^2	Total Trip Ends Average	Total Trip Ends Low	Total Trip Ends High	Independent Variable Range Average	Independent Variable Range Low	Independent Variable Range High	Directional Distribution Enter	Directional Distribution Exit
DAILY	6	0.92	8.36	5.31	9.53	146	100	260	50%	50%
EAK (ADJACENT ST)	25	0.85	0.47	0.20	0.84	178	74	426	59%	41%
EAK (ADJACENT ST)	28	0.80	0.60	0.26	1.06	183	74	426	51%	49%

TRIPS:

	BY AVERAGE Total	BY AVERAGE Enter	BY AVERAGE Exit	BY REGRESSION Total	BY REGRESSION Enter	BY REGRESSION Exit
DAILY	1,254	627	627	1,267	633	633
AM PEAK (ADJACENT ST)	71	42	29	70	41	29
PM PEAK (ADJACENT ST)	90	46	44	86	44	42

SATURDAY

RATES:

	# Studies	R^2	Total Trip Ends Average	Total Trip Ends Low	Total Trip Ends High	Independent Variable Range Average	Independent Variable Range Low	Independent Variable Range High	Directional Distribution Enter	Directional Distribution Exit
DAILY	8	0.93	8.19	6.35	9.79	206	100	355	50%	50%
AK OF GENERATOR	9	0.80	0.72	0.49	1.23	194	100	355	56%	44%

TRIPS:

	BY AVERAGE Total	BY AVERAGE Enter	BY AVERAGE Exit	BY REGRESSION Total	BY REGRESSION Enter	BY REGRESSION Exit
DAILY	1,229	614	614	1,148	574	574
PEAK OF GENERATOR	108	60	48	108	60	47

SUNDAY

RATES:

	# Studies	R^2	Total Trip Ends Average	Total Trip Ends Low	Total Trip Ends High	Independent Variable Range Average	Independent Variable Range Low	Independent Variable Range High	Directional Distribution Enter	Directional Distribution Exit
DAILY	8	0.90	5.95	4.01	8.48	206	100	355	50%	50%
AK OF GENERATOR	8	0.87	0.56	0.39	0.72	206	100	355	46%	54%

TRIPS:

	BY AVERAGE Total	BY AVERAGE Enter	BY AVERAGE Exit	BY REGRESSION Total	BY REGRESSION Enter	BY REGRESSION Exit
DAILY	893	446	446	746	373	373
PEAK OF GENERATOR	84	39	45	75	35	41

ITE TRIP GENERATION WORKSHEET
(10th Edition, Updated 2017)

PROPOSED REVISED BUILDING PROGRAM - DECEMBER 2019

LANDUSE: Mid-Rise Residential
LANDUSE CODE: 221
SETTING/LOCATION: General Urban/Suburban
JOB NAME: **Riverside Redevelopment**
JOB NUMBER: **10865.03**

Independent Variable --- Number of Units

617 units

WEEKDAY

RATES:

	# Studies	R^2	Total Trip Ends Average	Low	High	Independent Variable Range Average	Low	High	Directional Distribution Enter	Exit
DAILY	27	0.77	5.44	1.27	12.50	205	21	494	50%	50%
AM PEAK (ADJACENT ST)	53	0.67	0.36	0.06	1.61	207	26	703	26%	74%
PM PEAK (ADJACENT ST)	60	0.72	0.44	0.15	1.11	208	26	703	61%	39%

TRIPS:

	BY AVERAGE Total	Enter	Exit	BY REGRESSION Total	Enter	Exit
DAILY	3,356	1,678	1,678	3,361	1,680	1,680
AM PEAK (ADJACENT ST)	222	58	164	204	53	151
PM PEAK (ADJACENT ST)	271	166	106	254	155	99

SATURDAY

RATES:

	# Studies	R^2	Total Trip Ends Average	Low	High	Independent Variable Range Average	Low	High	Directional Distribution Enter	Exit
DAILY	6	0.73	4.91	4.03	8.51	224	111	336	50%	50%
PEAK OF GENERATOR	8	0.89	0.44	0.34	0.73	264	111	462	49%	51%

TRIPS:

	BY AVERAGE Total	Enter	Exit	BY REGRESSION Total	Enter	Exit
DAILY	3,029	1,515	1,515	2,293	1,146	1,146
PEAK OF GENERATOR	271	133	138	266	130	136

SUNDAY

RATES:

	# Studies	R^2	Total Trip Ends Average	Low	High	Independent Variable Range Average	Low	High	Directional Distribution Enter	Exit
DAILY	6	--	4.09	3.06	8.41	224	111	336	50%	50%
PEAK OF GENERATOR	6	--	0.39	0.26	1.07	224	111	336	62%	38%

TRIPS:

	BY AVERAGE Total	Enter	Exit	BY REGRESSION Total	Enter	Exit
DAILY	2,524	1,262	1,262	N/A	N/A	N/A
PEAK OF GENERATOR	241	149	91	N/A	N/A	N/A

ITE TRIP GENERATION WORKSHEET
(10th Edition, Updated 2017)

PROPOSED REVISED BUILDING PROGRAM - DECEMBER 2019

LANDUSE: General Office Building
LANDUSE CODE: 710
SETTING/LOCATION: General Urban/Suburban
JOB NAME: **Riverside Redevelopment**
JOB NUMBER: **10865.03**

Independent Variable --- Square Feet

FLOOR AREA (KSF): 243.39

WEEKDAY

RATES:

	# Studies	R^2	Total Trip Ends			Independent Variable Range			Directional Distribution	
			Average	Low	High	Average	Low	High	Enter	Exit
DAILY	66	0.83	9.74	2.71	27.56	171	6	1,300	50%	50%
AM PEAK (ADJACENT ST)	35	0.85	1.16	0.37	4.23	117	5	511	86%	14%
PM PEAK (ADJACENT ST)	32	0.88	1.15	0.47	3.23	114	6	511	16%	84%

TRIPS:

	BY AVERAGE			BY REGRESSION		
	Total	Enter	Exit	Total	Enter	Exit
DAILY	2,371	1,185	1,185	2,514	1,257	1,257
AM PEAK (ADJACENT ST)	282	243	40	255	220	36
PM PEAK (ADJACENT ST)	280	45	235	265	42	223

SATURDAY

RATES:

	# Studies	R^2	Total Trip Ends			Independent Variable Range			Directional Distribution	
			Average	Low	High	Average	Low	High	Enter	Exit
DAILY	5	--	2.21	1.24	7.46	94	28	183	50%	50%
PEAK OF GENERATOR	3	--	0.53	0.30	1.57	82	28	183	54%	46%

TRIPS:

	BY AVERAGE			BY REGRESSION		
	Total	Enter	Exit	Total	Enter	Exit
DAILY	538	269	269	N/A	N/A	N/A
PEAK OF GENERATOR	129	70	59	N/A	N/A	N/A

SUNDAY

RATES:

	# Studies	R^2	Total Trip Ends			Independent Variable Range			Directional Distribution	
			Average	Low	High	Average	Low	High	Enter	Exit
DAILY	5	--	0.70	0.19	3.05	94	28	183	50%	50%
PEAK OF GENERATOR	3	--	0.21	0.11	0.68	82	28	183	58%	42%

TRIPS:

	BY AVERAGE			BY REGRESSION		
	Total	Enter	Exit	Total	Enter	Exit
DAILY	170	85	85	N/A	N/A	N/A
PEAK OF GENERATOR	51	30	21	N/A	N/A	N/A

ITE TRIP GENERATION WORKSHEET
(10th Edition, Updated 2017)

PROPOSED REVISED BUILDING PROGRAM - DECEMBER 2019

LANDUSE: Shopping Center
LANDUSE CODE: 820
SETTING/LOCATION: General Urban/Suburban
JOB NAME: **Riverside Redevelopment**
JOB NUMBER: **10865.03**

Independent Variable --- Square Feet

FLOOR AREA (KSF): 43.2

WEEKDAY

RATES:

	# Studies	R^2	Total Trip Ends Average	Total Trip Ends Low	Total Trip Ends High	Independent Variable Range Average	Independent Variable Range Low	Independent Variable Range High	Directional Distribution Enter	Directional Distribution Exit
DAILY	147	0.76	37.75	7.42	207.98	453	9	1,510	50%	50%
AM PEAK (ADJACENT ST)	84	0.90	0.94	0.18	23.74	351	9	1,510	62%	38%
PM PEAK (ADJACENT ST)	261	0.82	3.81	0.74	18.69	327	2	2,200	48%	52%

TRIPS:

	BY AVERAGE Total	BY AVERAGE Enter	BY AVERAGE Exit	BY REGRESSION Total	BY REGRESSION Enter	BY REGRESSION Exit
DAILY	1,632	816	816	3,400	1,700	1,700
AM PEAK (ADJACENT ST)	41	25	15	173	108	66
PM PEAK (ADJACENT ST)	165	79	86	292	140	152

SATURDAY

RATES:

	# Studies	R^2	Total Trip Ends Average	Total Trip Ends Low	Total Trip Ends High	Independent Variable Range Average	Independent Variable Range Low	Independent Variable Range High	Directional Distribution Enter	Directional Distribution Exit
DAILY	58	0.71	46.12	13.07	167.89	602	56	1,510	50%	50%
PEAK OF GENERATOR	119	0.87	4.50	1.42	15.10	416	4	1,510	52%	48%

TRIPS:

	BY AVERAGE Total	BY AVERAGE Enter	BY AVERAGE Exit	BY REGRESSION Total	BY REGRESSION Enter	BY REGRESSION Exit
DAILY	1,994	997	997	5,300	2,650	2,650
PEAK OF GENERATOR	195	101	93	319	166	153

SUNDAY

RATES:

	# Studies	R^2	Total Trip Ends Average	Total Trip Ends Low	Total Trip Ends High	Independent Variable Range Average	Independent Variable Range Low	Independent Variable Range High	Directional Distribution Enter	Directional Distribution Exit
DAILY	30	–	21.10	4.15	148.15	509	47	1,510	50%	50%
PEAK OF GENERATOR	24	–	2.79	0.39	12.40	382	47	1,268	49%	51%

TRIPS:

	BY AVERAGE Total	BY AVERAGE Enter	BY AVERAGE Exit	BY REGRESSION Total	BY REGRESSION Enter	BY REGRESSION Exit
DAILY	912	456	456	N/A	N/A	N/A
PEAK OF GENERATOR	121	59	62	N/A	N/A	N/A

SHARED TRIP CALCULATIONS [1]

DECEMBER 2019 UPDATE (12/30/19)

RETAIL - OFFICE

WEEKDAY DAILY

RETAIL	%	#	BALANCED	#	%	OFFICE
EXIT ->	3%	3,094	**93**	1,484	15%	-> ENTER
ENTER <-	4%	3,094	**124**	1,484	22%	<- EXIT

WEEKDAY MORNING

RETAIL	%	#	BALANCED	#	%	OFFICE
EXIT ->	29%	120	**10**	259	4%	-> ENTER
ENTER <-	32%	196	**12**	42	28%	<- EXIT

WEEKDAY EVENING

RETAIL	%	#	BALANCED	#	%	OFFICE
EXIT ->	2%	277	**6**	50	31%	-> ENTER
ENTER <-	8%	255	**20**	263	20%	<- EXIT

RETAIL - HOTEL

WEEKDAY DAILY

RETAIL	%	#	BALANCED	#	%	HOTEL
EXIT ->	11%	3,094	**340**	1,153	33%	-> ENTER
ENTER <-	9%	3,094	**278**	1,153	38%	<- EXIT

WEEKDAY MORNING

RETAIL	%	#	BALANCED	#	%	HOTEL
EXIT ->	0%	120	**0**	75	0%	-> ENTER
ENTER <-	4%	196	**7**	52	14%	<- EXIT

WEEKDAY EVENING

RETAIL	%	#	BALANCED	#	%	HOTEL
EXIT ->	5%	277	**14**	80	17%	-> ENTER
ENTER <-	2%	255	**5**	77	16%	<- EXIT

RETAIL - RESIDENTIAL

WEEKDAY DAILY

RETAIL	%	#	BALANCED	#	%	RESIDENTIAL
EXIT ->	11%	3,094	**340**	1,983	33%	-> ENTER
ENTER <-	9%	3,094	**278**	1,983	38%	<- EXIT

WEEKDAY MORNING

RETAIL	%	#	BALANCED	#	%	RESIDENTIAL
EXIT ->	14%	120	**1**	62	2%	-> ENTER
ENTER <-	17%	196	**2**	178	1%	<- EXIT

WEEKDAY EVENING

RETAIL	%	#	BALANCED	#	%	RESIDENTIAL
EXIT ->	26%	277	**72**	183	46%	-> ENTER
ENTER <-	10%	255	**26**	117	42%	<- EXIT

OFFICE - HOTEL

WEEKDAY DAILY

OFFICE	%	#	BALANCED	#	%	HOTEL
EXIT ->	2%	1,484	**30**	1,153	3%	-> ENTER
ENTER <-	0%	1,484	**0**	1,153	0%	<- EXIT

WEEKDAY MORNING

OFFICE	%	#	BALANCED	#	%	HOTEL
EXIT ->	0%	42	**0**	75	0%	-> ENTER
ENTER <-	3%	259	**8**	52	75%	<- EXIT

WEEKDAY EVENING

OFFICE	%	#	BALANCED	#	%	HOTEL
EXIT ->	0%	263	**0**	80	0%	-> ENTER
ENTER <-	0%	50	**0**	77	0%	<- EXIT

OFFICE - RESIDENTIAL

WEEKDAY DAILY

OFFICE	%	#	BALANCED	#	%	RESIDENTIAL
EXIT ->	2%	1,484	**30**	1,983	3%	-> ENTER
ENTER <-	0%	1,484	**0**	1,983	0%	<- EXIT

WEEKDAY MORNING

OFFICE	%	#	BALANCED	#	%	RESIDENTIAL
EXIT ->	1%	42	**0**	62	0%	-> ENTER
ENTER <-	3%	259	**4**	178	2%	<- EXIT

WEEKDAY EVENING

OFFICE	%	#	BALANCED	#	%	RESIDENTIAL
EXIT ->	2%	263	**5**	183	4%	-> ENTER
ENTER <-	57%	50	**5**	117	4%	<- EXIT

HOTEL - RESIDENTIAL

WEEKDAY DAILY

HOTEL	%	#	BALANCED	#	%	RESIDENTIAL
EXIT ->	0%	1,153	**0**	1,983	0%	-> ENTER
ENTER <-	0%	1,153	**0**	1,983	0%	<- EXIT

WEEKDAY MORNING

HOTEL	%	#	BALANCED	#	%	RESIDENTIAL
EXIT ->	0%	52	**0**	62	0%	-> ENTER
ENTER <-	0%	75	**0**	178	0%	<- EXIT

WEEKDAY EVENING

HOTEL	%	#	BALANCED	#	%	RESIDENTIAL
EXIT ->	2%	77	**0**	183	0%	-> ENTER
ENTER <-	12%	80	**4**	117	3%	<- EXIT

TOTAL SHARED TRIPS - WEEKDAY DAILY

	ENTER	EXIT	TOTAL
RETAIL	680	773	1453
OFFICE	93	184	277
HOTEL	370	278	648
RES	370	278	648
TOTAL	1,513	1,513	3026

TOTAL SHARED TRIPS - WEEKDAY MORNING

	ENTER	EXIT	TOTAL
RETAIL	21	11	32
OFFICE	22	12	34
HOTEL	0	15	15
RES	1	6	7
TOTAL	44	44	88

TOTAL SHARED TRIPS - WEEKDAY EVENING

	ENTER	EXIT	TOTAL
RETAIL	51	92	143
OFFICE	11	25	36
HOTEL	18	5	23
RES	77	35	112
TOTAL	157	157	314

Note: Shared trips based off of person-trips for each land use. Person trips were developed by multiplying the unadjusted vehicle trips for each ITE land use by an applicable VOR from the Summary of Travel Trends, 2017 National Household Travel Survey (Table 16), USDOT FHA

1 Weekday morning and evening internal capture rates based on NCHRP Report 684, Saturday midday rates assumed to be the same as weekday evening rates
Weekday daily internal capture rates based on ITE Trip Generation Handbook, 2nd Edition, Saturday daily rates assumed to be the same as weekday daily rates

SHARED TRIP CALCULATIONS [1]

DECEMBER 2019 UPDATE (12/30/19)

RETAIL - OFFICE

SATURDAY DAILY

RETAIL	%	#	BALANCED	#	%	OFFICE
EXIT ->	3%	4,823	**48**	317	15%	-> ENTER
ENTER <-	4%	4,823	**70**	317	22%	<- EXIT

SATURDAY MIDDAY

RETAIL	%	#	BALANCED	#	%	OFFICE
EXIT ->	2%	279	**6**	82	31%	-> ENTER
ENTER <-	8%	302	**14**	70	20%	<- EXIT

RETAIL - HOTEL

SATURDAY DAILY

RETAIL	%	#	BALANCED	#	%	HOTEL
EXIT ->	11%	4,823	**345**	1,045	33%	-> ENTER
ENTER <-	9%	4,823	**397**	1,045	38%	<- EXIT

SATURDAY MIDDAY

RETAIL	%	#	BALANCED	#	%	HOTEL
EXIT ->	5%	279	**14**	110	17%	-> ENTER
ENTER <-	2%	302	**6**	86	16%	<- EXIT

RETAIL - RESIDENTIAL

SATURDAY DAILY

RETAIL	%	#	BALANCED	#	%	RESIDENTIAL
EXIT ->	11%	4,823	**446**	1,353	33%	-> ENTER
ENTER <-	9%	4,823	**434**	1,353	38%	<- EXIT

SATURDAY MIDDAY

RETAIL	%	#	BALANCED	#	%	RESIDENTIAL
EXIT ->	26%	279	**71**	154	46%	-> ENTER
ENTER <-	10%	302	**30**	160	42%	<- EXIT

OFFICE - HOTEL

SATURDAY DAILY

OFFICE	%	#	BALANCED	#	%	HOTEL
EXIT ->	2%	317	**6**	1,045	3%	-> ENTER
ENTER <-	0%	317	**0**	1,045	0%	<- EXIT

SATURDAY MIDDAY

OFFICE	%	#	BALANCED	#	%	HOTEL
EXIT ->	0%	70	**0**	110	0%	-> ENTER
ENTER <-	0%	82	**0**	86	0%	<- EXIT

OFFICE - RESIDENTIAL

SATURDAY DAILY

OFFICE	%	#	BALANCED	#	%	RESIDENTIAL
EXIT ->	2%	317	**6**	1,353	3%	-> ENTER
ENTER <-	0%	317	**0**	1,353	0%	<- EXIT

SATURDAY MIDDAY

OFFICE	%	#	BALANCED	#	%	RESIDENTIAL
EXIT ->	2%	70	**1**	154	4%	-> ENTER
ENTER <-	57%	82	**6**	160	4%	<- EXIT

HOTEL - RESIDENTIAL

SATURDAY DAILY

HOTEL	%	#	BALANCED	#	%	RESIDENTIAL
EXIT ->	0%	1,045	**0**	1,353	0%	-> ENTER
ENTER <-	0%	1,045	**0**	1,353	0%	<- EXIT

SATURDAY MIDDAY

HOTEL	%	#	BALANCED	#	%	RESIDENTIAL
EXIT ->	2%	86	**0**	154	0%	-> ENTER
ENTER <-	12%	110	**5**	160	3%	<- EXIT

TOTAL SHARED TRIPS - SATURDAY DAILY

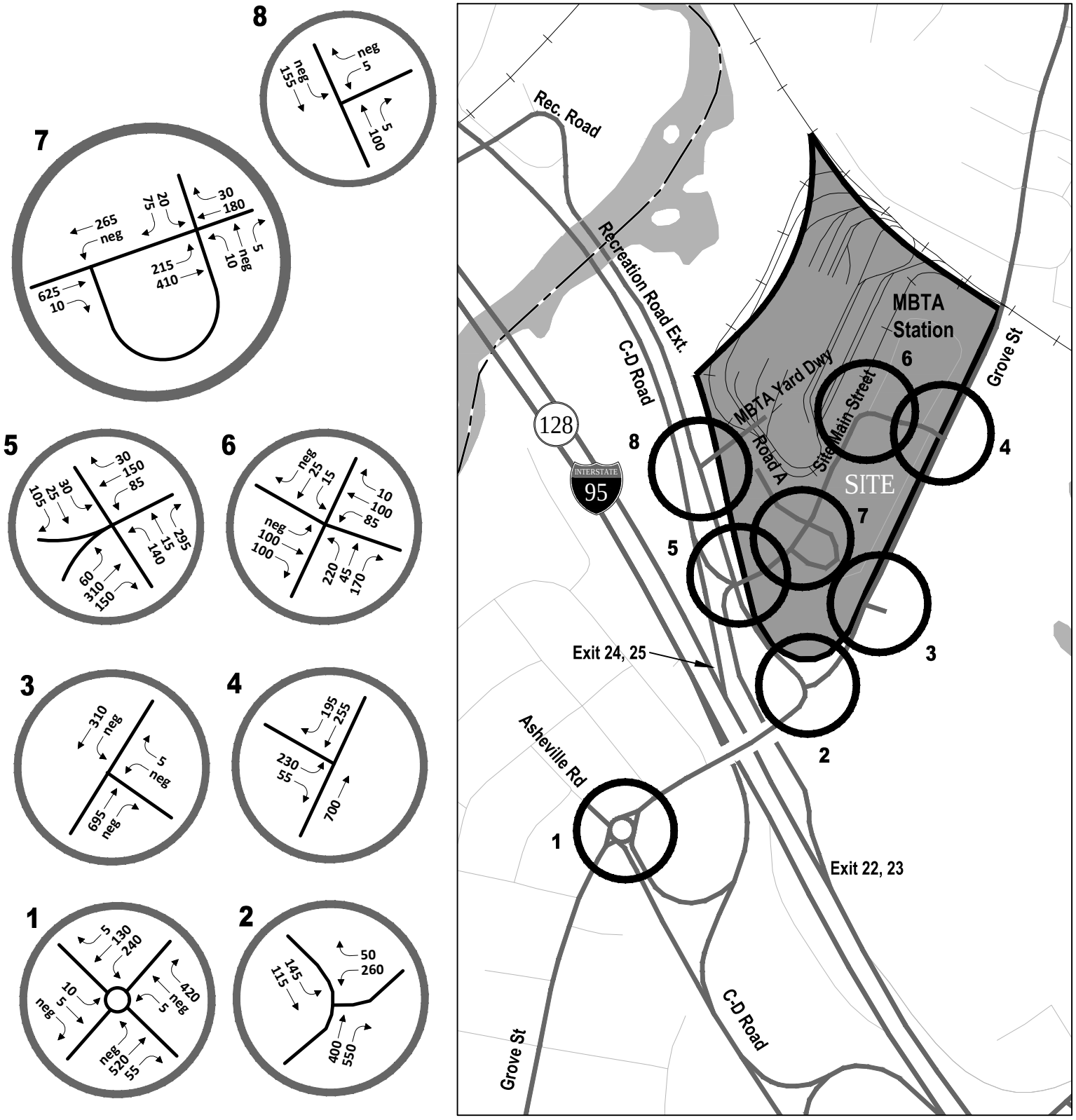
	ENTER	EXIT	TOTAL
RETAIL	901	839	1740
OFFICE	48	82	130
HOTEL	351	397	748
RES	452	434	886
TOTAL	1,752	1,752	3504

TOTAL SHARED TRIPS - SATURDAY MIDDAY

	ENTER	EXIT	TOTAL
RETAIL	50	91	141
OFFICE	12	15	27
HOTEL	19	6	25
RES	72	41	113
TOTAL	153	153	306

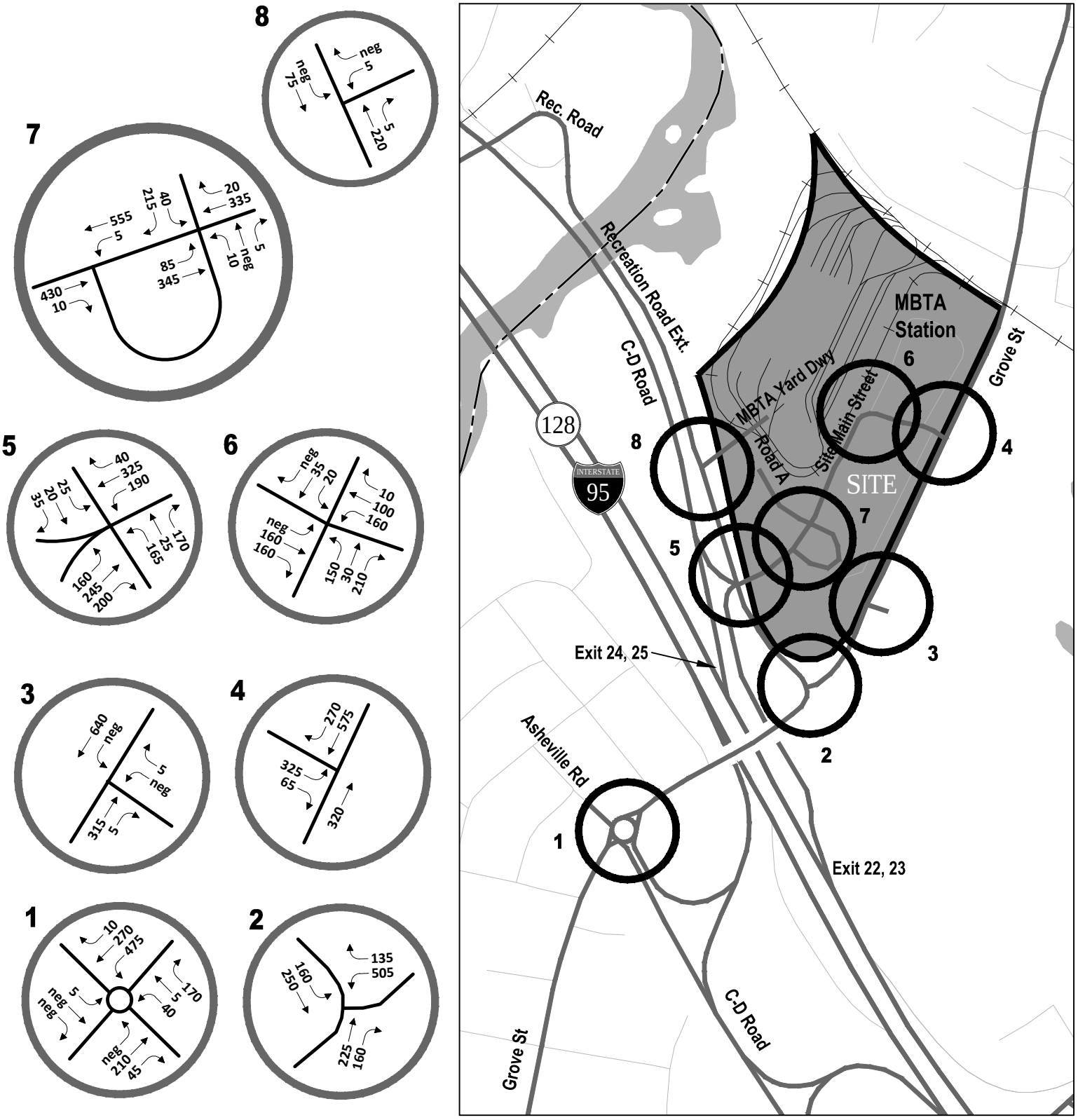
Note: Shared trips based off of person-trips for each land use. Person trips were developed by multiplying the unadjusted vehicle trips for each ITE land use by an applicable VOR from the Summary of Travel Trends, 2017 National Household Travel Survey (Table 16), USDOT FHA

1 Weekday morning and evening internal capture rates based on NCHRP Report 684, Saturday midday rates assumed to be the same as weekday evening rates
Weekday daily internal capture rates based on ITE Trip Generation Handbook, 2nd Edition, Saturday daily rates assumed to be the same as weekday daily rates



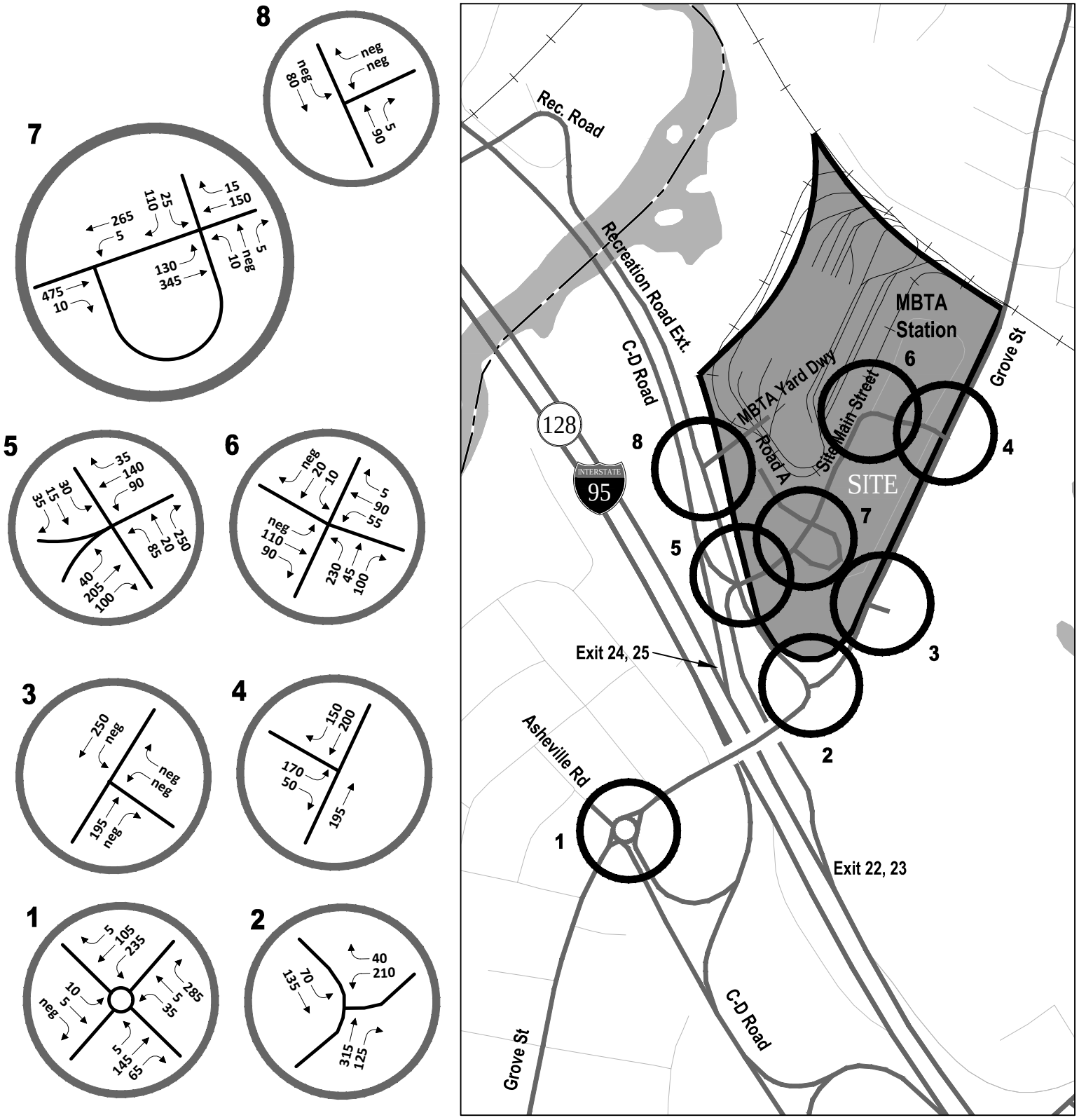
0 250 500 Feet

Figure 1
2029 Build with Mitigation Conditions
Weekday Morning Peak Hour Traffic Volumes
December 2019 Update
The Station at Riverside
Newton, Massachusetts



0 250 500 Feet

Figure 2
2029 Build with Mitigation Conditions
Weekday Evening Peak Hour Traffic Volumes
December 2019 Update
The Station at Riverside
Newton, Massachusetts



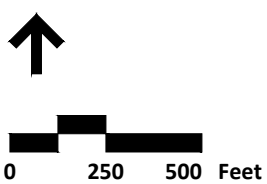


Figure 3
2029 Build with Mitigation Conditions
Saturday Midday Peak Hour Traffic Volumes
December 2019 Update
The Station at Riverside
Newton, Massachusetts

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	260	50	400	550	145	115
Future Volume (vph)	260	50	400	550	145	115
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	150		150	100	
Storage Lanes	1	1		1	1	
Taper Length (ft)	25				25	
Satd. Flow (prot)	1719	1538	1881	1599	1770	1863
Flt Permitted	0.950				0.263	
Satd. Flow (perm)	1719	1355	1881	1563	490	1863
Right Turn on Red		No		No		
Satd. Flow (RTOR)						
Link Speed (mph)	30		30			30
Link Distance (ft)	447		920			603
Travel Time (s)	10.2		20.9			13.7
Confl. Peds. (#/hr)		40		1	1	
Confl. Bikes (#/hr)		1				
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	5%	5%	1%	1%	2%	2%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	283	54	435	598	158	125
Turn Type	Prot	pm+ov	NA	pm+ov	pm+pt	NA
Protected Phases	3	5	6	3	5	2
Permitted Phases		3		6	2	
Detector Phase	3	5	6	3	5	2
Switch Phase						
Minimum Initial (s)	10.0	6.0	6.0	10.0	6.0	10.0
Minimum Split (s)	22.0	10.0	10.0	22.0	10.0	22.0
Total Split (s)	32.0	14.0	44.0	32.0	14.0	58.0
Total Split (%)	35.6%	15.6%	48.9%	35.6%	15.6%	64.4%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag		Lead	Lag		Lead	
Lead-Lag Optimize?		Yes			Yes	
Recall Mode	None	None	Min	None	None	Min
Act Effct Green (s)	16.9	26.5	19.7	36.5	29.7	29.7
Actuated g/C Ratio	0.30	0.48	0.35	0.66	0.53	0.53
v/c Ratio	0.54	0.08	0.65	0.58	0.33	0.13
Control Delay	23.1	9.0	22.1	6.5	8.6	7.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	23.1	9.0	22.1	6.5	8.6	7.0
LOS	C	A	C	A	A	A
Approach Delay	20.9		13.1			7.9
Approach LOS	C		B			A
Queue Length 50th (ft)	81	8	123	80	21	16
Queue Length 95th (ft)	184	31	259	128	62	50
Internal Link Dist (ft)	367		840			523
Turn Bay Length (ft)		150		150	100	
Base Capacity (vph)	975	722	1378	1342	521	1666
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.29	0.07	0.32	0.45	0.30	0.08

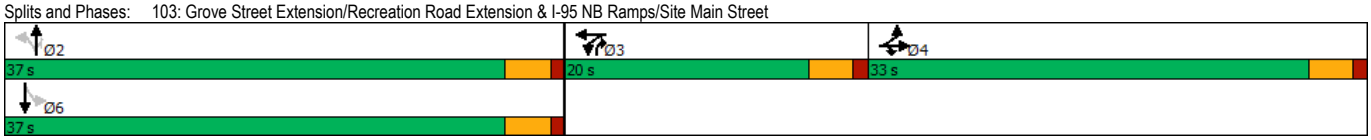
Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 55.6			
Natural Cycle: 55			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.65			
Intersection Signal Delay: 13.8		Intersection LOS: B	
Intersection Capacity Utilization 53.9%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 102: Grove Street & Grove Street Extension

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	60	310	150	85	150	30	140	15	295	30	25	105
Future Volume (vph)	60	310	150	85	150	30	140	15	295	30	25	105
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		150	0		0	0		150	0		0
Storage Lanes	0		1	1		0	0		1	0		0
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	0	1848	1583	1770	1816	0	0	1800	1599	0	1684	0
Flt Permitted		0.992		0.950				0.612			0.923	
Satd. Flow (perm)	0	1848	1583	1770	1816	0	0	1151	1410	0	1546	0
Right Turn on Red			Yes			No			No			Yes
Satd. Flow (RTOR)			163								114	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		282			181			603			485	
Travel Time (s)		6.4			4.1			13.7			11.0	
Confl. Peds. (#/hr)									40	40		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	1%	1%	1%	2%	2%	2%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	402	163	92	196	0	0	168	321	0	174	0
Turn Type	Split	NA	Prot	Split	NA		Perm	NA	pm+ov	Perm	NA	
Protected Phases	4	4	4	3	3			2	3		6	
Permitted Phases							2		2	6		
Detector Phase	4	4	4	3	3		2	2	3	6	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0		10.0	10.0	10.0	10.0	10.0	
Minimum Split (s)	14.0	14.0	14.0	14.0	14.0		22.0	22.0	14.0	22.0	22.0	
Total Split (s)	33.0	33.0	33.0	20.0	20.0		37.0	37.0	20.0	37.0	37.0	
Total Split (%)	36.7%	36.7%	36.7%	22.2%	22.2%		41.1%	41.1%	22.2%	41.1%	41.1%	
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0	1.0	
Lost Time Adjust (s)		0.0	0.0	0.0	0.0			0.0	0.0		0.0	
Total Lost Time (s)		4.0	4.0	4.0	4.0			4.0	4.0		4.0	
Lead/Lag	Lag	Lag	Lag	Lead	Lead				Lead			
Lead-Lag Optimize?												
Recall Mode	Min	Min	Min	Min	Min		Min	Min	Min	Min	Min	
Act Effct Green (s)		19.1	19.1	13.3	13.3			15.4	28.7		15.4	
Actuated g/C Ratio		0.32	0.32	0.22	0.22			0.25	0.47		0.25	
v/c Ratio		0.69	0.27	0.24	0.49			0.58	0.45		0.36	
Control Delay		25.8	4.6	25.0	28.6			30.6	11.8		11.1	
Queue Delay		0.0	0.0	0.0	0.0			0.0	0.0		0.0	
Total Delay		25.8	4.6	25.0	28.6			30.6	11.8		11.1	
LOS		C	A	C	C			C	B		B	
Approach Delay		19.7			27.5			18.2			11.1	
Approach LOS		B			C			B			B	
Queue Length 50th (ft)		122	0	27	62			54	61		17	
Queue Length 95th (ft)		256	38	80	156			130	142		69	
Internal Link Dist (ft)		202			101			523			405	
Turn Bay Length (ft)			150						150			
Base Capacity (vph)		936	882	494	507			664	805		939	
Starvation Cap Reductn		0	0	0	0			0	0		0	
Spillback Cap Reductn		0	0	0	0			0	0		0	
Storage Cap Reductn		0	0	0	0			0	0		0	
Reduced v/c Ratio		0.43	0.18	0.19	0.39			0.25	0.40		0.19	

Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 60.5			
Natural Cycle: 60			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.69			
Intersection Signal Delay: 19.7		Intersection LOS: B	
Intersection Capacity Utilization 65.4%		ICU Level of Service C	
Analysis Period (min) 15			

Splits and Phases: 103: Grove Street Extension/Recreation Road Extension & I-95 NB Ramps/Site Main Street



Intersection	
Int Delay, s/veh	0.1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	695	2	1	310	1	5
Future Vol, veh/h	695	2	1	310	1	5
Conflicting Peds, #/hr	0	1	1	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	5	5	0	0
Mvmt Flow	755	2	1	337	1	5

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	758	0	1096	757
Stage 1	-	-	-	-	757	-
Stage 2	-	-	-	-	339	-
Critical Hdwy	-	-	4.15	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.245	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	840	-	238	411
Stage 1	-	-	-	-	467	-
Stage 2	-	-	-	-	726	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	839	-	238	411
Mov Cap-2 Maneuver	-	-	-	-	238	-
Stage 1	-	-	-	-	467	-
Stage 2	-	-	-	-	725	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	15
HCM LOS			C

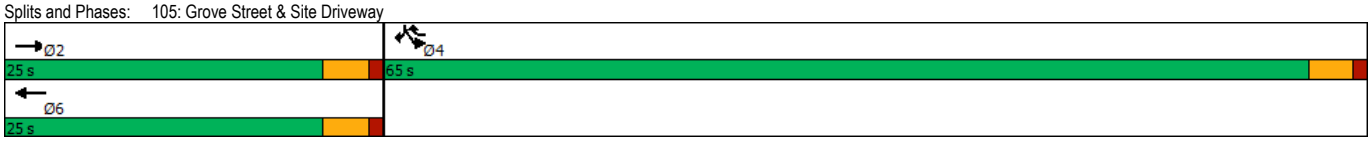
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	367	-	-	839	-
HCM Lane V/C Ratio	0.018	-	-	0.001	-
HCM Control Delay (s)	15	-	-	9.3	0
HCM Lane LOS	C	-	-	A	A
HCM 95th %tile Q(veh)	0.1	-	-	0	-

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	0	700	255	195	230	55
Future Volume (vph)	0	700	255	195	230	55
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0			100	0	0
Storage Lanes	0			1	1	1
Taper Length (ft)	25				25	
Satd. Flow (prot)	0	1863	1676	1583	1656	1482
Flt Permitted					0.950	
Satd. Flow (perm)	0	1863	1676	1583	1656	1482
Right Turn on Red				No		No
Satd. Flow (RTOR)						
Link Speed (mph)		30	30		30	
Link Distance (ft)		610	612		236	
Travel Time (s)		13.9	13.9		5.4	
Confl. Bikes (#/hr)				1		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	2%	2%	2%	9%	9%
Parking (#/hr)			0			
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	761	277	212	250	60
Turn Type		NA	NA	Over	Prot	Prot
Protected Phases		2	6	4	4	4
Permitted Phases						
Detector Phase		2	6	4	4	4
Switch Phase						
Minimum Initial (s)		10.0	10.0	6.0	6.0	6.0
Minimum Split (s)		22.0	22.0	10.0	10.0	10.0
Total Split (s)		25.0	25.0	65.0	65.0	65.0
Total Split (%)		27.8%	27.8%	72.2%	72.2%	72.2%
Yellow Time (s)		3.0	3.0	3.0	3.0	3.0
All-Red Time (s)		1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)		0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)		4.0	4.0	4.0	4.0	4.0
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode		Min	Min	None	None	None
Act Effct Green (s)		21.1	21.1	11.3	11.3	11.3
Actuated g/C Ratio		0.52	0.52	0.28	0.28	0.28
v/c Ratio		0.78	0.32	0.48	0.54	0.14
Control Delay		17.6	7.6	15.9	17.0	11.4
Queue Delay		0.0	0.0	0.0	0.0	0.0
Total Delay		17.6	7.6	15.9	17.0	11.4
LOS		B	A	B	B	B
Approach Delay		17.6	11.2		15.9	
Approach LOS		B	B		B	
Queue Length 50th (ft)		117	30	39	47	10
Queue Length 95th (ft)		#349	81	81	94	28
Internal Link Dist (ft)		530	532		156	
Turn Bay Length (ft)				100		
Base Capacity (vph)		971	874	1583	1656	1482
Starvation Cap Reductn		0	0	0	0	0
Spillback Cap Reductn		0	0	0	0	0
Storage Cap Reductn		0	0	0	0	0
Reduced v/c Ratio		0.78	0.32	0.13	0.15	0.04

Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 40.4			
Natural Cycle: 45			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.78			
Intersection Signal Delay: 15.3		Intersection LOS: B	
Intersection Capacity Utilization 56.3%		ICU Level of Service B	
Analysis Period (min) 15			

\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 105: Grove Street & Site Driveway



Intersection	
Intersection Delay, s/veh	14.5
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	220	45	170	15	25	0	85	100	10	0	100	100
Future Vol, veh/h	220	45	170	15	25	0	85	100	10	0	100	100
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	239	49	185	16	27	0	92	109	11	0	109	109
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	17.7	9.5	11.7	11.1
HCM LOS	C	A	B	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	44%	51%	38%	0%
Vol Thru, %	51%	10%	62%	50%
Vol Right, %	5%	39%	0%	50%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	195	435	40	200
LT Vol	85	220	15	0
Through Vol	100	45	25	100
RT Vol	10	170	0	100
Lane Flow Rate	212	473	43	217
Geometry Grp	1	1	1	1
Degree of Util (X)	0.339	0.667	0.072	0.326
Departure Headway (Hd)	5.751	5.079	5.996	5.403
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	623	709	595	663
Service Time	3.799	3.115	4.058	3.452
HCM Lane V/C Ratio	0.34	0.667	0.072	0.327
HCM Control Delay	11.7	17.7	9.5	11.1
HCM Lane LOS	B	C	A	B
HCM 95th-tile Q	1.5	5.1	0.2	1.4

Intersection	
Int Delay, s/veh	4.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	215	410	0	0	180	30	10	0	5	20	0	75
Future Vol, veh/h	215	410	0	0	180	30	10	0	5	20	0	75
Conflicting Peds, #/hr	85	0	30	30	0	85	25	0	35	35	0	25
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	234	446	0	0	196	33	11	0	5	22	0	82

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	314	0	-	-	-	0	1193	1228	481	1250	1212	323
Stage 1	-	-	-	-	-	-	914	914	-	298	298	-
Stage 2	-	-	-	-	-	-	279	314	-	952	914	-
Critical Hdwy	4.12	-	-	-	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	-	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1246	-	0	0	-	-	164	178	585	150	182	718
Stage 1	-	-	0	0	-	-	327	352	-	711	667	-
Stage 2	-	-	0	0	-	-	728	656	-	312	352	-
Platoon blocked, %		-			-	-						
Mov Cap-1 Maneuver	1158	-	-	-	-	-	111	121	568	106	124	653
Mov Cap-2 Maneuver	-	-	-	-	-	-	111	121	-	106	124	-
Stage 1	-	-	-	-	-	-	239	257	-	483	620	-
Stage 2	-	-	-	-	-	-	624	609	-	219	257	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	3.1	0	31.5	22.1
HCM LOS			D	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	152	1158	-	-	-	313
HCM Lane V/C Ratio	0.107	0.202	-	-	-	0.33
HCM Control Delay (s)	31.5	8.9	0	-	-	22.1
HCM Lane LOS	D	A	A	-	-	C
HCM 95th %tile Q(veh)	0.4	0.8	-	-	-	1.4

Intersection	
Int Delay, s/veh	0

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	625	10	2	265	0	0
Future Vol, veh/h	625	10	2	265	0	0
Conflicting Peds, #/hr	0	45	45	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	679	11	2	288	0	0

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	735	0	878	-
Stage 1	-	-	-	-	730	-
Stage 2	-	-	-	-	148	-
Critical Hdwy	-	-	4.13	-	6.63	-
Critical Hdwy Stg 1	-	-	-	-	5.43	-
Critical Hdwy Stg 2	-	-	-	-	5.83	-
Follow-up Hdwy	-	-	2.219	-	3.519	-
Pot Cap-1 Maneuver	-	-	868	-	303	0
Stage 1	-	-	-	-	476	0
Stage 2	-	-	-	-	865	0
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	835	-	291	-
Mov Cap-2 Maneuver	-	-	-	-	291	-
Stage 1	-	-	-	-	458	-
Stage 2	-	-	-	-	862	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.1	0
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	-	-	-	835	-
HCM Lane V/C Ratio	-	-	-	0.003	-
HCM Control Delay (s)	0	-	-	9.3	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	-	-	-	0	-

Intersection	
Int Delay, s/veh	0.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	5	0	100	5	0	155
Future Vol, veh/h	5	0	100	5	0	155
Conflicting Peds, #/hr	0	0	0	40	40	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	50	50	2	50	50	2
Mvmt Flow	5	0	109	5	0	168

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	320	152	0	0	154	0
Stage 1	152	-	-	-	-	-
Stage 2	168	-	-	-	-	-
Critical Hdwy	6.9	6.7	-	-	4.6	-
Critical Hdwy Stg 1	5.9	-	-	-	-	-
Critical Hdwy Stg 2	5.9	-	-	-	-	-
Follow-up Hdwy	3.95	3.75	-	-	2.65	-
Pot Cap-1 Maneuver	585	782	-	-	1180	-
Stage 1	771	-	-	-	-	-
Stage 2	758	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	566	756	-	-	1141	-
Mov Cap-2 Maneuver	566	-	-	-	-	-
Stage 1	746	-	-	-	-	-
Stage 2	758	-	-	-	-	-

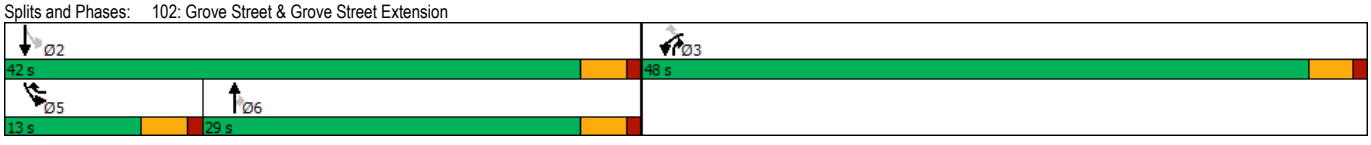
Approach	WB	NB	SB
HCM Control Delay, s	11.4	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	566	1141	-
HCM Lane V/C Ratio	-	-	0.01	-	-
HCM Control Delay (s)	-	-	11.4	0	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0	0	-

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	505	135	225	160	160	250
Future Volume (vph)	505	135	225	160	160	250
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	150		150	100	
Storage Lanes	1	1		1	1	
Taper Length (ft)	25				25	
Satd. Flow (prot)	1770	1583	1845	1568	1770	1863
Flt Permitted	0.950				0.367	
Satd. Flow (perm)	1770	1397	1845	1568	684	1863
Right Turn on Red		No		No		
Satd. Flow (RTOR)						
Link Speed (mph)	30		30			30
Link Distance (ft)	677		883			722
Travel Time (s)	15.4		20.1			16.4
Confl. Peds. (#/hr)		40				
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	2%	3%	3%	2%	2%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	549	147	245	174	174	272
Turn Type	Prot	pm+ov	NA	pm+ov	pm+pt	NA
Protected Phases	3	5	6	3	5	2
Permitted Phases		3		6	2	
Detector Phase	3	5	6	3	5	2
Switch Phase						
Minimum Initial (s)	10.0	6.0	6.0	10.0	6.0	10.0
Minimum Split (s)	22.0	10.0	10.0	22.0	10.0	22.0
Total Split (s)	48.0	13.0	29.0	48.0	13.0	42.0
Total Split (%)	53.3%	14.4%	32.2%	53.3%	14.4%	46.7%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag		Lead	Lag		Lead	
Lead-Lag Optimize?		Yes			Yes	
Recall Mode	None	None	Min	None	None	Min
Act Effct Green (s)	24.5	33.4	13.8	42.6	27.0	27.0
Actuated g/C Ratio	0.41	0.56	0.23	0.71	0.45	0.45
v/c Ratio	0.76	0.18	0.58	0.16	0.37	0.32
Control Delay	23.1	5.9	28.3	2.8	14.7	13.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	23.1	5.9	28.3	2.8	14.7	13.8
LOS	C	A	C	A	B	B
Approach Delay	19.5		17.7			14.2
Approach LOS	B		B			B
Queue Length 50th (ft)	157	17	77	15	35	58
Queue Length 95th (ft)	314	50	180	27	100	153
Internal Link Dist (ft)	597		803			642
Turn Bay Length (ft)		150		150	100	
Base Capacity (vph)	1347	822	815	1506	480	1251
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.41	0.18	0.30	0.12	0.36	0.22

Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 60			
Natural Cycle: 55			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.76			
Intersection Signal Delay: 17.5		Intersection LOS: B	
Intersection Capacity Utilization 58.7%		ICU Level of Service B	
Analysis Period (min) 15			

Splits and Phases: 102: Grove Street & Grove Street Extension

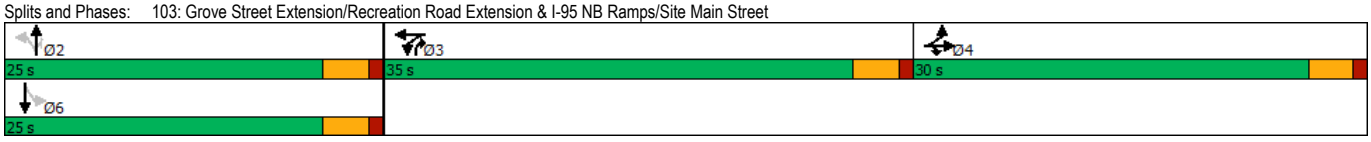


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	160	245	200	190	325	40	165	25	170	25	20	35
Future Volume (vph)	160	245	200	190	325	40	165	25	170	25	20	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		150	0		0	0		150	0		0
Storage Lanes	0		1	1		0	0		1	0		0
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	0	1827	1583	1770	1833	0	0	1767	1568	0	1727	0
Flt Permitted		0.981		0.950				0.733			0.876	
Satd. Flow (perm)	0	1827	1583	1770	1833	0	0	1352	1383	0	1505	0
Right Turn on Red			Yes			No			No			Yes
Satd. Flow (RTOR)			194								38	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		360			154			722			508	
Travel Time (s)		8.2			3.5			16.4			11.5	
Confl. Peds. (#/hr)									40	40		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	3%	3%	3%	2%	2%	2%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	440	217	207	396	0	0	206	185	0	87	0
Turn Type	Split	NA	Prot	Split	NA		Perm	NA	pm+ov	Perm	NA	
Protected Phases	4	4	4	3	3			2	3		6	
Permitted Phases							2		2	6		
Detector Phase	4	4	4	3	3		2	2	3	6	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0		10.0	10.0	10.0	10.0	10.0	
Minimum Split (s)	14.0	14.0	14.0	14.0	14.0		22.0	22.0	14.0	22.0	22.0	
Total Split (s)	30.0	30.0	30.0	35.0	35.0		25.0	25.0	35.0	25.0	25.0	
Total Split (%)	33.3%	33.3%	33.3%	38.9%	38.9%		27.8%	27.8%	38.9%	27.8%	27.8%	
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0	1.0	
Lost Time Adjust (s)		0.0	0.0	0.0	0.0			0.0	0.0		0.0	
Total Lost Time (s)		4.0	4.0	4.0	4.0			4.0	4.0		4.0	
Lead/Lag	Lag	Lag	Lag	Lead	Lead				Lead			
Lead-Lag Optimize?												
Recall Mode	Min	Min	Min	None	None		Min	Min	None	Min	Min	
Act Effct Green (s)		22.5	22.5	22.7	22.7			16.7	39.4		16.7	
Actuated g/C Ratio		0.30	0.30	0.30	0.30			0.22	0.53		0.22	
v/c Ratio		0.80	0.35	0.38	0.71			0.68	0.24		0.24	
Control Delay		39.0	7.2	23.9	31.7			41.9	8.6		19.0	
Queue Delay		0.0	0.0	0.0	0.0			0.0	0.0		0.0	
Total Delay		39.0	7.2	23.9	31.7			41.9	8.6		19.0	
LOS		D	A	C	C			D	A		B	
Approach Delay		28.5			29.0			26.1			19.0	
Approach LOS		C			C			C			B	
Queue Length 50th (ft)		198	8	82	176			96	41		20	
Queue Length 95th (ft)		#392	61	144	284			#187	70		61	
Internal Link Dist (ft)		280			74			642			428	
Turn Bay Length (ft)			150						150			
Base Capacity (vph)		674	706	779	807			403	999		475	
Starvation Cap Reductn		0	0	0	0			0	0		0	
Spillback Cap Reductn		0	0	0	0			0	0		0	
Storage Cap Reductn		0	0	0	0			0	0		0	
Reduced v/c Ratio		0.65	0.31	0.27	0.49			0.51	0.19		0.18	

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 74.6
Natural Cycle: 65
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.80
Intersection Signal Delay: 27.7 Intersection LOS: C
Intersection Capacity Utilization 68.4% ICU Level of Service C
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 103: Grove Street Extension/Recreation Road Extension & I-95 NB Ramps/Site Main Street



Intersection	
Int Delay, s/veh	0.1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	315	5	1	640	1	5
Future Vol, veh/h	315	5	1	640	1	5
Conflicting Peds, #/hr	0	3	3	0	0	2
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	3	3	2	2	0	0
Mvmt Flow	342	5	1	696	1	5

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	350	0	1046	350
Stage 1	-	-	-	-	348	-
Stage 2	-	-	-	-	698	-
Critical Hdwy	-	-	4.12	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.218	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1209	-	255	698
Stage 1	-	-	-	-	719	-
Stage 2	-	-	-	-	497	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1206	-	254	695
Mov Cap-2 Maneuver	-	-	-	-	254	-
Stage 1	-	-	-	-	718	-
Stage 2	-	-	-	-	497	-

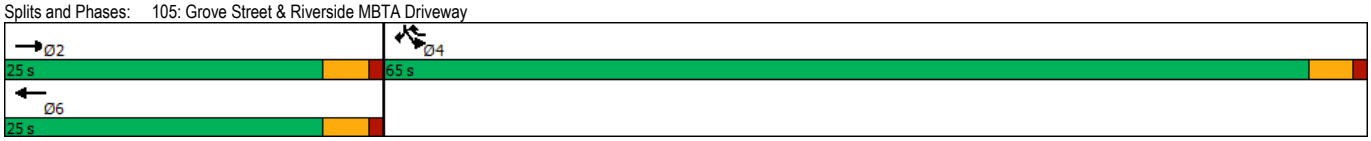
Approach	EB	WB	NB
HCM Control Delay, s	0	0	11.8
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	539	-	-	1206	-
HCM Lane V/C Ratio	0.012	-	-	0.001	-
HCM Control Delay (s)	11.8	-	-	8	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	0	-

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	0	320	575	270	325	65
Future Volume (vph)	0	320	575	270	325	65
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0			100	0	0
Storage Lanes	0			1	1	1
Taper Length (ft)	25				25	
Satd. Flow (prot)	0	1827	1900	1615	1703	1524
Flt Permitted					0.950	
Satd. Flow (perm)	0	1827	1900	1615	1703	1524
Right Turn on Red				No		No
Satd. Flow (RTOR)						
Link Speed (mph)		30	30		30	
Link Distance (ft)		460	612		281	
Travel Time (s)		10.5	13.9		6.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	4%	4%	0%	0%	6%	6%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	348	625	293	353	71
Turn Type		NA	NA	Over	Prot	Prot
Protected Phases		2	6	4	4	4
Permitted Phases						
Detector Phase		2	6	4	4	4
Switch Phase						
Minimum Initial (s)		10.0	10.0	6.0	6.0	6.0
Minimum Split (s)		22.0	22.0	10.0	10.0	10.0
Total Split (s)		25.0	25.0	65.0	65.0	65.0
Total Split (%)		27.8%	27.8%	72.2%	72.2%	72.2%
Yellow Time (s)		3.0	3.0	3.0	3.0	3.0
All-Red Time (s)		1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)		0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)		4.0	4.0	4.0	4.0	4.0
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode		Min	Min	None	None	None
Act Effct Green (s)		21.1	21.1	14.5	14.5	14.5
Actuated g/C Ratio		0.48	0.48	0.33	0.33	0.33
v/c Ratio		0.39	0.68	0.55	0.63	0.14
Control Delay		10.0	15.6	15.9	17.5	10.4
Queue Delay		0.0	0.0	0.0	0.0	0.0
Total Delay		10.0	15.6	15.9	17.5	10.4
LOS		A	B	B	B	B
Approach Delay		10.0	15.7		16.3	
Approach LOS		A	B		B	
Queue Length 50th (ft)		50	108	57	71	12
Queue Length 95th (ft)		123	#303	109	131	31
Internal Link Dist (ft)		380	532		201	
Turn Bay Length (ft)				100		
Base Capacity (vph)		884	919	1615	1703	1524
Starvation Cap Reductn		0	0	0	0	0
Spillback Cap Reductn		0	0	0	0	0
Storage Cap Reductn		0	0	0	0	0
Reduced v/c Ratio		0.39	0.68	0.18	0.21	0.05

Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 43.7			
Natural Cycle: 45			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.68			
Intersection Signal Delay: 14.7		Intersection LOS: B	
Intersection Capacity Utilization 54.9%		ICU Level of Service A	
Analysis Period (min) 15			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			

Splits and Phases: 105: Grove Street & Riverside MBTA Driveway



Intersection	
Intersection Delay, s/veh	16.5
Intersection LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	150	30	210	20	35	0	160	100	10	0	160	160
Future Vol, veh/h	150	30	210	20	35	0	160	100	10	0	160	160
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	163	33	228	22	38	0	174	109	11	0	174	174
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	19.2	10.8	15.3	15.3
HCM LOS	C	B	C	C

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	59%	38%	36%	0%
Vol Thru, %	37%	8%	64%	50%
Vol Right, %	4%	54%	0%	50%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	270	390	55	320
LT Vol	160	150	20	0
Through Vol	100	30	35	160
RT Vol	10	210	0	160
Lane Flow Rate	293	424	60	348
Geometry Grp	1	1	1	1
Degree of Util (X)	0.504	0.662	0.114	0.543
Departure Headway (Hd)	6.177	5.724	6.88	5.724
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	587	636	522	633
Service Time	4.177	3.724	4.9	3.724
HCM Lane V/C Ratio	0.499	0.667	0.115	0.55
HCM Control Delay	15.3	19.2	10.8	15.3
HCM Lane LOS	C	C	B	C
HCM 95th-tile Q	2.8	5	0.4	3.3

Intersection	
Int Delay, s/veh	9.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	85	345	0	0	335	20	10	0	5	40	0	215
Future Vol, veh/h	85	345	0	0	335	20	10	0	5	40	0	215
Conflicting Peds, #/hr	85	0	35	35	0	85	25	0	35	35	0	25
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	92	375	0	0	364	22	11	0	5	43	0	234

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	471	0	-	-	-	0	1076	1030	410	1057	1019	485
Stage 1	-	-	-	-	-	-	559	559	-	460	460	-
Stage 2	-	-	-	-	-	-	517	471	-	597	559	-
Critical Hdwy	4.12	-	-	-	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	-	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1091	-	0	0	-	-	197	233	642	203	237	582
Stage 1	-	-	0	0	-	-	513	511	-	581	566	-
Stage 2	-	-	0	0	-	-	541	560	-	490	511	-
Platoon blocked, %		-			-	-						
Mov Cap-1 Maneuver	1014	-	-	-	-	-	98	192	623	165	195	530
Mov Cap-2 Maneuver	-	-	-	-	-	-	98	192	-	165	195	-
Stage 1	-	-	-	-	-	-	454	452	-	478	526	-
Stage 2	-	-	-	-	-	-	296	520	-	417	452	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.8	0	35	33.3
HCM LOS			E	D

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	136	1014	-	-	-	393
HCM Lane V/C Ratio	0.12	0.091	-	-	-	0.705
HCM Control Delay (s)	35	8.9	0	-	-	33.3
HCM Lane LOS	E	A	A	-	-	D
HCM 95th %tile Q(veh)	0.4	0.3	-	-	-	5.3

Intersection	
Int Delay, s/veh	0.1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	430	10	5	555	0	0
Future Vol, veh/h	430	10	5	555	0	0
Conflicting Peds, #/hr	0	35	35	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	467	11	5	603	0	0

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	513	0	820	-
Stage 1	-	-	-	-	508	-
Stage 2	-	-	-	-	312	-
Critical Hdwy	-	-	4.13	-	6.63	-
Critical Hdwy Stg 1	-	-	-	-	5.43	-
Critical Hdwy Stg 2	-	-	-	-	5.83	-
Follow-up Hdwy	-	-	2.219	-	3.519	-
Pot Cap-1 Maneuver	-	-	1051	-	328	0
Stage 1	-	-	-	-	603	0
Stage 2	-	-	-	-	716	0
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1020	-	316	-
Mov Cap-2 Maneuver	-	-	-	-	316	-
Stage 1	-	-	-	-	586	-
Stage 2	-	-	-	-	711	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.1	0
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	-	-	-	1020	-
HCM Lane V/C Ratio	-	-	-	0.005	-
HCM Control Delay (s)	0	-	-	8.5	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	-	-	-	0	-

Intersection	
Int Delay, s/veh	0.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	5	0	220	5	0	75
Future Vol, veh/h	5	0	220	5	0	75
Conflicting Peds, #/hr	0	0	0	40	40	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	50	50	2	50	50	2
Mvmt Flow	5	0	239	5	0	82

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	364	282	0	0	284	0
Stage 1	282	-	-	-	-	-
Stage 2	82	-	-	-	-	-
Critical Hdwy	6.9	6.7	-	-	4.6	-
Critical Hdwy Stg 1	5.9	-	-	-	-	-
Critical Hdwy Stg 2	5.9	-	-	-	-	-
Follow-up Hdwy	3.95	3.75	-	-	2.65	-
Pot Cap-1 Maneuver	550	655	-	-	1047	-
Stage 1	667	-	-	-	-	-
Stage 2	833	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	532	633	-	-	1012	-
Mov Cap-2 Maneuver	532	-	-	-	-	-
Stage 1	645	-	-	-	-	-
Stage 2	833	-	-	-	-	-

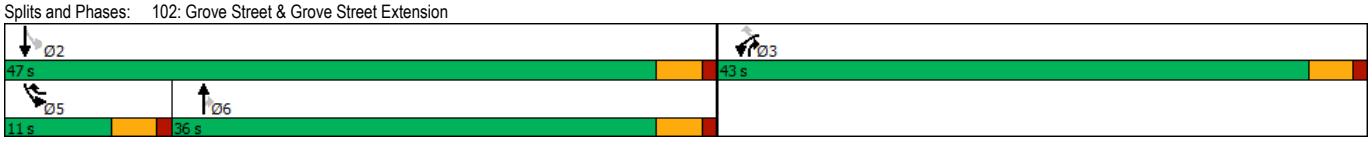
Approach	WB	NB	SB
HCM Control Delay, s	11.8	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	532	1012	-
HCM Lane V/C Ratio	-	-	0.01	-	-
HCM Control Delay (s)	-	-	11.8	0	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0	0	-

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	210	40	315	125	70	135
Future Volume (vph)	210	40	315	125	70	135
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	150		150	100	
Storage Lanes	1	1		1	1	
Taper Length (ft)	25				25	
Satd. Flow (prot)	1787	1599	1881	1599	1752	1845
Flt Permitted	0.950				0.342	
Satd. Flow (perm)	1787	1599	1881	1599	631	1845
Right Turn on Red		No		No		
Satd. Flow (RTOR)						
Link Speed (mph)	30		30			30
Link Distance (ft)	677		883			722
Travel Time (s)	15.4		20.1			16.4
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	1%	1%	1%	1%	3%	3%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	228	43	342	136	76	147
Turn Type	Prot	pm+ov	NA	pm+ov	pm+pt	NA
Protected Phases	3	5	6	3	5	2
Permitted Phases		3		6	2	
Detector Phase	3	5	6	3	5	2
Switch Phase						
Minimum Initial (s)	10.0	6.0	6.0	10.0	6.0	10.0
Minimum Split (s)	22.0	10.0	10.0	22.0	10.0	22.0
Total Split (s)	43.0	11.0	36.0	43.0	11.0	47.0
Total Split (%)	47.8%	12.2%	40.0%	47.8%	12.2%	52.2%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag		Lead	Lag		Lead	
Lead-Lag Optimize?		Yes			Yes	
Recall Mode	None	None	Min	None	None	Min
Act Effct Green (s)	13.4	24.6	14.7	33.6	22.9	22.9
Actuated g/C Ratio	0.30	0.55	0.33	0.75	0.51	0.51
v/c Ratio	0.43	0.05	0.55	0.11	0.15	0.16
Control Delay	17.0	6.6	17.8	2.7	6.6	6.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	17.0	6.6	17.8	2.7	6.6	6.5
LOS	B	A	B	A	A	A
Approach Delay	15.3		13.5			6.5
Approach LOS	B		B			A
Queue Length 50th (ft)	48	5	71	9	7	15
Queue Length 95th (ft)	113	19	157	19	26	45
Internal Link Dist (ft)	597		803			642
Turn Bay Length (ft)		150		150	100	
Base Capacity (vph)	1533	893	1391	1594	507	1675
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.15	0.05	0.25	0.09	0.15	0.09

Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 44.8			
Natural Cycle: 50			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.55			
Intersection Signal Delay: 12.4		Intersection LOS: B	
Intersection Capacity Utilization 43.2%		ICU Level of Service A	
Analysis Period (min) 15			

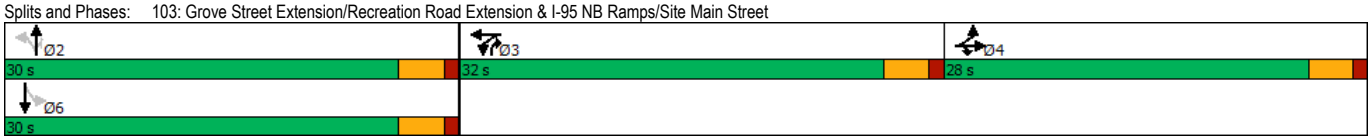
Splits and Phases: 102: Grove Street & Grove Street Extension



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	40	205	100	90	140	35	85	20	250	30	15	35
Future Volume (vph)	40	205	100	90	140	35	85	20	250	30	15	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		150	0		0	0		150	0		0
Storage Lanes	0		1	1		0	0		1	0		0
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	0	1830	1568	1770	1807	0	0	1808	1599	0	1720	0
Flt Permitted		0.992		0.950				0.723			0.874	
Satd. Flow (perm)	0	1830	1568	1770	1807	0	0	1360	1410	0	1483	0
Right Turn on Red			Yes			No			No			Yes
Satd. Flow (RTOR)			109								38	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		360			154			722			513	
Travel Time (s)		8.2			3.5			16.4			11.7	
Confl. Peds. (#/hr)									40	40		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	3%	3%	2%	2%	2%	1%	1%	1%	2%	2%	2%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	266	109	98	190	0	0	114	272	0	87	0
Turn Type	Split	NA	Prot	Split	NA		Perm	NA	pm+ov	Perm	NA	
Protected Phases	4	4	4	3	3			2	3		6	
Permitted Phases							2		2	6		
Detector Phase	4	4	4	3	3		2	2	3	6	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0		10.0	10.0	10.0	10.0	10.0	
Minimum Split (s)	14.0	14.0	14.0	14.0	14.0		22.0	22.0	14.0	22.0	22.0	
Total Split (s)	28.0	28.0	28.0	32.0	32.0		30.0	30.0	32.0	30.0	30.0	
Total Split (%)	31.1%	31.1%	31.1%	35.6%	35.6%		33.3%	33.3%	35.6%	33.3%	33.3%	
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0	1.0	
Lost Time Adjust (s)		0.0	0.0	0.0	0.0			0.0	0.0		0.0	
Total Lost Time (s)		4.0	4.0	4.0	4.0			4.0	4.0		4.0	
Lead/Lag	Lag	Lag	Lag	Lead	Lead				Lead			
Lead-Lag Optimize?												
Recall Mode	Min	Min	Min	None	None		Min	Min	None	Min	Min	
Act Effct Green (s)		14.0	14.0	13.3	13.3			13.0	26.4		13.0	
Actuated g/C Ratio		0.26	0.26	0.25	0.25			0.25	0.50		0.25	
v/c Ratio		0.55	0.22	0.22	0.42			0.34	0.36		0.22	
Control Delay		22.9	5.8	19.0	21.4			21.7	8.1		13.4	
Queue Delay		0.0	0.0	0.0	0.0			0.0	0.0		0.0	
Total Delay		22.9	5.8	19.0	21.4			21.7	8.1		13.4	
LOS		C	A	B	C			C	A		B	
Approach Delay		17.9			20.6			12.1			13.4	
Approach LOS		B			C			B			B	
Queue Length 50th (ft)		61	0	21	43			27	35		11	
Queue Length 95th (ft)		161	32	68	121			84	92		50	
Internal Link Dist (ft)		280			74			642			433	
Turn Bay Length (ft)			150						150			
Base Capacity (vph)		868	801	980	1000			699	1232		780	
Starvation Cap Reductn		0	0	0	0			0	0		0	
Spillback Cap Reductn		0	0	0	0			0	0		0	
Storage Cap Reductn		0	0	0	0			0	0		0	
Reduced v/c Ratio		0.31	0.14	0.10	0.19			0.16	0.22		0.11	

Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 52.9			
Natural Cycle: 50			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.55			
Intersection Signal Delay: 16.3		Intersection LOS: B	
Intersection Capacity Utilization 50.2%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 103: Grove Street Extension/Recreation Road Extension & I-95 NB Ramps/Site Main Street



Intersection	
Int Delay, s/veh	0

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	195	0	1	250	1	0
Future Vol, veh/h	195	0	1	250	1	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	1	1	0	0
Mvmt Flow	212	0	1	272	1	0

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	212	0	486	212
Stage 1	-	-	-	-	212	-
Stage 2	-	-	-	-	274	-
Critical Hdwy	-	-	4.11	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.209	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1364	-	544	833
Stage 1	-	-	-	-	828	-
Stage 2	-	-	-	-	777	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1364	-	543	833
Mov Cap-2 Maneuver	-	-	-	-	543	-
Stage 1	-	-	-	-	828	-
Stage 2	-	-	-	-	776	-

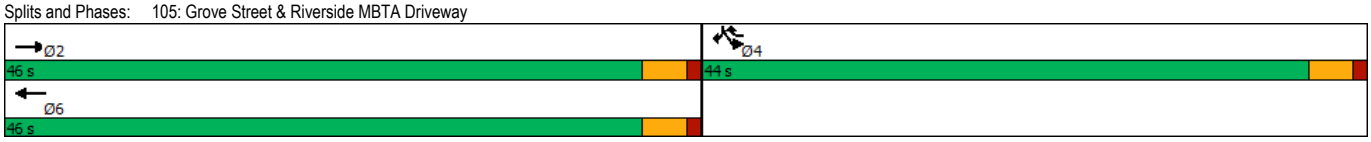
Approach	EB	WB	NB
HCM Control Delay, s	0	0	11.6
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	543	-	-	1364	-
HCM Lane V/C Ratio	0.002	-	-	0.001	-
HCM Control Delay (s)	11.6	-	-	7.6	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	0	-

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	0	195	200	150	170	50
Future Volume (vph)	0	195	200	150	170	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0			100	0	0
Storage Lanes	0			1	1	1
Taper Length (ft)	25				25	
Satd. Flow (prot)	0	1881	1881	1599	1736	1553
Flt Permitted					0.950	
Satd. Flow (perm)	0	1881	1881	1599	1736	1553
Right Turn on Red				No		No
Satd. Flow (RTOR)						
Link Speed (mph)		30	30		30	
Link Distance (ft)		460	781		281	
Travel Time (s)		10.5	17.8		6.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	1%	1%	1%	1%	4%	4%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	212	217	163	185	54
Turn Type		NA	NA	Over	Prot	Prot
Protected Phases		2	6	4	4	4
Permitted Phases						
Detector Phase		2	6	4	4	4
Switch Phase						
Minimum Initial (s)		10.0	10.0	6.0	6.0	6.0
Minimum Split (s)		22.0	22.0	10.0	10.0	10.0
Total Split (s)		46.0	46.0	44.0	44.0	44.0
Total Split (%)		51.1%	51.1%	48.9%	48.9%	48.9%
Yellow Time (s)		3.0	3.0	3.0	3.0	3.0
All-Red Time (s)		1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)		0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)		4.0	4.0	4.0	4.0	4.0
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode		Min	Min	None	None	None
Act Effct Green (s)		12.2	12.2	8.6	8.6	8.6
Actuated g/C Ratio		0.42	0.42	0.30	0.30	0.30
v/c Ratio		0.27	0.27	0.34	0.36	0.12
Control Delay		6.8	6.9	10.5	10.5	8.5
Queue Delay		0.0	0.0	0.0	0.0	0.0
Total Delay		6.8	6.9	10.5	10.5	8.5
LOS		A	A	B	B	A
Approach Delay		6.8	8.4		10.1	
Approach LOS		A	A		B	
Queue Length 50th (ft)		17	17	15	17	5
Queue Length 95th (ft)		46	47	57	63	24
Internal Link Dist (ft)		380	701		201	
Turn Bay Length (ft)				100		
Base Capacity (vph)		1881	1881	1599	1736	1553
Starvation Cap Reductn		0	0	0	0	0
Spillback Cap Reductn		0	0	0	0	0
Storage Cap Reductn		0	0	0	0	0
Reduced v/c Ratio		0.11	0.12	0.10	0.11	0.03

Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 29			
Natural Cycle: 40			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.36			
Intersection Signal Delay: 8.5		Intersection LOS: A	
Intersection Capacity Utilization 26.6%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 105: Grove Street & Riverside MBTA Driveway



Intersection	
Intersection Delay, s/veh	12.3
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	230	45	100	10	20	0	55	90	5	0	110	90
Future Vol, veh/h	230	45	100	10	20	0	55	90	5	0	110	90
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	250	49	109	11	22	0	60	98	5	0	120	98
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	14.3	9	10.3	10.4
HCM LOS	B	A	B	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	37%	61%	33%	0%
Vol Thru, %	60%	12%	67%	55%
Vol Right, %	3%	27%	0%	45%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	150	375	30	200
LT Vol	55	230	10	0
Through Vol	90	45	20	110
RT Vol	5	100	0	90
Lane Flow Rate	163	408	33	217
Geometry Grp	1	1	1	1
Degree of Util (X)	0.249	0.565	0.051	0.308
Departure Headway (Hd)	5.49	4.994	5.653	5.098
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	654	726	633	704
Service Time	3.524	2.994	3.69	3.129
HCM Lane V/C Ratio	0.249	0.562	0.052	0.308
HCM Control Delay	10.3	14.3	9	10.4
HCM Lane LOS	B	B	A	B
HCM 95th-tile Q	1	3.6	0.2	1.3

Intersection	
Int Delay, s/veh	4.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	130	345	0	0	150	15	10	0	5	25	0	110
Future Vol, veh/h	130	345	0	0	150	15	10	0	5	25	0	110
Conflicting Peds, #/hr	55	0	40	40	0	55	35	0	40	40	0	35
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	141	375	0	0	163	16	11	0	5	27	0	120

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	234	0	-	-	-	0	923	891	415	926	883	261
Stage 1	-	-	-	-	-	-	657	657	-	226	226	-
Stage 2	-	-	-	-	-	-	266	234	-	700	657	-
Critical Hdwy	4.12	-	-	-	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	-	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1333	-	0	0	-	-	250	282	637	249	285	778
Stage 1	-	-	0	0	-	-	454	462	-	777	717	-
Stage 2	-	-	0	0	-	-	739	711	-	430	462	-
Platoon blocked, %		-			-	-						
Mov Cap-1 Maneuver	1272	-	-	-	-	-	181	231	616	203	234	721
Mov Cap-2 Maneuver	-	-	-	-	-	-	181	231	-	203	234	-
Stage 1	-	-	-	-	-	-	390	397	-	638	684	-
Stage 2	-	-	-	-	-	-	598	678	-	354	397	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	2.2	0	21.3	15.5
HCM LOS			C	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	237	1272	-	-	-	490
HCM Lane V/C Ratio	0.069	0.111	-	-	-	0.299
HCM Control Delay (s)	21.3	8.2	0	-	-	15.5
HCM Lane LOS	C	A	A	-	-	C
HCM 95th %tile Q(veh)	0.2	0.4	-	-	-	1.2

Intersection	
Int Delay, s/veh	0.1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	475	10	5	265	0	0
Future Vol, veh/h	475	10	5	265	0	0
Conflicting Peds, #/hr	0	45	45	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	516	11	5	288	0	0

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	572	0	721	-
Stage 1	-	-	-	-	567	-
Stage 2	-	-	-	-	154	-
Critical Hdwy	-	-	4.13	-	6.63	-
Critical Hdwy Stg 1	-	-	-	-	5.43	-
Critical Hdwy Stg 2	-	-	-	-	5.83	-
Follow-up Hdwy	-	-	2.219	-	3.519	-
Pot Cap-1 Maneuver	-	-	999	-	378	0
Stage 1	-	-	-	-	567	0
Stage 2	-	-	-	-	859	0
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	962	-	362	-
Mov Cap-2 Maneuver	-	-	-	-	362	-
Stage 1	-	-	-	-	546	-
Stage 2	-	-	-	-	854	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.2	0
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	-	-	-	962	-
HCM Lane V/C Ratio	-	-	-	0.006	-
HCM Control Delay (s)	0	-	-	8.8	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	-	-	-	0	-

Intersection	
Int Delay, s/veh	0.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	2	0	90	5	0	80
Future Vol, veh/h	2	0	90	5	0	80
Conflicting Peds, #/hr	0	0	0	40	40	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	50	50	2	50	50	2
Mvmt Flow	2	0	98	5	0	87

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	228	141	0	0	143	0
Stage 1	141	-	-	-	-	-
Stage 2	87	-	-	-	-	-
Critical Hdwy	6.9	6.7	-	-	4.6	-
Critical Hdwy Stg 1	5.9	-	-	-	-	-
Critical Hdwy Stg 2	5.9	-	-	-	-	-
Follow-up Hdwy	3.95	3.75	-	-	2.65	-
Pot Cap-1 Maneuver	665	794	-	-	1192	-
Stage 1	781	-	-	-	-	-
Stage 2	829	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	643	768	-	-	1152	-
Mov Cap-2 Maneuver	643	-	-	-	-	-
Stage 1	755	-	-	-	-	-
Stage 2	829	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10.6	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	643	1152	-
HCM Lane V/C Ratio	-	-	0.003	-	-
HCM Control Delay (s)	-	-	10.6	0	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0	0	-

LANE SUMMARY

Site: 101 [Weekday Morning_2029 Build with Mitigation - Dec 2019 Building Program]

Grove Street at Asheville Road / I-95 SB Ramps
Site Category: (None)
Roundabout

Lane Use and Performance

	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist ft	Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
South: I-95 SB Ramps													
Lane 1[d]	463	2.0	615	0.753	100	25.3	LOS D	8.0	203.8	Full	1600	0.0	0.0
Approach	463	2.0		0.753		25.3	LOS D	8.0	203.8				
East: Grove Street													
Lane 1[d]	408	3.0	1089	0.374	100	7.1	LOS A	1.9	49.0	Full	1600	0.0	0.0
Approach	408	3.0		0.374		7.1	LOS A	1.9	49.0				
North: Asheville Road													
Lane 1[d]	17	7.0	694	0.025	100	5.4	LOS A	0.1	2.0	Full	1600	0.0	0.0
Approach	17	7.0		0.025		5.4	LOS A	0.1	2.0				
West: Grove Street													
Lane 1[d]	626	2.0	832	0.752	100	20.0	LOS C	12.6	321.1	Full	1600	0.0	0.0
Approach	626	2.0		0.752		20.0	LOS C	12.6	321.1				
Intersection	1514	2.3		0.753		18.0	LOS C	12.6	321.1				

Site Level of Service (LOS) Method: Delay & v/c (HCM 2010). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

LANE SUMMARY

Site: 101 [Weekday Evening_2029 Build with Mitigation - Dec 2019 Building Program]

Grove Street at Asheville Road / I-95 SB Ramps
Site Category: (None)
Roundabout

Lane Use and Performance

	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist ft	Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
South: I-95 SB Ramps													
Lane 1[d]	234	5.0	845	0.277	100	7.3	LOS A	1.1	28.6	Full	1600	0.0	0.0
Approach	234	5.0		0.277		7.3	LOS A	1.1	28.6				
East: Grove Street													
Lane 1[d]	821	2.0	1051	0.781	100	18.3	LOS C	9.4	238.6	Full	1600	0.0	0.0
Approach	821	2.0		0.781		18.3	LOS C	9.4	238.6				
North: Asheville Road													
Lane 1[d]	9	0.0	473	0.018	100	7.9	LOS A	0.1	1.4	Full	1600	0.0	0.0
Approach	9	0.0		0.018		7.9	LOS A	0.1	1.4				
West: Grove Street													
Lane 1[d]	278	3.0	643	0.433	100	12.0	LOS B	2.2	57.1	Full	1600	0.0	0.0
Approach	278	3.0		0.433		12.0	LOS B	2.2	57.1				
Intersection	1341	2.7		0.781		15.0	LOS B	9.4	238.6				

Site Level of Service (LOS) Method: Delay & v/c (HCM 2010). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

LANE SUMMARY

Site: 101 [Saturday Midday_2029 Build with Mitigation - Dec 2019 Building Program]

Grove Street at Asheville Road / I-95 SB Ramps
Site Category: (None)
Roundabout

Lane Use and Performance

	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist ft	Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
South: I-95 SB Ramps													
Lane 1[d]	353	1.0	939	0.376	100	8.0	LOS A	1.8	45.5	Full	1600	0.0	0.0
Approach	353	1.0		0.376		8.0	LOS A	1.8	45.5				
East: Grove Street													
Lane 1[d]	375	1.0	1065	0.352	100	7.0	LOS A	1.8	44.2	Full	1600	0.0	0.0
Approach	375	1.0		0.352		7.0	LOS A	1.8	44.2				
North: Asheville Road													
Lane 1[d]	17	0.0	749	0.023	100	5.0	LOS A	0.1	1.9	Full	1600	0.0	0.0
Approach	17	0.0		0.023		5.0	LOS A	0.1	1.9				
West: Grove Street													
Lane 1[d]	234	1.0	850	0.275	100	7.2	LOS A	1.1	28.6	Full	1600	0.0	0.0
Approach	234	1.0		0.275		7.2	LOS A	1.1	28.6				
Intersection	979	1.0		0.376		7.4	LOS A	1.8	45.5				

Site Level of Service (LOS) Method: Delay & v/c (HCM 2010). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

Minor Comments – Introduction Comment 4

Cluster Peak Hour Summary

Cluster Peak Hours

Cluster	AM Peak	Diff. from Network Peak		PM Peak	Diff. from Network Peak	
		Vehicles [1]	%		Veh	%
Overall Network	**7:45 - 8:45 AM**			**5:00 - 6:00 PM**		
1. Grove Street	7:45 - 8:45 AM	n/a	n/a	4:45 - 5:45 PM	119	1.39%
2. Lower Washington Street	8:00 - 9:00 AM	96	0.59%	4:45 - 5:45 PM	216	1.19%
3. Woodland	7:45 - 8:45 AM	n/a	n/a	5:00 - 6:00 PM	n/a	n/a
4. Auburndale Village	7:45 - 8:45 AM	n/a	n/a	5:00 - 6:00 PM	n/a	n/a
5. Upper Washington Street	7:30 - 8:30 AM	95	0.68%	5:00 - 6:00 PM	n/a	n/a
6. Route 30 West	7:30 - 8:30 AM	24	0.24%	4:45 - 5:45 PM	43	0.49%

1 - Difference in approach volumes on all intersection approaches combined during the cluster peak hour as compared to the network peak hour, based on 15-minute count intervals.

Cluster Location

Cluster	Intersection Name and Number
Cluster 1 - Grove Street	1. Grove Street at Route 128 Southbound Ramps / Asheville Road
	2. Grove Street at Route 128 Northbound Ramps
	3. Grove Street at Hotel Indigo Driveway / Condo Driveway
	4. Grove Street at Riverside MBTA Parking Lot Driveway
	5. Grove Street at Riverside Office Building (South) / Apartment Dwy
	6. Grove Street at Riverside Office Building (Center) / Apartment Dwy
	7. Grove Street at Riverside Office Building (North) / Seminary Avenue
Cluster 2 - Lower Washington Street	8 Washington Street at Concord Street
	9. Washington Street at Grove Street
	10. Concord Road at Hagar Road
	11. Grove Street at Hagar Road / Colgate Road
	12. Rt 128 Exit 21B Collector-Distributor Road at Rt 128 SB On-Ramp
	13. Washington St at Quinobequin Rd / Wales Rd / Rt 128 SB Ramps
	14. Washington Street at Route 128 Northbound Ramps
	15. Washington Street at Beacon Street
Cluster 3 - Woodland	16. Grove Street at Hancock Street
	17. Grove Street at Woodland Road
	18. Hancock Street at Woodland Road
	19. Woodland Road at Central Street
Cluster 4 - Auburndale Village	20. Grove Street at Central Street / Auburn Street
	21. Lexington Street at Auburn Street
	22. Commonwealth Avenue at Lexington Street
	23. Lexington Street at Wolcott Street
	24. Commonwealth Avenue at Melrose Street
Cluster 5 - Upper Washington Street	25. Commonwealth Avenue at Auburn Street (east intersection)
	26. Washington Street at Woodland Street
	27. Washington Street at Commonwealth Avenue
	28. Washington Street at Auburn Street
	29. Washington Street at Perkins Street / Mass Pike EB On-Ramp
	30. Washington Street at Mass Pike WB Off-Ramp
Cluster 6 - Route 30 West	31. South Avenue at River Road / Route 128 Southbound Ramps
	32. South Avenue / Commonwealth Avenue at Route 128 NB Ramps
	33. Commonwealth Avenue at Auburn Street (West intersection)

Minor Comments – Signalized Intersection Capacity Analysis Comment 1

Revised Signalized Capacity Analyses Summary Table

Revised Signalized Capacity Analyses Worksheets

Table A-1: Signalized Intersection Capacity Analysis – Revised Signal Timings

	2019 Existing Conditions					2029 No-Build Conditions					2029 Build Conditions				
				Vehicle Queues					Vehicle Queues					Vehicle Queues	
Location	**v/c[1]**	**Delay[2]**	**LOS[3]**	**50th[4]**	**95th[5]**	**v/c**	**Delay**	**LOS**	**50th**	**95th**	**v/c**	**Delay**	**LOS**	**50th**	**95th**
20: Grove Street at Central Street and Auburn Street															
Weekday Morning															
Central Street EB LTR	0.39	19	B	28	81	0.33	18	B	24	85	0.34	19	B	24	86
Auburn Street WB LTR	0.59	21	C	37	#136	0.57	21	C	35	#157	0.75	31	C	51	#224
Grove Street NB LT	0.54	13	B	68	#255	0.56	13	B	71	#290	0.57	14	B	73	#299
Grove Street NB R	0.11	4	A	0	23	0.11	4	A	1	25	0.14	5	A	3	33
Auburn Street SB LTR	0.51	14	B	44	#203	0.56	16	B	47	#225	0.59	17	B	51	#242
Overall		**15**	**B**				**15**	**B**				**18**	**B**		
Weekday Evening															
Central Street EB LTR	0.27	17	B	20	74	0.27	18	B	21	76	0.28	18	B	21	76
Auburn Street WB LTR	0.65	24	C	45	#165	0.60	22	C	40	~174	0.71	28	C	50	#217
Grove Street NB LTR	0.43	11	B	52	190	0.45	11	B	54	199	0.47	12	B	57	208
Grove Street NB R	0.09	3	A	0	17	0.09	3	A	0	19	0.14	4	A	2	30
Auburn Street SB LTR	0.61	17	B	59	#264	0.63	17	B	60	#280	0.65	18	B	62	#291
Overall		**16**	**B**				**16**	**B**				**17**	**B**		
Saturday Midday															
Central Street EB LTR	0.10	16	B	7	32	0.09	16	B	7	33	0.09	16	B	7	33
Auburn Street WB LTR	0.24	10	A	6	46	0.25	10	A	7	48	0.37	13	B	16	73
Grove Street NB LTR	0.25	10	A	27	106	0.26	10	A	29	114	0.28	10	A	30	119
Grove Street NB R	0.03	0	A	0	0	0.03	0	A	0	0	0.07	2	A	0	10
Auburn Street SB LTR	0.33	10	B	32	114	0.32	10	B	31	122	0.33	10	B	32	128
Overall [f]		**10**	**A**				**10**	**A**				**10**	**B**		
27: Commonwealth Avenue at Washington Street															
Weekday Morning															
Commonwealth Avenue EB L	0.17	42	D	19	50	0.18	44	D	19	51	0.18	44	D	19	51
Commonwealth Avenue EB TR	0.75	42	D	171	231	0.77	45	D	173	241	0.78	45	D	173	241
Commonwealth Avenue WB L	0.84	69	E	136	#299	0.91	81	F	149	#330	0.95	89	F	165	#368
Commonwealth Avenue WB TR	0.50	33	C	167	233	0.55	34	C	181	250	0.54	34	C	181	250
Washington Street NB L	0.31	52	D	25	63	0.36	54	D	31	72	0.36	54	D	31	72
Washington Street NB TR	0.75	25	C	293	425	0.82	28	C	357	516	0.83	29	C	362	523
Washington Street SB LTR	0.90	44	D	287	#494	1.15	113	F	~412	#625	1.18	>120	F	~416	#629
Overall		**37**	**D**				**58**	**E**				**61**	**E**		
Weekday Evening															
Commonwealth Avenue EB L	0.15	37	D	29	66	0.18	40	D	27	67	0.18	40	D	27	67
Commonwealth Avenue EB TR	0.80	45	D	226	274	0.80	45	D	214	291	0.80	45	D	214	291
Commonwealth Avenue WB L	0.97	97	F	166	#374	0.98	99	F	~178	#395	1.02	108	F	~198	#415
Commonwealth Avenue WB TR	0.48	41	D	120	172	0.39	36	D	123	176	0.39	36	D	123	176
Washington Street NB L	0.42	58	E	40	88	0.44	58	E	43	93	0.44	58	E	43	93
Washington Street NB TR	0.89	35	C	436	#644	0.94	39	D	475	#730	0.95	42	D	488	#749
Washington Street SB LTR	1.18	>120	F	~460	#694	>1.20	>120	F	~575	#823	>1.20	>120	F	~581	#829
Overall		**66**	**E**				**99**	**F**				**104**	**F**		
Saturday Midday															
Commonwealth Avenue EB L	0.15	39	D	17	43	0.13	40	D	15	44	0.13	40	D	15	44
Commonwealth Avenue EB TR	0.66	37	D	124	182	0.65	37	D	118	193	0.66	38	D	120	193
Commonwealth Avenue WB L	0.58	50	D	72	153	0.59	51	D	75	163	0.64	52	D	85	#189
Commonwealth Avenue WB TR	0.25	27	C	47	114	0.25	28	C	48	117	0.25	28	C	49	117
Washington Street NB L	0.35	48	D	31	77	0.36	49	D	32	83	0.36	49	D	33	83
Washington Street NB TR	0.67	21	C	214	317	0.65	20	B	207	343	0.67	20	C	217	350
Washington Street SB LTR	0.72	32	C	176	296	0.73	32	C	185	315	0.73	33	C	188	315
Overall		**29**	**C**				**29**	**C**				**30**	**C**		

a volume-to-capacity ratio
b average delay in seconds per vehicle
c level of service
d 50th percentile queue length, measured in feet
e 95th percentile queue length, measured in feet

f Overall delay under No Build Conditions is 9.9 seconds and under Build Conditions is 10.4 seconds. Since 10.0 seconds is the threshold between overall LOS A and B, there is a drop in LOS.

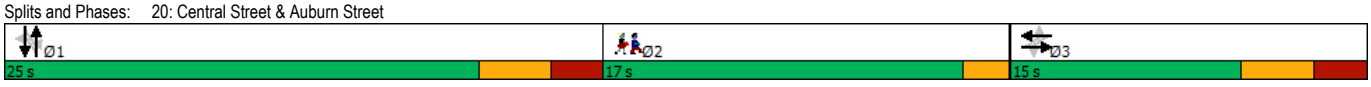
~ Volume exceeds capacity, queue is theoretically infinite
# 95th percentile volume exceeds capacity, queue may be longer

Note: Signal timing adjustments based on inconsistencies noted in the Transportation Peer Review by Green International dated February 6, 2020

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø2
Lane Configurations													
Traffic Volume (vph)	35	80	5	60	55	95	20	445	75	85	220	10	
Future Volume (vph)	35	80	5	60	55	95	20	445	75	85	220	10	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	12	16	12	12	15	12	12	16	12	12	16	12	
Storage Length (ft)	0		0	0		0	0		75	0		0	
Storage Lanes	0		0	0		0	0		1	0		0	
Taper Length (ft)	25			25			25			25			
Satd. Flow (prot)	0	2071	0	0	1891	0	0	2107	1583	0	2072	0	
Flt Permitted		0.827			0.880			0.977			0.695		
Satd. Flow (perm)	0	1735	0	0	1688	0	0	2062	1541	0	1458	0	
Right Turn on Red			Yes			Yes			Yes			Yes	
Satd. Flow (RTOR)		3			63				82		3		
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		598			316			1117			312		
Travel Time (s)		13.6			7.2			25.4			7.1		
Confl. Peds. (#/hr)	3					3	15		4	4		15	
Confl. Bikes (#/hr)									1			3	
Peak Hour Factor	0.77	0.77	0.77	0.82	0.82	0.82	0.90	0.90	0.90	0.91	0.91	0.91	
Heavy Vehicles (%)	2%	2%	2%	1%	1%	1%	2%	2%	2%	2%	2%	2%	
Shared Lane Traffic (%)													
Lane Group Flow (vph)	0	155	0	0	256	0	0	516	83	0	346	0	
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA		
Protected Phases		3			3			1			1		2
Permitted Phases	3			3			1		1	1			
Detector Phase	3	3		3	3		1	1	1	1	1		
Switch Phase													
Minimum Initial (s)	17.0	17.0		17.0	17.0		30.0	30.0	30.0	30.0	30.0		15.0
Minimum Split (s)	22.3	22.3		22.3	22.3		35.2	35.2	35.2	35.2	35.2		17.0
Total Split (s)	15.0	15.0		15.0	15.0		25.0	25.0	25.0	25.0	25.0		17.0
Total Split (%)	26.3%	26.3%		26.3%	26.3%		43.9%	43.9%	43.9%	43.9%	43.9%		30%
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0		2.0
All-Red Time (s)	2.3	2.3		2.3	2.3		2.2	2.2	2.2	2.2	2.2		0.0
Lost Time Adjust (s)		0.0			0.0			0.0	0.0		0.0		
Total Lost Time (s)		5.3			5.3			5.2	5.2		5.2		
Lead/Lag							Lead	Lead	Lead	Lead	Lead		Lag
Lead-Lag Optimize?													
Recall Mode	Min	Min		Min	Min		Min	Min	Min	Min	Min		None
Act Effct Green (s)		9.9			9.9			20.2	20.2		20.2		
Actuated g/C Ratio		0.23			0.23			0.47	0.47		0.47		
v/c Ratio		0.39			0.59			0.54	0.11		0.51		
Control Delay		19.3			21.0			12.9	3.7		13.7		
Queue Delay		0.0			0.0			0.0	0.0		0.0		
Total Delay		19.3			21.0			12.9	3.7		13.7		
LOS		B			C			B	A		B		
Approach Delay		19.3			21.0			11.6			13.7		
Approach LOS		B			C			B			B		
Queue Length 50th (ft)		28			37			68	0		44		
Queue Length 95th (ft)		81			#136			#255	23		#203		
Internal Link Dist (ft)		518			236			1037			232		
Turn Bay Length (ft)									75				
Base Capacity (vph)		398			433			959	761		680		
Starvation Cap Reductn		0			0			0	0		0		
Spillback Cap Reductn		0			0			0	0		0		
Storage Cap Reductn		0			0			0	0		0		
Reduced v/c Ratio		0.39			0.59			0.54	0.11		0.51		

Intersection Summary			
Area Type:	Other		
Cycle Length: 57			
Actuated Cycle Length: 43.4			
Natural Cycle: 75			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.59			
Intersection Signal Delay: 14.8		Intersection LOS: B	
Intersection Capacity Utilization 79.1%		ICU Level of Service D	
Analysis Period (min) 15			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			

Splits and Phases: 20: Central Street & Auburn Street

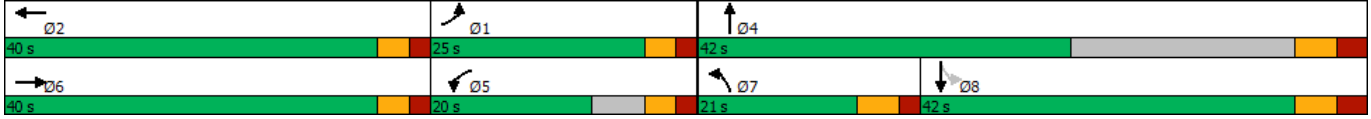


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	30	420	60	205	470	25	40	935	200	45	800	25
Future Volume (vph)	30	420	60	205	470	25	40	935	200	45	800	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	80		350	100		0	150		0	0		0
Storage Lanes	1		1	1		0	1		0	0		0
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	1736	3388	0	1752	3473	0	1752	3392	0	0	3513	0
Flt Permitted	0.950			0.950			0.950				0.748	
Satd. Flow (perm)	1732	3388	0	1729	3473	0	1749	3392	0	0	2635	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		12			4			25			2	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		453			516			466			1829	
Travel Time (s)		10.3			11.7			10.6			41.6	
Confl. Peds. (#/hr)	3		19	19		3	3		11	11		3
Confl. Bikes (#/hr)			1			4						1
Peak Hour Factor	0.88	0.88	0.88	0.94	0.94	0.94	0.97	0.97	0.97	0.98	0.98	0.98
Heavy Vehicles (%)	4%	4%	4%	3%	3%	3%	3%	3%	3%	2%	2%	2%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	34	545	0	218	527	0	41	1170	0	0	888	0
Turn Type	Prot	NA		Prot	NA		Prot	NA		Perm	NA	
Protected Phases	1	6		5	2		7	4			8	
Permitted Phases										8		
Detector Phase	1	6		5	2		7	4		8	8	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Minimum Split (s)	11.0	31.0		11.0	31.0		12.0	24.0		26.0	26.0	
Total Split (s)	25.0	40.0		20.0	40.0		21.0	42.0		42.0	42.0	
Total Split (%)	19.5%	31.3%		15.6%	31.3%		16.4%	32.8%		32.8%	32.8%	
Yellow Time (s)	3.0	3.0		3.0	3.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	3.0		3.0	3.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0			0.0	
Total Lost Time (s)	5.0	5.0		5.0	5.0		6.0	7.0			7.0	
Lead/Lag	Lag	Lead		Lag	Lead		Lead			Lag	Lag	
Lead-Lag Optimize?												
Recall Mode	None	Min		None	Min		None	None		None	None	
Act Effct Green (s)	10.8	20.0		14.1	28.6		7.3	43.4			35.7	
Actuated g/C Ratio	0.11	0.21		0.15	0.30		0.08	0.46			0.38	
v/c Ratio	0.17	0.75		0.84	0.50		0.31	0.75			0.90	
Control Delay	42.4	42.2		68.9	32.7		51.6	24.9			43.6	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0			0.0	
Total Delay	42.4	42.2		68.9	32.7		51.6	24.9			43.6	
LOS	D	D		E	C		D	C			D	
Approach Delay		42.2			43.3			25.8			43.6	
Approach LOS		D			D			C			D	
Queue Length 50th (ft)	19	171		136	167		25	293			287	
Queue Length 95th (ft)	50	231		#299	233		63	425			#494	
Internal Link Dist (ft)		373			436			386			1749	
Turn Bay Length (ft)	80			100			150					
Base Capacity (vph)	373	1282		376	1330		282	2051			992	
Starvation Cap Reductn	0	0		0	0		0	0			0	
Spillback Cap Reductn	0	0		0	0		0	0			0	
Storage Cap Reductn	0	0		0	0		0	0			0	
Reduced v/c Ratio	0.09	0.43		0.58	0.40		0.15	0.57			0.90	

Intersection Summary

Area Type: Other
Cycle Length: 128
Actuated Cycle Length: 94.9
Natural Cycle: 100
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.90
Intersection Signal Delay: 37.0 — Intersection LOS: D
Intersection Capacity Utilization 99.5% — ICU Level of Service F
Analysis Period (min) 15
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

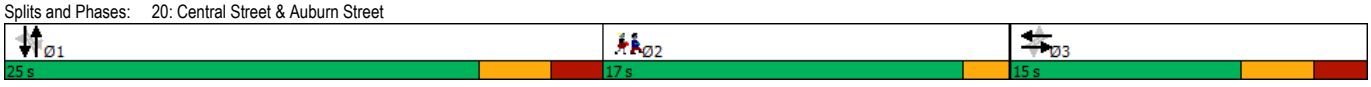
Splits and Phases: 27: Washington Street & Commonwealth Avenue



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø2
Lane Configurations													
Traffic Volume (vph)	20	80	5	45	90	100	10	370	60	115	255	10	
Future Volume (vph)	20	80	5	45	90	100	10	370	60	115	255	10	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	12	16	12	12	15	12	12	16	12	12	16	12	
Storage Length (ft)	0		0	0		0	0		75	0		0	
Storage Lanes	0		0	0		0	0		1	0		0	
Taper Length (ft)	25			25			25			25			
Satd. Flow (prot)	0	2080	0	0	1910	0	0	2109	1583	0	2092	0	
Flt Permitted		0.896			0.904			0.986			0.715		
Satd. Flow (perm)	0	1879	0	0	1743	0	0	2081	1546	0	1518	0	
Right Turn on Red			Yes			Yes			Yes			Yes	
Satd. Flow (RTOR)		3			56				82		3		
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		598			316			1117			312		
Travel Time (s)		13.6			7.2			25.4			7.1		
Confl. Peds. (#/hr)	3					3	9		2	2		9	
Confl. Bikes (#/hr)									1				
Peak Hour Factor	0.91	0.91	0.91	0.82	0.82	0.82	0.91	0.91	0.91	0.88	0.88	0.88	
Heavy Vehicles (%)	2%	2%	2%	1%	1%	1%	2%	2%	2%	1%	1%	1%	
Shared Lane Traffic (%)													
Lane Group Flow (vph)	0	115	0	0	287	0	0	418	66	0	432	0	
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA		
Protected Phases		3			3			1			1		2
Permitted Phases	3			3			1		1	1			
Detector Phase	3	3		3	3		1	1	1	1	1		
Switch Phase													
Minimum Initial (s)	17.0	17.0		17.0	17.0		30.0	30.0	30.0	30.0	30.0		15.0
Minimum Split (s)	22.3	22.3		22.3	22.3		35.2	35.2	35.2	35.2	35.2		17.0
Total Split (s)	15.0	15.0		15.0	15.0		25.0	25.0	25.0	25.0	25.0		17.0
Total Split (%)	26.3%	26.3%		26.3%	26.3%		43.9%	43.9%	43.9%	43.9%	43.9%		30%
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0		2.0
All-Red Time (s)	2.3	2.3		2.3	2.3		2.2	2.2	2.2	2.2	2.2		0.0
Lost Time Adjust (s)		0.0			0.0			0.0	0.0		0.0		
Total Lost Time (s)		5.3			5.3			5.2	5.2		5.2		
Lead/Lag							Lead	Lead	Lead	Lead	Lead		Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes		Yes
Recall Mode	Min	Min		Min	Min		Min	Min	Min	Min	Min		None
Act Effct Green (s)		9.9			9.9			20.2	20.2		20.2		
Actuated g/C Ratio		0.23			0.23			0.47	0.47		0.47		
v/c Ratio		0.27			0.65			0.43	0.09		0.61		
Control Delay		17.4			24.0			11.1	3.0		16.7		
Queue Delay		0.0			0.0			0.0	0.0		0.0		
Total Delay		17.4			24.0			11.1	3.0		16.7		
LOS		B			C			B	A		B		
Approach Delay		17.4			24.0			10.0			16.7		
Approach LOS		B			C			B			B		
Queue Length 50th (ft)		20			45			52	0		59		
Queue Length 95th (ft)		74			#165			190	17		#264		
Internal Link Dist (ft)		518			236			1037			232		
Turn Bay Length (ft)									75				
Base Capacity (vph)		430			441			968	763		707		
Starvation Cap Reductn		0			0			0	0		0		
Spillback Cap Reductn		0			0			0	0		0		
Storage Cap Reductn		0			0			0	0		0		
Reduced v/c Ratio		0.27			0.65			0.43	0.09		0.61		

Intersection Summary			
Area Type:	Other		
Cycle Length: 57			
Actuated Cycle Length: 43.4			
Natural Cycle: 75			
Control Type: Semi Act-Uncoord			
Maximum v/c Ratio: 0.65			
Intersection Signal Delay: 15.9		Intersection LOS: B	
Intersection Capacity Utilization 81.1%		ICU Level of Service D	
Analysis Period (min) 15			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			

Splits and Phases: 20: Central Street & Auburn Street

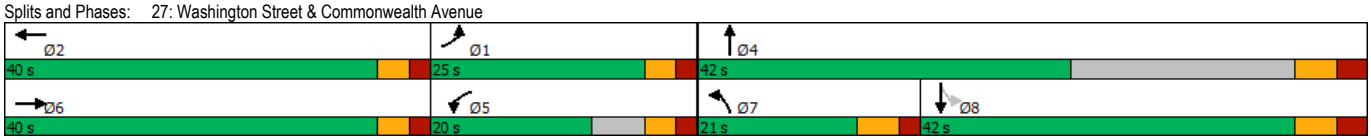


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	45	490	75	220	290	35	55	1070	225	30	945	25
Future Volume (vph)	45	490	75	220	290	35	55	1070	225	30	945	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	80		350	100		0	150		0	0		0
Storage Lanes	1		1	1		0	1		0	0		0
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	1787	3490	0	1770	3474	0	1787	3469	0	0	3551	0
Flt Permitted	0.950			0.950			0.950				0.716	
Satd. Flow (perm)	1777	3490	0	1759	3474	0	1785	3469	0	0	2548	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		13			10			25			2	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		453			516			466			1829	
Travel Time (s)		10.3			11.7			10.6			41.6	
Confl. Peds. (#/hr)	6		10	10		6	3		4	4		3
Confl. Bikes (#/hr)						2						1
Peak Hour Factor	0.83	0.83	0.83	0.91	0.91	0.91	0.92	0.92	0.92	0.97	0.97	0.97
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	1%	1%	1%	1%	1%	1%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	54	680	0	242	357	0	60	1408	0	0	1031	0
Turn Type	Prot	NA		Prot	NA		Prot	NA		Perm	NA	
Protected Phases	1	6		5	2		7	4			8	
Permitted Phases										8		
Detector Phase	1	6		5	2		7	4		8	8	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Minimum Split (s)	11.0	31.0		11.0	31.0		12.0	24.0		26.0	26.0	
Total Split (s)	25.0	40.0		20.0	40.0		21.0	42.0		42.0	42.0	
Total Split (%)	19.5%	31.3%		15.6%	31.3%		16.4%	32.8%		32.8%	32.8%	
Yellow Time (s)	3.0	3.0		3.0	3.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	3.0		3.0	3.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0			0.0	
Total Lost Time (s)	5.0	5.0		5.0	5.0		6.0	7.0			7.0	
Lead/Lag	Lag	Lead		Lag	Lead		Lead			Lag	Lag	
Lead-Lag Optimize?												
Recall Mode	None	Min		None	Min		None	None		None	None	
Act Effct Green (s)	20.4	25.0		14.7	22.1		8.3	47.0			35.6	
Actuated g/C Ratio	0.20	0.24		0.14	0.21		0.08	0.45			0.34	
v/c Ratio	0.15	0.80		0.97	0.48		0.42	0.89			1.18	
Control Delay	36.8	44.7		96.9	41.1		58.1	34.7			125.8	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0			0.0	
Total Delay	36.8	44.7		96.9	41.1		58.1	34.7			125.8	
LOS	D	D		F	D		E	C			F	
Approach Delay		44.1			63.6			35.7			125.8	
Approach LOS		D			E			D			F	
Queue Length 50th (ft)	29	226		166	120		40	436			~460	
Queue Length 95th (ft)	66	274		#374	172		88	#644			#694	
Internal Link Dist (ft)		373			436			386			1749	
Turn Bay Length (ft)	80			100			150					
Base Capacity (vph)	412	1204		346	1197		262	1913			874	
Starvation Cap Reductn	0	0		0	0		0	0			0	
Spillback Cap Reductn	0	0		0	0		0	0			0	
Storage Cap Reductn	0	0		0	0		0	0			0	
Reduced v/c Ratio	0.13	0.56		0.70	0.30		0.23	0.74			1.18	

Intersection Summary

Area Type: Other
Cycle Length: 128
Actuated Cycle Length: 104
Natural Cycle: 110
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.18
Intersection Signal Delay: 65.9 Intersection LOS: E
Intersection Capacity Utilization 92.7% ICU Level of Service F
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

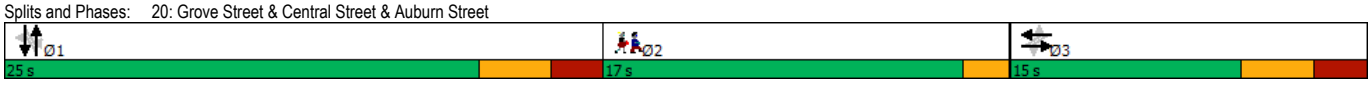
Splits and Phases: 27: Washington Street & Commonwealth Avenue



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø2
Lane Configurations													
Traffic Volume (vph)	10	25	2	15	20	65	2	220	20	65	155	10	
Future Volume (vph)	10	25	2	15	20	65	2	220	20	65	155	10	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	12	16	12	12	15	12	12	16	12	12	16	12	
Storage Length (ft)	0		0	0		0	0		75	0		0	
Storage Lanes	0		0	0		0	0		1	0		0	
Taper Length (ft)	25			25			25			25			
Satd. Flow (prot)	0	2110	0	0	1825	0	0	2091	1568	0	2066	0	
Flt Permitted		0.902			0.950			0.998			0.853		
Satd. Flow (perm)	0	1926	0	0	1744	0	0	2086	1517	0	1783	0	
Right Turn on Red			Yes			Yes			Yes			Yes	
Satd. Flow (RTOR)		2			69				82		4		
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		598			316			1117			312		
Travel Time (s)		13.6			7.2			25.4			7.1		
Confl. Peds. (#/hr)	2		2	2		2	11		9	9		11	
Peak Hour Factor	0.82	0.82	0.82	0.94	0.94	0.94	0.93	0.93	0.93	0.83	0.83	0.83	
Heavy Vehicles (%)	0%	0%	0%	2%	2%	2%	3%	3%	3%	2%	2%	2%	
Shared Lane Traffic (%)													
Lane Group Flow (vph)	0	44	0	0	106	0	0	239	22	0	277	0	
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA		
Protected Phases		3			3			1			1		2
Permitted Phases	3			3			1		1	1			
Detector Phase	3	3		3	3		1	1	1	1	1		
Switch Phase													
Minimum Initial (s)	17.0	17.0		17.0	17.0		30.0	30.0	30.0	30.0	30.0		15.0
Minimum Split (s)	22.3	22.3		22.3	22.3		35.2	35.2	35.2	35.2	35.2		17.0
Total Split (s)	15.0	15.0		15.0	15.0		25.0	25.0	25.0	25.0	25.0		17.0
Total Split (%)	26.3%	26.3%		26.3%	26.3%		43.9%	43.9%	43.9%	43.9%	43.9%		30%
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0		2.0
All-Red Time (s)	2.3	2.3		2.3	2.3		2.2	2.2	2.2	2.2	2.2		0.0
Lost Time Adjust (s)		0.0			0.0			0.0	0.0		0.0		
Total Lost Time (s)		5.3			5.3			5.2	5.2		5.2		
Lead/Lag							Lead	Lead	Lead	Lead	Lead		Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes		Yes
Recall Mode	Min	Min		Min	Min		Min	Min	Min	Min	Min		None
Act Effct Green (s)		9.9			9.9			20.2	20.2		20.2		
Actuated g/C Ratio		0.23			0.23			0.47	0.47		0.47		
v/c Ratio		0.10			0.24			0.25	0.03		0.33		
Control Delay		15.9			9.8			9.5	0.1		10.3		
Queue Delay		0.0			0.0			0.0	0.0		0.0		
Total Delay		15.9			9.8			9.5	0.1		10.3		
LOS		B			A			A	A		B		
Approach Delay		15.9			9.8			8.7			10.3		
Approach LOS		B			A			A			B		
Queue Length 50th (ft)		7			6			27	0		32		
Queue Length 95th (ft)		32			46			106	0		114		
Internal Link Dist (ft)		518			236			1037			232		
Turn Bay Length (ft)									75				
Base Capacity (vph)		440			451			970	750		831		
Starvation Cap Reductn		0			0			0	0		0		
Spillback Cap Reductn		0			0			0	0		0		
Storage Cap Reductn		0			0			0	0		0		
Reduced v/c Ratio		0.10			0.24			0.25	0.03		0.33		

Intersection Summary			
Area Type:	Other		
Cycle Length: 57			
Actuated Cycle Length: 43.4			
Natural Cycle: 75			
Control Type: Semi Act-Uncoord			
Maximum v/c Ratio: 0.33			
Intersection Signal Delay: 10.0		Intersection LOS: A	
Intersection Capacity Utilization 77.3%		ICU Level of Service D	
Analysis Period (min) 15			

Splits and Phases: 20: Grove Street & Central Street & Auburn Street

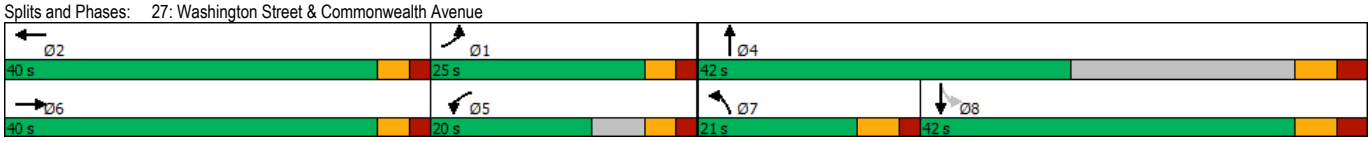


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	25	325	60	120	205	30	50	730	155	30	570	20
Future Volume (vph)	25	325	60	120	205	30	50	730	155	30	570	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	80		350	100		0	150		0	0		0
Storage Lanes	1		1	1		0	1		0	0		0
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	1752	3416	0	1770	3466	0	1770	3429	0	0	3513	0
Flt Permitted	0.950			0.950			0.950				0.840	
Satd. Flow (perm)	1751	3416	0	1767	3466	0	1767	3429	0	0	2956	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		16			12			25			3	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		453			516			466			1829	
Travel Time (s)		10.3			11.7			10.6			41.6	
Confl. Peds. (#/hr)	1		2	2		1	2		7	7		2
Confl. Bikes (#/hr)									6			
Peak Hour Factor	0.81	0.81	0.81	0.87	0.87	0.87	0.85	0.85	0.85	0.90	0.90	0.90
Heavy Vehicles (%)	3%	3%	3%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	31	475	0	138	270	0	59	1041	0	0	688	0
Turn Type	Prot	NA		Prot	NA		Prot	NA		Perm	NA	
Protected Phases	1	6		5	2		7	4			8	
Permitted Phases										8		
Detector Phase	1	6		5	2		7	4		8	8	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Minimum Split (s)	11.0	31.0		11.0	31.0		12.0	24.0		26.0	26.0	
Total Split (s)	25.0	40.0		20.0	40.0		21.0	42.0		42.0	42.0	
Total Split (%)	19.5%	31.3%		15.6%	31.3%		16.4%	32.8%		32.8%	32.8%	
Yellow Time (s)	3.0	3.0		3.0	3.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	3.0		3.0	3.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0			0.0	
Total Lost Time (s)	5.0	5.0		5.0	5.0		6.0	7.0			7.0	
Lead/Lag	Lag	Lead		Lag	Lead		Lead			Lag	Lag	
Lead-Lag Optimize?												
Recall Mode	None	Min		None	Min		None	None		None	None	
Act Effct Green (s)	10.3	17.5		11.4	26.7		8.1	38.2			27.5	
Actuated g/C Ratio	0.12	0.21		0.13	0.31		0.10	0.45			0.32	
v/c Ratio	0.15	0.66		0.58	0.25		0.35	0.67			0.72	
Control Delay	39.4	36.9		49.7	27.2		48.0	20.6			32.4	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0			0.0	
Total Delay	39.4	36.9		49.7	27.2		48.0	20.6			32.4	
LOS	D	D		D	C		D	C			C	
Approach Delay		37.0			34.8			22.1			32.4	
Approach LOS		D			C			C			C	
Queue Length 50th (ft)	17	124		72	47		31	214			176	
Queue Length 95th (ft)	43	182		153	114		77	317			296	
Internal Link Dist (ft)		373			436			386			1749	
Turn Bay Length (ft)	80			100			150					
Base Capacity (vph)	439	1500		441	1520		331	2376			1292	
Starvation Cap Reductn	0	0		0	0		0	0			0	
Spillback Cap Reductn	0	0		0	0		0	0			0	
Storage Cap Reductn	0	0		0	0		0	0			0	
Reduced v/c Ratio	0.07	0.32		0.31	0.18		0.18	0.44			0.53	

Intersection Summary

Area Type: Other
Cycle Length: 128
Actuated Cycle Length: 85.2
Natural Cycle: 80
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.72
Intersection Signal Delay: 29.4 — Intersection LOS: C
Intersection Capacity Utilization 74.0% — ICU Level of Service D
Analysis Period (min) 15

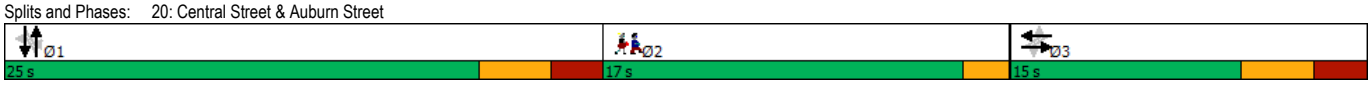
Splits and Phases: 27: Washington Street & Commonwealth Avenue



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø2
Lane Configurations													
Traffic Volume (vph)	35	85	5	65	60	100	20	470	80	90	230	10	
Future Volume (vph)	35	85	5	65	60	100	20	470	80	90	230	10	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	12	16	12	12	15	12	12	16	12	12	16	12	
Storage Length (ft)	0		0	0		0	0		75	0		0	
Storage Lanes	0		0	0		0	0		1	0		0	
Taper Length (ft)	25			25			25			25			
Satd. Flow (prot)	0	2071	0	0	1893	0	0	2107	1583	0	2073	0	
Flt Permitted		0.852			0.870			0.977			0.660		
Satd. Flow (perm)	0	1788	0	0	1671	0	0	2062	1541	0	1385	0	
Right Turn on Red			Yes			Yes			Yes			Yes	
Satd. Flow (RTOR)		3			61				82		3		
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		598			316			1117			312		
Travel Time (s)		13.6			7.2			25.4			7.1		
Confl. Peds. (#/hr)	3					3	15		4	4		15	
Confl. Bikes (#/hr)									1			3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	
Heavy Vehicles (%)	2%	2%	2%	1%	1%	1%	2%	2%	2%	2%	2%	2%	
Shared Lane Traffic (%)													
Lane Group Flow (vph)	0	135	0	0	245	0	0	533	87	0	359	0	
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA		
Protected Phases		3			3			1			1		2
Permitted Phases	3			3			1		1	1			
Detector Phase	3	3		3	3		1	1	1	1	1		
Switch Phase													
Minimum Initial (s)	17.0	17.0		17.0	17.0		30.0	30.0	30.0	30.0	30.0		15.0
Minimum Split (s)	22.3	22.3		22.3	22.3		35.2	35.2	35.2	35.2	35.2		17.0
Total Split (s)	15.0	15.0		15.0	15.0		25.0	25.0	25.0	25.0	25.0		17.0
Total Split (%)	26.3%	26.3%		26.3%	26.3%		43.9%	43.9%	43.9%	43.9%	43.9%		30%
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0		2.0
All-Red Time (s)	2.3	2.3		2.3	2.3		2.2	2.2	2.2	2.2	2.2		0.0
Lost Time Adjust (s)		0.0			0.0			0.0	0.0		0.0		
Total Lost Time (s)		5.3			5.3			5.2	5.2		5.2		
Lead/Lag							Lead	Lead	Lead	Lead	Lead		Lag
Lead-Lag Optimize?													
Recall Mode	Min	Min		Min	Min		Min	Min	Min	Min	Min		None
Act Effct Green (s)		9.9			9.9			20.2	20.2		20.2		
Actuated g/C Ratio		0.23			0.23			0.47	0.47		0.47		
v/c Ratio		0.33			0.57			0.56	0.11		0.56		
Control Delay		18.4			20.5			13.4	3.9		15.5		
Queue Delay		0.0			0.0			0.0	0.0		0.0		
Total Delay		18.4			20.5			13.4	3.9		15.5		
LOS		B			C			B	A		B		
Approach Delay		18.4			20.5			12.1			15.5		
Approach LOS		B			C			B			B		
Queue Length 50th (ft)		24			35			71	1		47		
Queue Length 95th (ft)		85			#157			#290	25		#225		
Internal Link Dist (ft)		518			236			1037			232		
Turn Bay Length (ft)									75				
Base Capacity (vph)		409			428			959	761		646		
Starvation Cap Reductn		0			0			0	0		0		
Spillback Cap Reductn		0			0			0	0		0		
Storage Cap Reductn		0			0			0	0		0		
Reduced v/c Ratio		0.33			0.57			0.56	0.11		0.56		

Intersection Summary			
Area Type:	Other		
Cycle Length: 57			
Actuated Cycle Length: 43.4			
Natural Cycle: 75			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.57			
Intersection Signal Delay: 15.1		Intersection LOS: B	
Intersection Capacity Utilization 81.4%		ICU Level of Service D	
Analysis Period (min) 15			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			

Splits and Phases: 20: Central Street & Auburn Street



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	30	440	65	215	495	25	45	1005	210	45	850	25
Future Volume (vph)	30	440	65	215	495	25	45	1005	210	45	850	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	80		350	100		0	150		0	0		0
Storage Lanes	1		1	1		0	1		0	0		0
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	1736	3387	0	1752	3477	0	1752	3392	0	0	3516	0
Flt Permitted	0.950			0.950			0.950				0.681	
Satd. Flow (perm)	1732	3387	0	1729	3477	0	1750	3392	0	0	2399	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		13			4			24			2	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		453			516			466			1829	
Travel Time (s)		10.3			11.7			10.6			41.6	
Confl. Peds. (#/hr)	3		19	19		3	3		11	11		3
Confl. Bikes (#/hr)			1			4						1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	4%	4%	4%	3%	3%	3%	3%	3%	3%	2%	2%	2%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	33	549	0	234	565	0	49	1320	0	0	1000	0
Turn Type	Prot	NA		Prot	NA		Prot	NA		Perm	NA	
Protected Phases	1	6		5	2		7	4			8	
Permitted Phases										8		
Detector Phase	1	6		5	2		7	4		8	8	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Minimum Split (s)	11.0	31.0		11.0	31.0		12.0	24.0		26.0	26.0	
Total Split (s)	25.0	40.0		20.0	40.0		21.0	42.0		42.0	42.0	
Total Split (%)	19.5%	31.3%		15.6%	31.3%		16.4%	32.8%		32.8%	32.8%	
Yellow Time (s)	3.0	3.0		3.0	3.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	3.0		3.0	3.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0			0.0	
Total Lost Time (s)	5.0	5.0		5.0	5.0		6.0	7.0			7.0	
Lead/Lag	Lag	Lead		Lag	Lead		Lead			Lag	Lag	
Lead-Lag Optimize?												
Recall Mode	None	Min		None	Min		None	None		None	None	
Act Effct Green (s)	10.6	20.3		14.5	29.2		7.7	46.3			35.6	
Actuated g/C Ratio	0.11	0.21		0.15	0.30		0.08	0.47			0.36	
v/c Ratio	0.18	0.77		0.91	0.55		0.36	0.82			1.15	
Control Delay	44.0	44.6		81.2	34.1		53.7	27.8			113.1	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0			0.0	
Total Delay	44.0	44.6		81.2	34.1		53.7	27.8			113.1	
LOS	D	D		F	C		D	C			F	
Approach Delay		44.6			47.9			28.7			113.1	
Approach LOS		D			D			C			F	
Queue Length 50th (ft)	19	173		149	181		31	357			~412	
Queue Length 95th (ft)	51	241		#330	250		72	516			#625	
Internal Link Dist (ft)		373			436			386			1749	
Turn Bay Length (ft)	80			100			150					
Base Capacity (vph)	358	1233		362	1280		271	1973			868	
Starvation Cap Reductn	0	0		0	0		0	0			0	
Spillback Cap Reductn	0	0		0	0		0	0			0	
Storage Cap Reductn	0	0		0	0		0	0			0	
Reduced v/c Ratio	0.09	0.45		0.65	0.44		0.18	0.67			1.15	

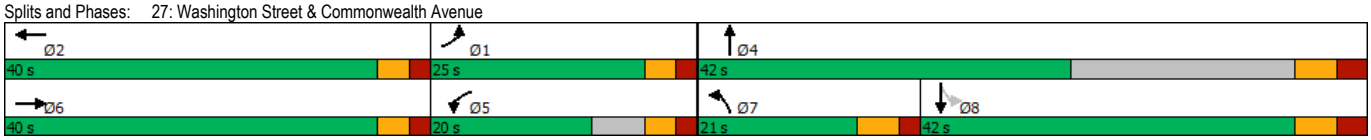
Intersection Summary

Area Type: Other
Cycle Length: 128
Actuated Cycle Length: 98.3
Natural Cycle: 110
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.15
Intersection Signal Delay: 57.8 — Intersection LOS: E
Intersection Capacity Utilization 101.7% — ICU Level of Service G
Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

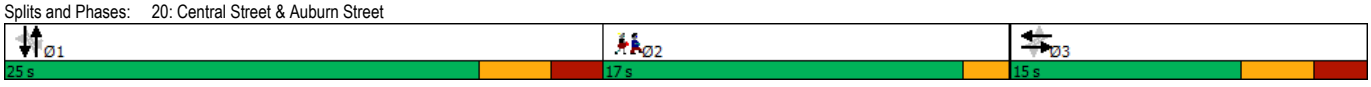
Splits and Phases: 27: Washington Street & Commonwealth Avenue



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø2
Lane Configurations													
Traffic Volume (vph)	20	85	5	45	95	105	10	390	65	120	270	10	
Future Volume (vph)	20	85	5	45	95	105	10	390	65	120	270	10	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	12	16	12	12	15	12	12	16	12	12	16	12	
Storage Length (ft)	0		0	0		0	0		75	0		0	
Storage Lanes	0		0	0		0	0		1	0		0	
Taper Length (ft)	25			25			25			25			
Satd. Flow (prot)	0	2080	0	0	1908	0	0	2109	1583	0	2092	0	
Flt Permitted		0.909			0.906			0.987			0.699		
Satd. Flow (perm)	0	1906	0	0	1744	0	0	2083	1546	0	1484	0	
Right Turn on Red			Yes			Yes			Yes			Yes	
Satd. Flow (RTOR)		3			57				82		3		
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		598			316			1117			312		
Travel Time (s)		13.6			7.2			25.4			7.1		
Confl. Peds. (#/hr)	3					3	9		2	2		9	
Confl. Bikes (#/hr)									1				
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	
Heavy Vehicles (%)	2%	2%	2%	1%	1%	1%	2%	2%	2%	1%	1%	1%	
Shared Lane Traffic (%)													
Lane Group Flow (vph)	0	119	0	0	266	0	0	435	71	0	434	0	
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA		
Protected Phases		3			3			1			1		2
Permitted Phases	3			3			1		1	1			
Detector Phase	3	3		3	3		1	1	1	1	1		
Switch Phase													
Minimum Initial (s)	17.0	17.0		17.0	17.0		30.0	30.0	30.0	30.0	30.0		15.0
Minimum Split (s)	22.3	22.3		22.3	22.3		35.2	35.2	35.2	35.2	35.2		17.0
Total Split (s)	15.0	15.0		15.0	15.0		25.0	25.0	25.0	25.0	25.0		17.0
Total Split (%)	26.3%	26.3%		26.3%	26.3%		43.9%	43.9%	43.9%	43.9%	43.9%		30%
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0		2.0
All-Red Time (s)	2.3	2.3		2.3	2.3		2.2	2.2	2.2	2.2	2.2		0.0
Lost Time Adjust (s)		0.0			0.0			0.0	0.0		0.0		
Total Lost Time (s)		5.3			5.3			5.2	5.2		5.2		
Lead/Lag							Lead	Lead	Lead	Lead	Lead		Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes		Yes
Recall Mode	Min	Min		Min	Min		Min	Min	Min	Min	Min		None
Act Effct Green (s)		9.9			9.9			20.2	20.2		20.2		
Actuated g/C Ratio		0.23			0.23			0.47	0.47		0.47		
v/c Ratio		0.27			0.60			0.45	0.09		0.63		
Control Delay		17.5			21.8			11.3	3.3		17.3		
Queue Delay		0.0			0.0			0.0	0.0		0.0		
Total Delay		17.5			21.8			11.3	3.3		17.3		
LOS		B			C			B	A		B		
Approach Delay		17.5			21.8			10.2			17.3		
Approach LOS		B			C			B			B		
Queue Length 50th (ft)		21			40			54	0		60		
Queue Length 95th (ft)		76			#174			199	19		#280		
Internal Link Dist (ft)		518			236			1037			232		
Turn Bay Length (ft)									75				
Base Capacity (vph)		436			442			969	763		692		
Starvation Cap Reductn		0			0			0	0		0		
Spillback Cap Reductn		0			0			0	0		0		
Storage Cap Reductn		0			0			0	0		0		
Reduced v/c Ratio		0.27			0.60			0.45	0.09		0.63		

Intersection Summary			
Area Type:	Other		
Cycle Length: 57			
Actuated Cycle Length: 43.4			
Natural Cycle: 75			
Control Type: Semi Act-Uncoord			
Maximum v/c Ratio: 0.63			
Intersection Signal Delay: 15.5		Intersection LOS: B	
Intersection Capacity Utilization 81.9%		ICU Level of Service D	
Analysis Period (min) 15			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			

Splits and Phases: 20: Central Street & Auburn Street



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	45	515	80	235	305	35	60	1140	240	30	1010	25
Future Volume (vph)	45	515	80	235	305	35	60	1140	240	30	1010	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	80		350	100		0	150		0	0		0
Storage Lanes	1		1	1		0	1		0	0		0
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	1787	3490	0	1770	3478	0	1787	3469	0	0	3558	0
Flt Permitted	0.950			0.950			0.950				0.659	
Satd. Flow (perm)	1778	3490	0	1759	3478	0	1785	3469	0	0	2347	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		13			9			25			2	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		453			516			466			1829	
Travel Time (s)		10.3			11.7			10.6			41.6	
Confl. Peds. (#/hr)	6		10	10		6	3		4	4		3
Confl. Bikes (#/hr)						2						1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	1%	1%	1%	1%	1%	1%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	49	647	0	255	370	0	65	1500	0	0	1158	0
Turn Type	Prot	NA		Prot	NA		Prot	NA		Perm	NA	
Protected Phases	1	6		5	2		7	4			8	
Permitted Phases										8		
Detector Phase	1	6		5	2		7	4		8	8	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Minimum Split (s)	11.0	31.0		11.0	31.0		12.0	24.0		26.0	26.0	
Total Split (s)	25.0	40.0		20.0	40.0		21.0	42.0		42.0	42.0	
Total Split (%)	19.5%	31.3%		15.6%	31.3%		16.4%	32.8%		32.8%	32.8%	
Yellow Time (s)	3.0	3.0		3.0	3.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	3.0		3.0	3.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0			0.0	
Total Lost Time (s)	5.0	5.0		5.0	5.0		6.0	7.0			7.0	
Lead/Lag	Lag	Lead		Lag	Lead		Lead			Lag	Lag	
Lead-Lag Optimize?												
Recall Mode	None	Min		None	Min		None	None		None	None	
Act Effct Green (s)	15.8	23.6		15.1	28.0		8.6	47.2			35.5	
Actuated g/C Ratio	0.15	0.23		0.15	0.27		0.08	0.46			0.34	
v/c Ratio	0.18	0.80		0.98	0.39		0.44	0.94			1.43	
Control Delay	39.5	45.3		99.0	36.1		57.6	39.1			230.2	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0			0.0	
Total Delay	39.5	45.3		99.0	36.1		57.6	39.1			230.2	
LOS	D	D		F	D		E	D			F	
Approach Delay		44.9			61.8			39.8			230.2	
Approach LOS		D			E			D			F	
Queue Length 50th (ft)	27	214		~178	123		43	475			~575	
Queue Length 95th (ft)	67	291		#395	176		93	#730			#823	
Internal Link Dist (ft)		373			436			386			1749	
Turn Bay Length (ft)	80			100			150					
Base Capacity (vph)	385	1210		348	1241		264	1923			809	
Starvation Cap Reductn	0	0		0	0		0	0			0	
Spillback Cap Reductn	0	0		0	0		0	0			0	
Storage Cap Reductn	0	0		0	0		0	0			0	
Reduced v/c Ratio	0.13	0.53		0.73	0.30		0.25	0.78			1.43	

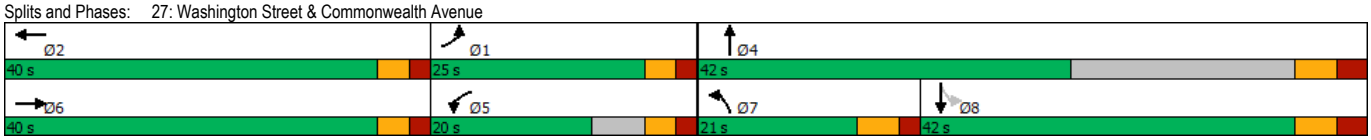
Intersection Summary

Area Type: Other
Cycle Length: 128
Actuated Cycle Length: 103.2
Natural Cycle: 120
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.43
Intersection Signal Delay: 98.6 Intersection LOS: F
Intersection Capacity Utilization 95.9% ICU Level of Service F
Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

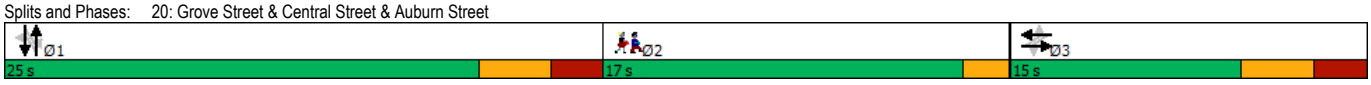
Splits and Phases: 27: Washington Street & Commonwealth Avenue



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø2
Lane Configurations													
Traffic Volume (vph)	10	25	2	15	20	70	2	235	20	70	165	10	
Future Volume (vph)	10	25	2	15	20	70	2	235	20	70	165	10	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	12	16	12	12	15	12	12	16	12	12	16	12	
Storage Length (ft)	0		0	0		0	0		75	0		0	
Storage Lanes	0		0	0		0	0		1	0		0	
Taper Length (ft)	25			25			25			25			
Satd. Flow (prot)	0	2106	0	0	1820	0	0	2091	1568	0	2066	0	
Flt Permitted		0.901			0.954			0.998			0.847		
Satd. Flow (perm)	0	1922	0	0	1747	0	0	2086	1517	0	1770	0	
Right Turn on Red			Yes			Yes			Yes			Yes	
Satd. Flow (RTOR)		2			76				82		4		
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		598			316			1117			312		
Travel Time (s)		13.6			7.2			25.4			7.1		
Confl. Peds. (#/hr)	2		2	2		2	11		9	9		11	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	
Heavy Vehicles (%)	0%	0%	0%	2%	2%	2%	3%	3%	3%	2%	2%	2%	
Shared Lane Traffic (%)													
Lane Group Flow (vph)	0	40	0	0	114	0	0	257	22	0	266	0	
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA		
Protected Phases		3			3			1			1		2
Permitted Phases	3			3			1		1	1			
Detector Phase	3	3		3	3		1	1	1	1	1		
Switch Phase													
Minimum Initial (s)	17.0	17.0		17.0	17.0		30.0	30.0	30.0	30.0	30.0		15.0
Minimum Split (s)	22.3	22.3		22.3	22.3		35.2	35.2	35.2	35.2	35.2		17.0
Total Split (s)	15.0	15.0		15.0	15.0		25.0	25.0	25.0	25.0	25.0		17.0
Total Split (%)	26.3%	26.3%		26.3%	26.3%		43.9%	43.9%	43.9%	43.9%	43.9%		30%
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0		2.0
All-Red Time (s)	2.3	2.3		2.3	2.3		2.2	2.2	2.2	2.2	2.2		0.0
Lost Time Adjust (s)		0.0			0.0			0.0	0.0		0.0		
Total Lost Time (s)		5.3			5.3			5.2	5.2		5.2		
Lead/Lag							Lead	Lead	Lead	Lead	Lead		Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes		Yes
Recall Mode	Min	Min		Min	Min		Min	Min	Min	Min	Min		None
Act Effct Green (s)		9.9			9.9			20.2	20.2		20.2		
Actuated g/C Ratio		0.23			0.23			0.47	0.47		0.47		
v/c Ratio		0.09			0.25			0.26	0.03		0.32		
Control Delay		15.9			9.6			9.6	0.1		10.2		
Queue Delay		0.0			0.0			0.0	0.0		0.0		
Total Delay		15.9			9.6			9.6	0.1		10.2		
LOS		B			A			A	A		B		
Approach Delay		15.9			9.6			8.9			10.2		
Approach LOS		B			A			A			B		
Queue Length 50th (ft)		7			7			29	0		31		
Queue Length 95th (ft)		33			48			114	0		122		
Internal Link Dist (ft)		518			236			1037			232		
Turn Bay Length (ft)									75				
Base Capacity (vph)		439			457			970	750		826		
Starvation Cap Reductn		0			0			0	0		0		
Spillback Cap Reductn		0			0			0	0		0		
Storage Cap Reductn		0			0			0	0		0		
Reduced v/c Ratio		0.09			0.25			0.26	0.03		0.32		

Intersection Summary			
Area Type:	Other		
Cycle Length: 57			
Actuated Cycle Length: 43.4			
Natural Cycle: 75			
Control Type: Semi Act-Uncoord			
Maximum v/c Ratio: 0.32			
Intersection Signal Delay: 9.9		Intersection LOS: A	
Intersection Capacity Utilization 77.3%		ICU Level of Service D	
Analysis Period (min) 15			

Splits and Phases: 20: Grove Street & Central Street & Auburn Street

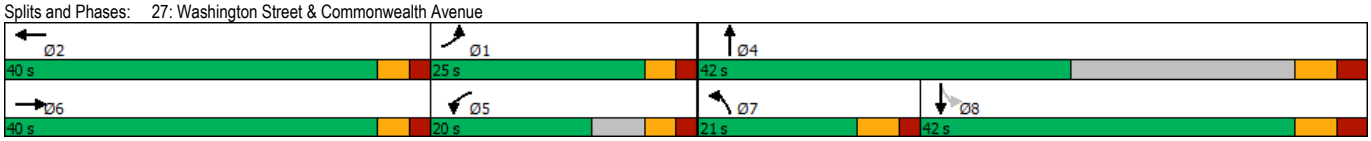


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	25	345	65	130	215	30	55	785	165	30	615	20
Future Volume (vph)	25	345	65	130	215	30	55	785	165	30	615	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	80		350	100		0	150		0	0		0
Storage Lanes	1		1	1		0	1		0	0		0
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	1752	3413	0	1770	3466	0	1770	3429	0	0	3513	0
Flt Permitted	0.950			0.950			0.950				0.846	
Satd. Flow (perm)	1751	3413	0	1767	3466	0	1767	3429	0	0	2977	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		17			12			25			2	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		453			516			466			1829	
Travel Time (s)		10.3			11.7			10.6			41.6	
Confl. Peds. (#/hr)	1		2	2		1	2		7	7		2
Confl. Bikes (#/hr)									6			
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	3%	3%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	27	446	0	141	267	0	60	1032	0	0	723	0
Turn Type	Prot	NA		Prot	NA		Prot	NA		Perm	NA	
Protected Phases	1	6		5	2		7	4			8	
Permitted Phases										8		
Detector Phase	1	6		5	2		7	4		8	8	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Minimum Split (s)	11.0	31.0		11.0	31.0		12.0	24.0		26.0	26.0	
Total Split (s)	25.0	40.0		20.0	40.0		21.0	42.0		42.0	42.0	
Total Split (%)	19.5%	31.3%		15.6%	31.3%		16.4%	32.8%		32.8%	32.8%	
Yellow Time (s)	3.0	3.0		3.0	3.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	3.0		3.0	3.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0			0.0	
Total Lost Time (s)	5.0	5.0		5.0	5.0		6.0	7.0			7.0	
Lead/Lag	Lag	Lead		Lag	Lead		Lead			Lag	Lag	
Lead-Lag Optimize?												
Recall Mode	None	Min		None	Min		None	None		None	None	
Act Effct Green (s)	10.2	16.9		11.5	26.4		8.2	39.2			28.5	
Actuated g/C Ratio	0.12	0.20		0.13	0.31		0.10	0.46			0.33	
v/c Ratio	0.13	0.65		0.59	0.25		0.36	0.65			0.73	
Control Delay	39.8	37.3		50.6	27.8		48.6	19.8			32.2	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0			0.0	
Total Delay	39.8	37.3		50.6	27.8		48.6	19.8			32.2	
LOS	D	D		D	C		D	B			C	
Approach Delay		37.5			35.7			21.4			32.2	
Approach LOS		D			D			C			C	
Queue Length 50th (ft)	15	118		75	48		32	207			185	
Queue Length 95th (ft)	44	193		163	117		83	343			315	
Internal Link Dist (ft)		373			436			386			1749	
Turn Bay Length (ft)	80			100			150					
Base Capacity (vph)	435	1494		440	1515		330	2355			1297	
Starvation Cap Reductn	0	0		0	0		0	0			0	
Spillback Cap Reductn	0	0		0	0		0	0			0	
Storage Cap Reductn	0	0		0	0		0	0			0	
Reduced v/c Ratio	0.06	0.30		0.32	0.18		0.18	0.44			0.56	

Intersection Summary

Area Type: Other
Cycle Length: 128
Actuated Cycle Length: 85.8
Natural Cycle: 80
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.73
Intersection Signal Delay: 29.3 — Intersection LOS: C
Intersection Capacity Utilization 79.4% — ICU Level of Service D
Analysis Period (min) 15

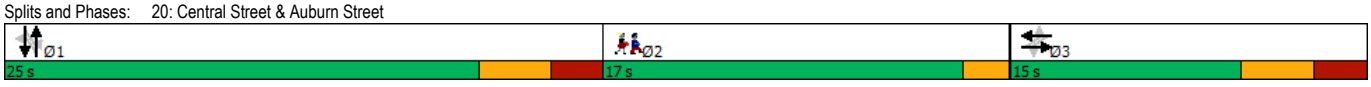
Splits and Phases: 27: Washington Street & Commonwealth Avenue



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø2
Lane Configurations													
Traffic Volume (vph)	35	85	5	115	60	100	20	480	100	90	245	10	
Future Volume (vph)	35	85	5	115	60	100	20	480	100	90	245	10	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	12	16	12	12	15	12	12	16	12	12	16	12	
Storage Length (ft)	0		0	0		0	0		75	0		0	
Storage Lanes	0		0	0		0	0		1	0		0	
Taper Length (ft)	25			25			25			25			
Satd. Flow (prot)	0	2071	0	0	1908	0	0	2107	1583	0	2073	0	
Flt Permitted		0.827			0.827			0.977			0.652		
Satd. Flow (perm)	0	1735	0	0	1610	0	0	2062	1541	0	1368	0	
Right Turn on Red			Yes			Yes			Yes			Yes	
Satd. Flow (RTOR)		3			44				82		3		
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		598			316			1117			312		
Travel Time (s)		13.6			7.2			25.4			7.1		
Confl. Peds. (#/hr)	3					3	15		4	4		15	
Confl. Bikes (#/hr)									1			3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	
Heavy Vehicles (%)	2%	2%	2%	1%	1%	1%	2%	2%	2%	2%	2%	2%	
Shared Lane Traffic (%)													
Lane Group Flow (vph)	0	135	0	0	299	0	0	544	109	0	375	0	
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA		
Protected Phases		3			3			1			1		2
Permitted Phases	3			3			1		1	1			
Detector Phase	3	3		3	3		1	1	1	1	1		
Switch Phase													
Minimum Initial (s)	17.0	17.0		17.0	17.0		30.0	30.0	30.0	30.0	30.0		15.0
Minimum Split (s)	22.3	22.3		22.3	22.3		35.2	35.2	35.2	35.2	35.2		17.0
Total Split (s)	15.0	15.0		15.0	15.0		25.0	25.0	25.0	25.0	25.0		17.0
Total Split (%)	26.3%	26.3%		26.3%	26.3%		43.9%	43.9%	43.9%	43.9%	43.9%		30%
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0		2.0
All-Red Time (s)	2.3	2.3		2.3	2.3		2.2	2.2	2.2	2.2	2.2		0.0
Lost Time Adjust (s)		0.0			0.0			0.0	0.0		0.0		
Total Lost Time (s)		5.3			5.3			5.2	5.2		5.2		
Lead/Lag							Lead	Lead	Lead	Lead	Lead		Lag
Lead-Lag Optimize?													
Recall Mode	Min	Min		Min	Min		Min	Min	Min	Min	Min		None
Act Effct Green (s)		9.9			9.9			20.2	20.2		20.2		
Actuated g/C Ratio		0.23			0.23			0.47	0.47		0.47		
v/c Ratio		0.34			0.75			0.57	0.14		0.59		
Control Delay		18.6			30.7			13.7	4.7		16.6		
Queue Delay		0.0			0.0			0.0	0.0		0.0		
Total Delay		18.6			30.7			13.7	4.7		16.6		
LOS		B			C			B	A		B		
Approach Delay		18.6			30.7			12.2			16.6		
Approach LOS		B			C			B			B		
Queue Length 50th (ft)		24			51			73	3		51		
Queue Length 95th (ft)		86			#224			#299	33		#242		
Internal Link Dist (ft)		518			236			1037			232		
Turn Bay Length (ft)									75				
Base Capacity (vph)		398			400			959	761		638		
Starvation Cap Reductn		0			0			0	0		0		
Spillback Cap Reductn		0			0			0	0		0		
Storage Cap Reductn		0			0			0	0		0		
Reduced v/c Ratio		0.34			0.75			0.57	0.14		0.59		

Intersection Summary			
Area Type:	Other		
Cycle Length: 57			
Actuated Cycle Length: 43.4			
Natural Cycle: 75			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.75			
Intersection Signal Delay: 17.7		Intersection LOS: B	
Intersection Capacity Utilization 86.9%		ICU Level of Service E	
Analysis Period (min) 15			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			

Splits and Phases: 20: Central Street & Auburn Street

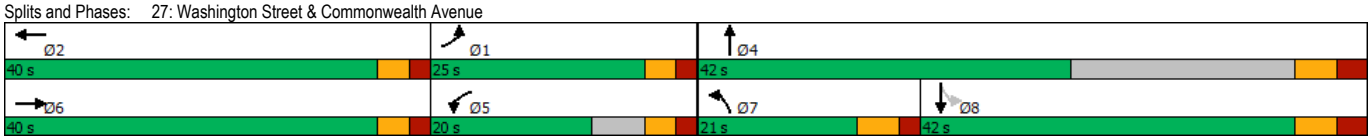


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	30	440	65	235	495	25	45	1005	220	45	850	25
Future Volume (vph)	30	440	65	235	495	25	45	1005	220	45	850	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	80		350	100		0	150		0	0		0
Storage Lanes	1		1	1		0	1		0	0		0
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	1736	3387	0	1752	3477	0	1752	3388	0	0	3516	0
Flt Permitted	0.950			0.950			0.950				0.672	
Satd. Flow (perm)	1732	3387	0	1729	3477	0	1750	3388	0	0	2368	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		13			4			26			2	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		453			516			466			1829	
Travel Time (s)		10.3			11.7			10.6			41.6	
Confl. Peds. (#/hr)	3		19	19		3	3		11	11		3
Confl. Bikes (#/hr)			1			4						1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	4%	4%	4%	3%	3%	3%	3%	3%	3%	2%	2%	2%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	33	549	0	255	565	0	49	1331	0	0	1000	0
Turn Type	Prot	NA		Prot	NA		Prot	NA		Perm	NA	
Protected Phases	1	6		5	2		7	4			8	
Permitted Phases										8		
Detector Phase	1	6		5	2		7	4		8	8	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Minimum Split (s)	11.0	31.0		11.0	31.0		12.0	24.0		26.0	26.0	
Total Split (s)	25.0	40.0		20.0	40.0		21.0	42.0		42.0	42.0	
Total Split (%)	19.5%	31.3%		15.6%	31.3%		16.4%	32.8%		32.8%	32.8%	
Yellow Time (s)	3.0	3.0		3.0	3.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	3.0		3.0	3.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0			0.0	
Total Lost Time (s)	5.0	5.0		5.0	5.0		6.0	7.0			7.0	
Lead/Lag	Lag	Lead		Lag	Lead		Lead			Lag	Lag	
Lead-Lag Optimize?												
Recall Mode	None	Min		None	Min		None	None		None	None	
Act Effct Green (s)	10.6	20.3		15.1	29.8		7.7	46.2			35.5	
Actuated g/C Ratio	0.11	0.21		0.15	0.30		0.08	0.47			0.36	
v/c Ratio	0.18	0.78		0.95	0.54		0.36	0.83			1.18	
Control Delay	44.0	45.0		88.7	33.9		53.8	28.6			123.2	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0			0.0	
Total Delay	44.0	45.0		88.7	33.9		53.8	28.6			123.2	
LOS	D	D		F	C		D	C			F	
Approach Delay		44.9			51.0			29.5			123.2	
Approach LOS		D			D			C			F	
Queue Length 50th (ft)	19	173		165	181		31	362			~416	
Queue Length 95th (ft)	51	241		#368	250		72	523			#629	
Internal Link Dist (ft)		373			436			386			1749	
Turn Bay Length (ft)	80			100			150					
Base Capacity (vph)	355	1223		359	1269		269	1954			850	
Starvation Cap Reductn	0	0		0	0		0	0			0	
Spillback Cap Reductn	0	0		0	0		0	0			0	
Storage Cap Reductn	0	0		0	0		0	0			0	
Reduced v/c Ratio	0.09	0.45		0.71	0.45		0.18	0.68			1.18	

Intersection Summary

Area Type: Other
Cycle Length: 128
Actuated Cycle Length: 98.9
Natural Cycle: 120
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.18
Intersection Signal Delay: 61.3 Intersection LOS: E
Intersection Capacity Utilization 102.8% ICU Level of Service G
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

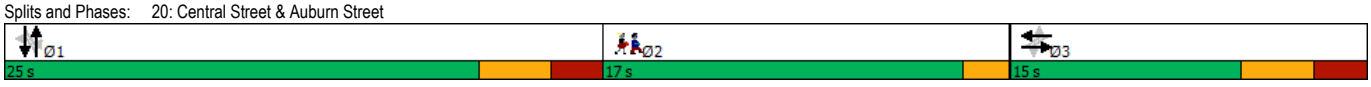
Splits and Phases: 27: Washington Street & Commonwealth Avenue



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø2
Lane Configurations													
Traffic Volume (vph)	20	85	5	75	95	105	10	405	100	120	275	10	
Future Volume (vph)	20	85	5	75	95	105	10	405	100	120	275	10	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	12	16	12	12	15	12	12	16	12	12	16	12	
Storage Length (ft)	0		0	0		0	0		75	0		0	
Storage Lanes	0		0	0		0	0		1	0		0	
Taper Length (ft)	25			25			25			25			
Satd. Flow (prot)	0	2080	0	0	1915	0	0	2109	1583	0	2092	0	
Flt Permitted		0.896			0.867			0.987			0.682		
Satd. Flow (perm)	0	1879	0	0	1684	0	0	2083	1546	0	1448	0	
Right Turn on Red			Yes			Yes			Yes			Yes	
Satd. Flow (RTOR)		3			47				94		2		
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		598			316			1117			312		
Travel Time (s)		13.6			7.2			25.4			7.1		
Confl. Peds. (#/hr)	3					3	9		2	2		9	
Confl. Bikes (#/hr)									1				
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	
Heavy Vehicles (%)	2%	2%	2%	1%	1%	1%	2%	2%	2%	1%	1%	1%	
Shared Lane Traffic (%)													
Lane Group Flow (vph)	0	119	0	0	299	0	0	451	109	0	440	0	
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA		
Protected Phases		3			3			1			1		2
Permitted Phases	3			3			1		1	1			
Detector Phase	3	3		3	3		1	1	1	1	1		
Switch Phase													
Minimum Initial (s)	17.0	17.0		17.0	17.0		30.0	30.0	30.0	30.0	30.0		15.0
Minimum Split (s)	22.3	22.3		22.3	22.3		35.2	35.2	35.2	35.2	35.2		17.0
Total Split (s)	15.0	15.0		15.0	15.0		25.0	25.0	25.0	25.0	25.0		17.0
Total Split (%)	26.3%	26.3%		26.3%	26.3%		43.9%	43.9%	43.9%	43.9%	43.9%		30%
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0		2.0
All-Red Time (s)	2.3	2.3		2.3	2.3		2.2	2.2	2.2	2.2	2.2		0.0
Lost Time Adjust (s)		0.0			0.0			0.0	0.0		0.0		
Total Lost Time (s)		5.3			5.3			5.2	5.2		5.2		
Lead/Lag							Lead	Lead	Lead	Lead	Lead		Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes		Yes
Recall Mode	Min	Min		Min	Min		Min	Min	Min	Min	Min		None
Act Effct Green (s)		9.9			9.9			20.2	20.2		20.2		
Actuated g/C Ratio		0.23			0.23			0.47	0.47		0.47		
v/c Ratio		0.28			0.71			0.47	0.14		0.65		
Control Delay		17.5			28.0			11.5	4.1		18.4		
Queue Delay		0.0			0.0			0.0	0.0		0.0		
Total Delay		17.5			28.0			11.5	4.1		18.4		
LOS		B			C			B	A		B		
Approach Delay		17.5			28.0			10.1			18.4		
Approach LOS		B			C			B			B		
Queue Length 50th (ft)		21			50			57	2		62		
Queue Length 95th (ft)		76			#217			208	30		#291		
Internal Link Dist (ft)		518			236			1037			232		
Turn Bay Length (ft)									75				
Base Capacity (vph)		430			419			969	769		674		
Starvation Cap Reductn		0			0			0	0		0		
Spillback Cap Reductn		0			0			0	0		0		
Storage Cap Reductn		0			0			0	0		0		
Reduced v/c Ratio		0.28			0.71			0.47	0.14		0.65		

Intersection Summary			
Area Type:	Other		
Cycle Length: 57			
Actuated Cycle Length: 43.4			
Natural Cycle: 75			
Control Type: Semi Act-Uncoord			
Maximum v/c Ratio: 0.71			
Intersection Signal Delay: 17.1		Intersection LOS: B	
Intersection Capacity Utilization 85.4%		ICU Level of Service E	
Analysis Period (min) 15			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			

Splits and Phases: 20: Central Street & Auburn Street



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	45	515	80	245	305	35	60	1140	260	30	1010	25
Future Volume (vph)	45	515	80	245	305	35	60	1140	260	30	1010	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	80		350	100		0	150		0	0		0
Storage Lanes	1		1	1		0	1		0	0		0
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	1787	3490	0	1770	3478	0	1787	3461	0	0	3558	0
Flt Permitted	0.950			0.950			0.950				0.645	
Satd. Flow (perm)	1778	3490	0	1759	3478	0	1785	3461	0	0	2297	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		13			9			27			2	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		453			516			466			1829	
Travel Time (s)		10.3			11.7			10.6			41.6	
Confl. Peds. (#/hr)	6		10	10		6	3		4	4		3
Confl. Bikes (#/hr)						2						1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	1%	1%	1%	1%	1%	1%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	49	647	0	266	370	0	65	1522	0	0	1158	0
Turn Type	Prot	NA		Prot	NA		Prot	NA		Perm	NA	
Protected Phases	1	6		5	2		7	4			8	
Permitted Phases										8		
Detector Phase	1	6		5	2		7	4		8	8	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Minimum Split (s)	11.0	31.0		11.0	31.0		12.0	24.0		26.0	26.0	
Total Split (s)	25.0	40.0		20.0	40.0		21.0	42.0		42.0	42.0	
Total Split (%)	19.5%	31.3%		15.6%	31.3%		16.4%	32.8%		32.8%	32.8%	
Yellow Time (s)	3.0	3.0		3.0	3.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	3.0		3.0	3.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0			0.0	
Total Lost Time (s)	5.0	5.0		5.0	5.0		6.0	7.0			7.0	
Lead/Lag	Lag	Lead		Lag	Lead		Lead			Lag	Lag	
Lead-Lag Optimize?												
Recall Mode	None	Min		None	Min		None	None		None	None	
Act Effct Green (s)	15.8	23.6		15.2	28.1		8.6	47.2			35.5	
Actuated g/C Ratio	0.15	0.23		0.15	0.27		0.08	0.46			0.34	
v/c Ratio	0.18	0.80		1.02	0.39		0.44	0.95			1.46	
Control Delay	39.5	45.3		107.6	36.1		57.7	41.5			244.4	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0			0.0	
Total Delay	39.5	45.3		107.6	36.1		57.7	41.5			244.4	
LOS	D	D		F	D		E	D			F	
Approach Delay		44.9			66.0			42.1			244.4	
Approach LOS		D			E			D			F	
Queue Length 50th (ft)	27	214		~198	123		43	488			~581	
Queue Length 95th (ft)	67	291		#415	176		93	#749			#829	
Internal Link Dist (ft)		373			436			386			1749	
Turn Bay Length (ft)	80			100			150					
Base Capacity (vph)	384	1209		347	1240		263	1917			791	
Starvation Cap Reductn	0	0		0	0		0	0			0	
Spillback Cap Reductn	0	0		0	0		0	0			0	
Storage Cap Reductn	0	0		0	0		0	0			0	
Reduced v/c Ratio	0.13	0.54		0.77	0.30		0.25	0.79			1.46	

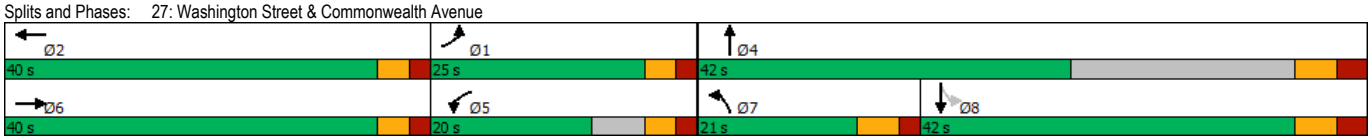
Intersection Summary

Area Type: Other
Cycle Length: 128
Actuated Cycle Length: 103.3
Natural Cycle: 130
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.46
Intersection Signal Delay: 103.8 — Intersection LOS: F
Intersection Capacity Utilization 96.4% — ICU Level of Service F
Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

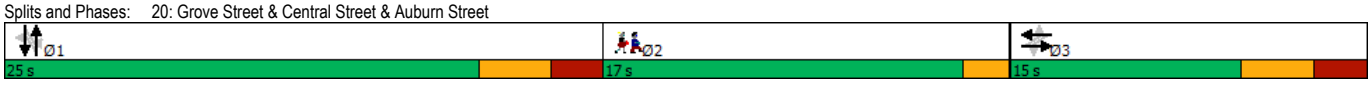
Splits and Phases: 27: Washington Street & Commonwealth Avenue



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø2
Lane Configurations													
Traffic Volume (vph)	10	25	2	55	20	70	2	245	45	70	175	10	
Future Volume (vph)	10	25	2	55	20	70	2	245	45	70	175	10	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	12	16	12	12	15	12	12	16	12	12	16	12	
Storage Length (ft)	0		0	0		0	0		75	0		0	
Storage Lanes	0		0	0		0	0		1	0		0	
Taper Length (ft)	25			25			25			25			
Satd. Flow (prot)	0	2106	0	0	1856	0	0	2091	1568	0	2068	0	
Flt Permitted		0.889			0.858			0.998			0.849		
Satd. Flow (perm)	0	1896	0	0	1620	0	0	2086	1517	0	1777	0	
Right Turn on Red			Yes			Yes			Yes			Yes	
Satd. Flow (RTOR)		2			71				82		4		
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		598			316			1117			312		
Travel Time (s)		13.6			7.2			25.4			7.1		
Confl. Peds. (#/hr)	2		2	2		2	11		9	9		11	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	
Heavy Vehicles (%)	0%	0%	0%	2%	2%	2%	3%	3%	3%	2%	2%	2%	
Shared Lane Traffic (%)													
Lane Group Flow (vph)	0	40	0	0	158	0	0	268	49	0	277	0	
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA		
Protected Phases		3			3			1			1		2
Permitted Phases	3			3			1		1	1			
Detector Phase	3	3		3	3		1	1	1	1	1		
Switch Phase													
Minimum Initial (s)	17.0	17.0		17.0	17.0		30.0	30.0	30.0	30.0	30.0		15.0
Minimum Split (s)	22.3	22.3		22.3	22.3		35.2	35.2	35.2	35.2	35.2		17.0
Total Split (s)	15.0	15.0		15.0	15.0		25.0	25.0	25.0	25.0	25.0		17.0
Total Split (%)	26.3%	26.3%		26.3%	26.3%		43.9%	43.9%	43.9%	43.9%	43.9%		30%
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0		2.0
All-Red Time (s)	2.3	2.3		2.3	2.3		2.2	2.2	2.2	2.2	2.2		0.0
Lost Time Adjust (s)		0.0			0.0			0.0	0.0		0.0		
Total Lost Time (s)		5.3			5.3			5.2	5.2		5.2		
Lead/Lag							Lead	Lead	Lead	Lead	Lead		Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes		Yes
Recall Mode	Min	Min		Min	Min		Min	Min	Min	Min	Min		None
Act Effct Green (s)		9.9			9.9			20.2	20.2		20.2		
Actuated g/C Ratio		0.23			0.23			0.47	0.47		0.47		
v/c Ratio		0.09			0.37			0.28	0.07		0.33		
Control Delay		15.9			13.1			9.7	2.0		10.3		
Queue Delay		0.0			0.0			0.0	0.0		0.0		
Total Delay		15.9			13.1			9.7	2.0		10.3		
LOS		B			B			A	A		B		
Approach Delay		15.9			13.1			8.5			10.3		
Approach LOS		B			B			A			B		
Queue Length 50th (ft)		7			16			30	0		32		
Queue Length 95th (ft)		33			73			119	10		128		
Internal Link Dist (ft)		518			236			1037			232		
Turn Bay Length (ft)									75				
Base Capacity (vph)		434			424			970	750		829		
Starvation Cap Reductn		0			0			0	0		0		
Spillback Cap Reductn		0			0			0	0		0		
Storage Cap Reductn		0			0			0	0		0		
Reduced v/c Ratio		0.09			0.37			0.28	0.07		0.33		

Intersection Summary			
Area Type:	Other		
Cycle Length: 57			
Actuated Cycle Length: 43.4			
Natural Cycle: 75			
Control Type: Semi Act-Uncoord			
Maximum v/c Ratio: 0.37			
Intersection Signal Delay: 10.4		Intersection LOS: B	
Intersection Capacity Utilization 77.3%		ICU Level of Service D	
Analysis Period (min) 15			

Splits and Phases: 20: Grove Street & Central Street & Auburn Street

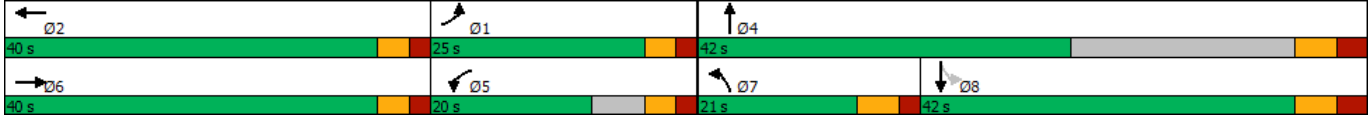


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	25	345	65	145	215	30	55	785	180	30	615	20
Future Volume (vph)	25	345	65	145	215	30	55	785	180	30	615	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	80		350	100		0	150		0	0		0
Storage Lanes	1		1	1		0	1		0	0		0
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	1752	3413	0	1770	3466	0	1770	3421	0	0	3513	0
Flt Permitted	0.950			0.950			0.950				0.844	
Satd. Flow (perm)	1751	3413	0	1767	3466	0	1767	3421	0	0	2970	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		17			12			28			2	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		453			516			466			1829	
Travel Time (s)		10.3			11.7			10.6			41.6	
Confl. Peds. (#/hr)	1		2	2		1	2		7	7		2
Confl. Bikes (#/hr)									6			
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	3%	3%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	27	446	0	158	267	0	60	1049	0	0	723	0
Turn Type	Prot	NA		Prot	NA		Prot	NA		Perm	NA	
Protected Phases	1	6		5	2		7	4			8	
Permitted Phases										8		
Detector Phase	1	6		5	2		7	4		8	8	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Minimum Split (s)	11.0	31.0		11.0	31.0		12.0	24.0		26.0	26.0	
Total Split (s)	25.0	40.0		20.0	40.0		21.0	42.0		42.0	42.0	
Total Split (%)	19.5%	31.3%		15.6%	31.3%		16.4%	32.8%		32.8%	32.8%	
Yellow Time (s)	3.0	3.0		3.0	3.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	3.0		3.0	3.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0			0.0	
Total Lost Time (s)	5.0	5.0		5.0	5.0		6.0	7.0			7.0	
Lead/Lag	Lag	Lead		Lag	Lead		Lead			Lag	Lag	
Lead-Lag Optimize?												
Recall Mode	None	Min		None	Min		None	None		None	None	
Act Effct Green (s)	10.3	17.0		12.2	26.9		8.2	39.6			28.9	
Actuated g/C Ratio	0.12	0.20		0.14	0.31		0.09	0.46			0.33	
v/c Ratio	0.13	0.66		0.64	0.25		0.36	0.67			0.73	
Control Delay	39.9	37.9		52.1	27.9		49.1	20.3			32.5	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0			0.0	
Total Delay	39.9	37.9		52.1	27.9		49.1	20.3			32.5	
LOS	D	D		D	C		D	C			C	
Approach Delay		38.0			36.9			21.9			32.5	
Approach LOS		D			D			C			C	
Queue Length 50th (ft)	15	120		85	49		33	217			188	
Queue Length 95th (ft)	44	193		#189	117		83	350			315	
Internal Link Dist (ft)		373			436			386			1749	
Turn Bay Length (ft)	80			100			150					
Base Capacity (vph)	430	1471		433	1492		324	2331			1273	
Starvation Cap Reductn	0	0		0	0		0	0			0	
Spillback Cap Reductn	0	0		0	0		0	0			0	
Storage Cap Reductn	0	0		0	0		0	0			0	
Reduced v/c Ratio	0.06	0.30		0.36	0.18		0.19	0.45			0.57	

Intersection Summary

Area Type: Other
Cycle Length: 128
Actuated Cycle Length: 86.8
Natural Cycle: 80
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.73
Intersection Signal Delay: 29.8 — Intersection LOS: C
Intersection Capacity Utilization 80.2% — ICU Level of Service D
Analysis Period (min) 15
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 27: Washington Street & Commonwealth Avenue



Minor Comments – Transit Capacity Analysis Comment 1

Updated Transit Capacity Charts

Table 4 MBTA Green Line D Branch Capacity by Service Period: Existing and Expected Future with Type 10 Train Cars in Operation

		Today's Green Line Operations				*Operations with Supercar Trains*
Weekday Service Period	Time	MBTA Policy Max Passenger Load/Train[1]	Train Headways (minutes)[2]	Trains per 30 Minutes	**Policy Max Passenger Load per 30-Minute**	**Policy Max Passenger Load per 30-Minute[3]**
Sunrise	3:00 AM - 5:59 AM	200	11	2.7	545	982
Early AM	6:00 AM - 6:29 AM	200	6	5.0	1,000	1,800
Early AM (Rush Hr)	6:30 AM - 6:59 AM	200	6	5.0	1,000	1,800
AM Peak	**7:00 AM - 8:59 AM**	200	6	5.0	**1,000**	**1,800**
Midday Base	9:00 AM - 1:29 PM	132	9	3.3	440	792
Midday School	1:30 PM - 3:29 PM	200	9	3.3	667	1,200
Midday School (Rush Hr)	3:30 PM - 3:59 PM	200	6	5.0	1,000	1,800
PM Peak	**4:00 PM - 6:30 PM**	**200**	**6**	**5.0**	**1,000**	**1,800**
Evening	6:30 PM - 9:59 PM	132	8	3.8	495	891
Late Evening	10:00 PM - 11:59 PM	132	11	2.7	360	648
Night	12:00 AM - 2:59 AM	132	11	2.7	360	648

Sources:
1. For Green Line vehicle Type 7/Type 8, per MBTA Service Delivery Policy (2017), Table B2 "Vehicle Load On Light Rail, Heavy Rail". Assumes 2-car operation.
2. MBTA Rapid Transit Schedule, Effective September 3, 2017 - December 30, 2017. Peak period frequencies based on an FMCB presentation on 11/20/17.
3. MBTA presentation on the *Green Line Transformation* (Public Meeting, September 2019), slide 17: Although it states "running two-Supercar trains would effectively double the Green Line capacity", the max passenger loads noted are 200 for today's operation using Type 7, 8, 9 cars and 360 for Type 10 Supercars, which corresponds to an 80-percent increase. Capacity assumes same train headways and use of 2-car trains as applied to today's operations.

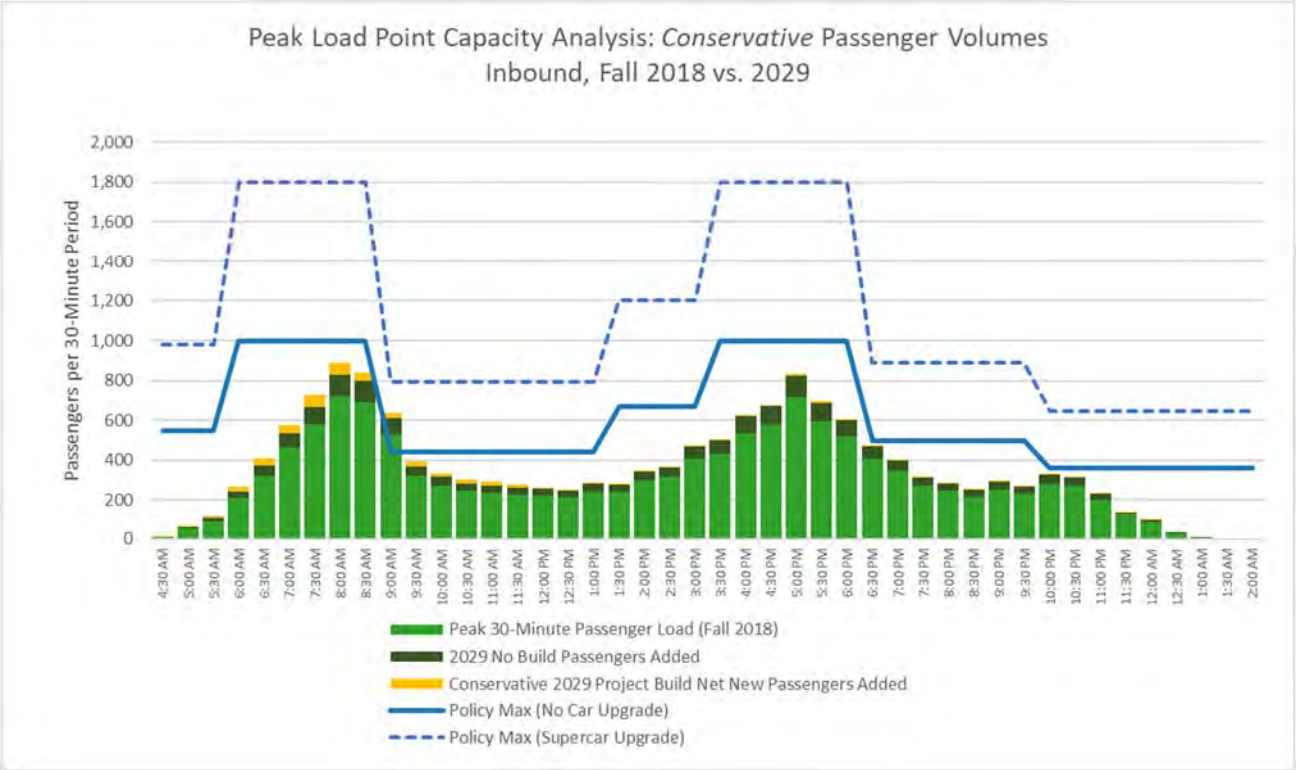
Future Transit Capacity Analysis: Green Line (D Branch)

The charts below illustrate the expected future passenger loads at the peak load point relative to the planned service capacity for the Green Line's D Branch.[11] The charts present both project-generated transit trips under a *conservative* and a *realistic* mode-choice scenario.

At future ridership levels with the project-generated growth the MBTA Green Line (D) does not trigger any new exceedances above the MBTA's policy capacity thresholds than what is experienced today. At future ridership levels and the capacity enhancements gained with the Type 10 train cars, the MBTA Green Line (D) is expected to be in compliance with the MBTA's policy capacity thresholds.

[11] The peak load point on the Green Line varies by time period. For the D Line, Inbound, the peak load point is most often occurs between Fenway and Kenmore in the mornings, and at varying points between Hynes and Park Street in the afternoon. Outbound, the peak load point occurs at varying points between Government Center and Arlington in the mornings and early afternoon, and between Hynes and Kenmore in the mid-afternoon and evening periods.

Figure **Inbound Green Line Service: Average Peak Load Point Capacity Analysis, Future Condition, Under Two Growth Scenarios**



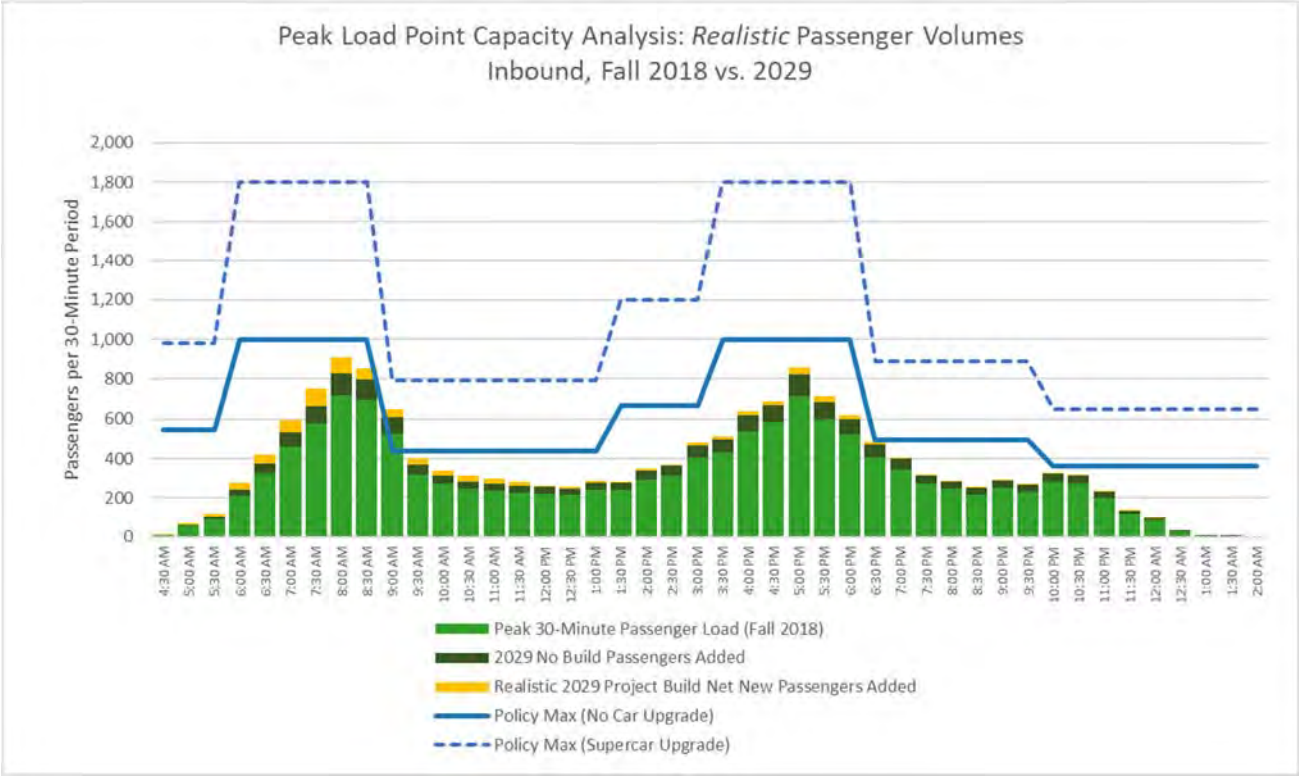


Figure Outbound Green Line Service: Average Peak Load Point Capacity Analysis, Future Condition, Under Two Growth Scenarios