

December 19, 2024

NEX-2400043.00

Ms. Elizabeth Hughes, AICP, Town Planner
Town of Concord
Planning Division
141 Keyes Road
Concord, MA 01742

SUBJECT: 275 Forest Ridge Road, Concord, MA
Traffic Peer Review Letter #2

Dear Ms. Hughes and Members of the Zoning Board of Appeals:

Greenman-Pedersen, Inc. (GPI) previously performed a traffic peer review of the following materials submitted to the Concord Zoning Board of Appeals for the Proposed Residences at Thoreau Comprehensive Permit Application at 275 Forest Ridge Road:

- *Comprehensive Permit Application*, prepared for Thoreau Residences LLC by The Pinebrook Group, dated December 21, 2023.
- *Multi-Family Site Development, Residences at Thoreau, 275 Forest Ridge Road, Concord, MA*; prepared by Allen & Major Associates, Inc.; dated December 20, 2023.
- *Traffic Impact and Access Study, Proposed Residential Development, 275 Forest Ridge Road, Concord, Massachusetts*; prepared by MDM Transportation Consultants, Inc. (MDM); dated December 2023.

Our comments related to traffic impacts, site circulation and access, and parking elements of the project were summarized in a letter dated April 3, 2024. Subsequent to our initial review, the Applicant completed a redesign of the site plan to address numerous comments from Town staff and the public. Accordingly, the Applicant's team has provided the following updated documents for review as part of this Comprehensive Permit Application:

- *Multi-Family Site Development, Residences at Thoreau, 275 Forest Ridge Road, Concord, MA*; prepared by Allen & Major Associates, Inc.; revised October 18, 2024.
- *Traffic Impact and Access Study, Proposed Residential Development, 275 Forest Ridge Road, Concord, Massachusetts*; prepared by MDM Transportation Consultants, Inc. (MDM); dated October 2024.

As requested, GPI has reviewed the above materials for compliance with the applicable sections of the Town of Concord Zoning Bylaws, Massachusetts Department of Transportation (MassDOT) guidelines for traffic analysis, and general engineering practice. As the October 2024 *Traffic Impact and Access Study (TIAS)* appears to essentially be an update to the December 2023 TIAS to address the changes to the site plan and does not appear to incorporate many of the comments within GPI's initial April 3, 2024 traffic review letter, the majority of original comments on the TIAS are still valid. Those comments that remain valid have been repeated within this letter with their original comment number.

Site Circulation, Access, and Egress

2. The Applicant has designed the site driveway in a boulevard style with a 12-foot travelway in each direction, separated by a 7-foot median island. This layout does not provide enough width for emergency

vehicle bypass in the event a vehicle becomes disabled along the drive aisle. **GPI recommends the Applicant consider one of the following options:**

- a. **Widen the driveway to provide a 16-foot travelway on either side of the median island for emergency vehicle bypass;**
 - b. **Eliminate the median island and provide a single 12-foot entrance and exit lane separated by a centerline; or**
 - c. **Replace the raised median island with a mountable surface, such as textured concrete, to allow for emergency vehicle bypass. This median may also be raised with sloped edges to be mountable.**
3. The Applicant has provided vehicle turning path figures for a fire apparatus circulating the site. However, the Applicant has not provided a vehicle turning path analysis for a trash removal vehicle accessing and egressing the trash receptacle. In addition, the site plans do not indicate where trash will be stored on the site and how it will be accessed by trash removal vehicles. **The Applicant should provide a vehicle turning path analysis for the trash removal vehicle to ensure the site provides sufficient circulation for trash removal vehicles.**
 4. The Applicant has designated snow storage areas within the islands at the internal intersections on the site, which may create sight line obstructions for vehicles attempting to exit the parking area between Buildings A and B. **GPI recommends eliminating the snow storage areas on the inside of the parking loop around the buildings.**
 5. There is an existing sidewalk along the west side of Forest Ridge Road. The Applicant has proposed a sidewalk along the northerly side of the site driveway connecting to the existing crosswalk on Forest Ridge Road at the site driveway intersection. The existing crosswalk pavement markings are faded and contain numerous sealed cracks. In addition, there is a large grass strip separating the sidewalk on the west side of Forest Ridge Road from the edge of the paved travelway. **GPI recommends that the Applicant complete a pavement overlay at the intersection of Forest Ridge Road with the proposed site driveway to provide a consistent pavement surface. In addition, the Applicant should install curb ramps at the site driveway intersection with Forest Ridge Road to allow pedestrians to cross Forest Ridge Road via an ADA-accessible connection to the sidewalk on the west side of Forest Ridge Road. The Applicant should also install MUTCD-compliant pedestrian crossing warning signage at the crosswalk.**

Traffic Impact and Access Study (TIAS)

8. GPI generally concurs with the description of the existing intersection geometries. Although, GPI notes that TIAS states that the Sweet Birch Lane approach to the traffic circle at Forest Ridge Road / Sweet Birch Lane / Black Birch Lane operates under STOP sign control; however, there is currently no STOP sign or STOP line provided on the Sweet Birch Lane approach to the traffic circle. **GPI recommends the Applicant install a STOP sign (R1-1) on the Sweet Birch Lane approach.**
9. The Applicant has performed an updated collision history assessment based on MassDOT collision data for the five-year period from 2019 – 2023. The MassDOT crash portal notes that crash data for the year 2023 has not yet been closed, which indicates that some crashes may be missing from the data. However, the available crash data demonstrates the crash rate at the study area intersections is well below the state and District-wide average, indicating that no significant safety pattern exists.
10. The Applicant has utilized a 0.5 percent annual growth rate to project traffic volumes to 2030 No-Build conditions based on MassDOT permanent count station data from Station #403 located on Route 2 east of the Concord Rotary. GPI concurs that this is the closest permanent count station to the site and is appropriate in considering seasonal variation in the traffic volumes in the area. However, GPI notes that there is also a count station (#4003) located on Main Street (Route 62) just west of Forest Ridge Road

that provides traffic count data for the years 2011-2013 and 2015-2019 that may provide a better estimate of the traffic growth within the study area. In addition, upon review of the traffic volumes utilized in the TIAS for Station #403, GPI was unable to reconcile the traffic volumes for the years except 2011 and 2013. Further, MassDOT provides count data for the year 2019 that was not included in the evaluation of the growth rate at this count station. GPI has estimated the growth rate based on the count station data available on MassDOT's Transportation Data Management System for count stations #403 and #4003, and determined that traffic has generally been growing at a rate of 1.0 percent per year from 2010 to 2019. This growth rate is consistent with the rate utilized in recent traffic studies for other development projects in the surrounding area. **Therefore, GPI recommends the Applicant update the analysis using a 1.0 percent per year annual growth rate to project volumes to 2030 No-Build conditions.**

The Applicant has included traffic to be generated by the Apartments at Powder Mill, a 230-unit residential development in Acton, within the 2031 No-Build traffic-volume projections. GPI concurs with the inclusion of trips generated by the Apartments at Powder Mill.

11. The sight distance calculations were based on an assumed turning speed of 15 miles per hour (MPH) exiting the circle at Forest Ridge Road / Sweet Birch Lane / Black Birch Lane; however, the Applicant has not provided any evidence to support this travel speed. Although none of the signs are MUTCD compliant, Forest Ridge Road is posted with a speed limit of 25 MPH. **Therefore, the Applicant should provide documentation of speed measurements or utilize a 25 MPH design speed for estimating sight distance requirements.**
12. The sight distance was measured from a decision point 10 feet back from the edge of the roadway as part of the December 2023 TIAS. The October 2024 TIAS does not indicate where the decision point was located in measuring sight distances. AASHTO Green Book states that intersection sight distances should be measured at 14.5 feet back from the edge of the travel way where applicable. GPI previously recommended that the Applicant provide a sight line plan with the decision point being located 14.5 feet back instead of 10 feet. No such plan was included in the October TIAS or site plan set. **GPI recommends the Applicant prepare a sight line plan that depicts the available sight lines and required clear zones to meet AASHTO recommendations for minimum stopping sight distance (SSD) and desirable intersection sight distance (ISD) at the proposed site driveway intersection with Forest Ridge Road based on a posted speed of 25 MPH.**
17. The Applicant has applied the existing Peak Hour Factor (PHF) to the 2031 No-Build and Build analysis conditions as part of the Synchro analysis. **MassDOT guidelines for traffic impact analysis require that all future year conditions utilize a default PHF of 0.92.** The Synchro analysis worksheets provided by the Applicant for the Forest Ridge Road / Sweet Birch Lane / Black Birch Lane intersection did not provide input data for PHFs or heavy vehicle percentages. **The Applicant should provide these worksheets.**
18. The Applicant has provided an assessment of the parking supply that would be required to satisfy zoning requirements, which noted that 2.0 spaces per dwelling unit are required for multi-family developments. However, Table IV in Section 7 of the Concord Zoning Bylaws notes that only 1.5 spaces per dwelling unit are required for subsidized low and moderate incoming housing developments. As this project is being developed as a Chapter 40B development, the lower parking provision of 1.5 spaces per dwelling unit is applicable for at least the affordable units within the development. Applying the 1.5 spaces per unit parking rate to the entire 237 units would result in a parking requirement of 356 spaces.
19. The Applicant has also provided an assessment of the parking demand anticipated to be generated by the proposed development based on ITE parking generation rates for LUC 221 (Multifamily Housing (mid-rise)) and empirical parking demand data collected at six multifamily residential developments within the I-495 belt of Massachusetts. The results of this analysis indicate that the peak parking demand may range from 292 to 344 parking spaces. ITE recommends that the peak parking demand not exceed the parking supply by more than 90 percent to avoid illegal parking and excessive recirculation of

vehicles to find empty spaces. Therefore, based on ITE and the empirical data, a total of 382 parking spaces would be required to meet peak parking demands. GPI concurs with the Applicant's assessment that the 394 parking spaces proposed will be adequate to accommodate the peak parking demand anticipated for the proposed residential development.

20. The Applicant has proposed several Transportation Demand Management (TDM) measures to reduce single-occupant vehicle trips generated by the proposed development. In addition to the measures described in the TIAS, GPI recommends the Applicant consider the following additional TDM strategies:
 - a. An on-site Transportation Coordinator (TC) will be established to distribute information to residents on available transportation options in the area and provide incentives for utilizing alternatives means of travel;
 - b. The TC will provide all new residents with information on registering with NuRIDE upon move-in. Nu-RIDE offers incentives for making green trips (walking, biking, using public transit, carpooling, or ridesharing) and provides assistance to commuters in identifying appropriate ride-share matches in their area. In addition, Nu-RIDE offers a guaranteed ride home for any commuters making green trips that need to leave work in an emergency or inclement weather.
 - c. Consider providing at least one ride-share parking space near the entrances to each building.
 - d. The Applicant should consider transit subsidies or rental reductions for residents utilizing the commuter rail, and/or providing shuttle service from the site to the nearest commuter rail station at key times in the morning and evening.
21. GPI notes that Applicant has not provided an assessment of the available public transportation services in the surrounding area. However, the site is located approximately two miles from the West Concord MBTA Commuter Rail station and less. **GPI recommends the Applicant review available public transportation near and around the site to assess whether additional transportation demand management (TDM) measures may be included to encourage use of public transportation by residents.**
22. Although there is a sidewalk around the majority of the traffic circle at Forest Ridge Road / Black Birch Lane / Sweet Birch Lane, there is not sidewalk on the northeast quadrant between Black Birch Lane and Forest Ridge Road SB. **GPI recommends that the Applicant install a sidewalk along this portion of the traffic circle to provide a continuous pedestrian path around the circle for improved pedestrian connectivity. In addition, the Applicant should install curb ramps and a crosswalk on the Forest Ridge Road southbound approach to the circle to provide access to the sidewalk along the west side of Forest Ridge Road.**
23. A sidewalk currently exists along the west side of Forest Ridge Road between the Black Birch Lane / Sweet Birch Lane circle and Main Street (Route 62), which is in fair – good condition along its entire length with the exception of a few areas of cracking around utilities and some areas where grass has grown through the pavement joints. However, none of the curb ramps at the crosswalks are ADA-compliant. None have level landing areas and some do not provide tactile warning strips. In addition, the existing crosswalk pavement markings are faded and the crosswalk warning signage is not mounted at the correct height. **The Applicant should consider upgrading these ramps to meet ADA guidelines and restripe the crosswalks consistent with Manual on Uniform Traffic Control Devices (MUTCD) standards.**
24. The Applicant has concluded that the project will have minimal impact on the operations of the study area intersections and that no additional improvements are required to mitigate the impacts of the proposed development. GPI concurs that the proposed development will have limited impact on the traffic operations of the study area intersection. However, GPI notes there are several existing deficiencies that warrant safety enhancements to ensure that the additional traffic generated by the proposed development does not result in increased collisions.

- a. At the intersection of Main Street (Route 62) / Forest Ridge Road, the existing STOP sign is faded and provides no retro-reflectivity for nighttime visibility. In addition, the existing STOP line is faded and narrow. **GPI recommends the Applicant install a new STOP sign and STOP line on the Forest Ridge Road approach to Main Street (Route 62), compliant with Manual on Uniform Traffic Control Devices (MUTCD) standards.**
- b. Similarly, the existing STOP sign (R1-1) is faded, is not retro-reflective, and is partially obscured by vegetation along the easterly side of the roadway. **GPI recommends the Applicant replace the existing STOP sign with a new MUTCD-compliant sign and install STOP AHEAD warning signage in advance of the intersection to further alert drivers to the approaching stop condition.**
- c. Separate left- and right-turn lanes are provided on the Forest Ridge Road approach to Main Street (Route 62). However, the existing pavement markings are faded and partially covered with pavement crack sealant. In addition, the lane markings were paved over during the most recent pavement overlay for the 40 feet closest to Main Street (Route 62). **GPI recommends the Applicant install new lane markings, including lane lines, turn arrows, and a centerline within 100 feet of the STOP line on Forest Ridge Road approaching Main Street (Route 62).**
- d. GPI also notes that Forest Ridge Road northbound approaches Main Street (Route 62) on a downhill grade. When Main Street (Route 62) was last resurfaced, the first 50 feet of Forest Ridge Road were also resurfaced. However, the roadway was regraded at that time so that the last 50 feet of Forest Ridge Road slopes upward toward Main Street (Route 62) to match the finished elevation of Main Street (Route 62). As a result, a low point has been created on Forest Ridge Road just south of the intersection where water ponds and freezes during the winter months, causing vehicles to slide into the intersection. **GPI recommends the Applicant consider regrading Forest Ridge Road as it approaches Main Street to eliminate the low point and/or properly direct water toward the existing catch basins on Forest Ridge Road.**

New Comments

The following represent new comments related to the proposed site plans and traffic study.

25. Sheet C-106A of the site plan package depicts snow storage areas along both sides and within the median on the proposed site driveway. This snow has the potential to obstruct sight lines for vehicles entering and exiting the site driveway. In addition, the fire truck turning path diagram on Sheet C-107A indicates that the truck chassis will extend over the snow storage area when making a left turn into the site driveway. **GPI recommends that all snow storage areas within 25 feet of an intersection be eliminated to avoid sight line obstructions, avoid icing of intersections due to snow melt, and ensure adequate turning movements for fire apparatus.**
26. Although the Applicant has proposed sidewalks along the perimeter of Buildings A and B, the Applicant has not provided any connections between these two sidewalk systems. **GPI recommends the Applicant extend the sidewalk at either end of Buildings A and B out to the internal roadway and provide curb ramps and a crosswalk across both ends of the parking aisle separating Buildings A and B.**
27. The Civil Site Plan Narrative describes that *“the Applicant will work with the Concord school system on providing school bus accommodations for any school aged children, however, it is anticipated that the bus service provider may not enter the private property and require stopping on Forest Ridge Road.”* **GPI recommends that the Applicant provide a bus shelter and curb ramps for ADA accessibility at the location of the proposed bus stop. As the existing sidewalks are separated from the roadway by a large grass strip, the Applicant may need to wide the sidewalk to the roadway in the area of the bus stop.**

28. While the Applicant has provided an assessment of the adequacy of the parking supply on the site, the Applicant has not provided an assessment of the adequacy of the parking at the adjacent Thoreau Club. The proposed driveway configuration will require the elimination of 42 parking spaces from the Thoreau Club parking lot. **The Applicant should provide an assessment of the adequacy of the remaining parking to accommodate the peak parking demand generated by the Thoreau Club.**
29. A speed table is proposed on the site driveway approximately 30 feet southwest of the first internal intersection. The location of this speed table may make turning maneuvers through the internal intersection difficult, especially for trucks and emergency vehicles. **Therefore, no speed tables should be located within 100 feet of an intersection unless the entire intersection is proposed to be raised. The main reason to install a speed table is to slow traffic at a location where traffic may otherwise be moving quickly. Generally, these are installed along straight, flat sections of roadway for the greatest traffic calming benefits. Drivers will already be slowing near the internal intersection and there is an S-curve in the driveway to the southwest of the internal intersection. Therefore, a speed table is not warranted between the S-curve and the internal intersection. The most effective location for a speed table is near the center of the straight section of the driveway between the S-curve and Forest Ridge Road.**
30. While a STOP sign and STOP line are provided on the northbound approach to the parking aisle that separates Buildings A and B, there is not STOP line or STOP sign proposed on the opposing approach exiting the northerly parking aisle. **The Applicant should install a STOP line and STOP sign on this approach.**
31. **The Applicant should consider a pedestrian connection between the pool area and the perimeter sidewalk around Building A to provide a direct pedestrian connection between the parking along the north side of Building A and the pool area.**
32. The December 2023 TIAS was based on traffic counts collected in October 2023. As part of the October 2024 TIAS, new turning movement counts were collected at the study area intersections in October 2024. Section 2.2.2 of the TIAS indicates that the 2023 traffic volumes were grown by 0.5 percent and increased to represent additional activity from the Thoreau Club in order to represent 2024 Baseline conditions. No calculations or detailed data have been provided within the October 2024 TIAS to explain how these adjustments were completed. **The Applicant should provide the back-up calculations to support the estimation of 2024 Baseline traffic volumes.**
33. The Applicant has provided a signal warrant analysis for the intersection of Main Street / Forest Ridge Road within the October 2024 TIAS. GPI has numerous comments regarding the signal warrant analysis, which are summarized below:
 - a. The TIAS provides turning movement count data for the Main Street / Forest Ridge Road intersection from 7:00 AM – 9:00 AM and 4:00 PM – 6:00 PM. However, the signal warrant analysis is based on 12-hours of count data from 6:00 AM – 6:00 PM. The TIAS does not provide any count data for the period from 9:00 AM – 4:00 PM, nor does the TIAS describe how traffic volumes were estimated for this time period. **If 12-hour turning movement counts were collected at the subject intersection, the Applicant should provide the detailed count data as part of the TIAS. Otherwise, the Applicant should provide a description and detailed calculations to demonstrate how volumes were estimated from 9:00 AM to 4:00 PM.**
 - b. The TIAS states that the volumes used as part of the signal warrant analysis were based on the 2024 Baseline volumes plus the site-generated vehicle trips. The TIAS does not provide an estimation of site-generated vehicle trips for any hours other than the weekday AM and PM peak hours. **The Applicant should describe and provide detailed calculations demonstrating how site-generated trips were calculated for all hours of the day.**
 - c. GPI compared the traffic volumes contained in the signal warrant analysis worksheets to the raw turning movement counts at the Main Street / Forest Ridge Road intersection for the weekday

morning (7:00 AM – 9:00 AM) and weekday evening (4:00 PM – 6:00 PM) peak periods for which turning movement count data was provided in the TIAS. The comparison indicates that in many cases the volumes used in the signal warrant analysis were lower than the raw turning movement count data despite the Applicant describing that the volumes were based on 2024 Baseline plus site-generated trips. **The Applicant should provide a detailed description and supporting calculations to demonstrate how the hourly traffic volumes were estimated on all movements through the intersection.**

- d. It appears that the Applicant has included only the northbound left-turn volume on Forest Ridge Road as part of the signal warrant analysis; however, Forest Ridge Road has been evaluated as a two-lane roadway. When evaluating traffic signal warrants for two-lane minor streets where separate left- and right-turn lanes are provided, it is common to run the analysis under two scenarios:
 - i. As a two-lane approach with all left- and right-turn movements included; or
 - ii. As a one-lane approach with only the left-turn movement included.

If the approach is evaluated with two lanes, then the entire volume in both lanes should be included. Otherwise, the approach should be evaluated as a single-lane approach. Although GPI has provided several comments above regarding the accuracy of the traffic volumes included in the signal warrant analysis, GPI has reevaluated the signal warrant conditions based on the volumes provided in the TIAS and the results of the analysis indicate that based on a one-lane approach using the left-turn volume only on Forest Ridge Road, the volumes will exceed the thresholds for Warrant 2 – Four-Hour Warrant. **The Applicant should update the signal warrant analysis to evaluate the warranting condition as a one-lane approach with only the left-turn volume and as a two-lane approach with all turning movements on Forest Ridge Road.**

- e. The Applicant has evaluated the need for traffic signal at the Main Street / Forest Ridge Road intersection based on the conditions of only Warrant 2 – Four Hour and Warrant 3 – Peak Hour despite providing 12-hours of traffic volume data. While only one warrant needs to be met to justify installation of a traffic signal, MassDOT prefers that the conditions of Warrant 1 – Eight Hour be met prior to installing a signal. **The Applicant should conduct a review of the warranting criteria for Warrant 1 – Eight Hour. Based on a preliminary review of the criteria using the volumes provided in the TIAS, it appears that the conditions of Warrant 1B will be met for 10 hours of the day.**

34. The capacity analysis for the Main Street / Forest Ridge Road intersection during the weekday AM peak hour utilizes a Peak Hour Factor (PHF) of 0.94 for all movements except the northbound right-turn on Forest Ridge Road. **The same intersection PHF should be utilized for all movements through the intersection.**

35. There is data from a delay study provided in the Appendix of the October 2024 TIAS; however, there is not explanation in the TIAS of how or why this was conducted or how the data was used. A review of the Synchro analysis worksheets indicates that it appears the Applicant used the results of the delay study to reduce the critical headway or critical gap for vehicles exiting Forest Ridge Road onto Main Street. The critical headway represents the minimum time gap that a driver exiting a side street movement will accept between successive vehicles on the mainline in order to enter the roadway. The default critical headway used in HCM 6 analysis methodology for the left-turn exiting Forest Ridge Road should be 6.43 seconds and the critical headway for the right-turn exiting Forest Ridge Road should be 6.3 seconds. The Applicant has reduced the critical headways to 5.8 and 3.3 seconds, respectively, to effectively lower the delay on the Forest Ridge Road from that calculated using HCM 6 methodology. Similarly, during the weekday PM peak hour, the Applicant has reduced the critical headway for vehicles turning left from Main Street onto Forest Ridge Road from 4.19 to 4.12 seconds. **As no delay study was conducted for the left-turn from Main Street onto Forest Ridge Road, the critical headway on this movement should not be reduced. In addition, the delay study was only conducted during the weekday PM peak period from 4:00 PM – 5:00 PM. No delay study was conducted during the**

weekday morning peak period to determine a baseline delay; therefore the critical headways should not be adjusted for the weekday morning peak period.

There is only a summary page provided in the appendix for the delay study that was conducted. Although the turning movements exiting Forest Ridge Road in the delay study appear to match the volumes collected as part of the turning movement counts, the count sheets indicate that the turning movement counts and delay study were conducted on different days (October 10 and October 30, 2024). **If the delay data is to be used to adjust the critical headway in the weekday PM peak hour, the Applicant should provide the detailed delay study data that demonstrates the delay experienced by each vehicle passing through the intersection and provide details on how the delay study was conducted.**

GPI notes that although many drivers may choose to take shorter gaps in traffic during periods of heavy congestion to avoid excessive delays, it is not necessarily a desirable or safe condition to do so. Therefore, the critical headway should be adjusted with caution and in special circumstances, and a reduced headway should not be used for the design of improvements at an intersection.

36. Concord Public Works (CPW) Engineering has reviewed these comments and is in agreement. CPW Engineering reserves the right to comment on future submittals related to any new or previously submitted information provided to the Town for review.

Should you have any questions or require additional information, please contact me directly at (603) 766-5223 or by email to rebeccabrown@gpinet.com.

Sincerely,

GREENMAN-PEDERSEN, INC.



Rebecca L. Brown, P.E.
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