

To: Forest Ridge Association  
c/o Mr. Jack Dawley  
24 Black Birch Lane  
Concord, MA 01742

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## Condition Study and Pavement Assessment of Forest Ridge Road, Concord, MA

The Applicant Pinebrook Group, LLC and Wood Partners. is proposing to construct a residential development with 237 residential units across two (2) buildings with 394 surface parking spaces. The proposed location is currently undeveloped land, situated on a low-lying site of campgrounds and athletic fields, that would require the placement of extensive fill material. The site is adjacent to the Thoreau Club which includes a pool, tennis courts, and small additional buildings.

In the traffic study submitted to the Town it is estimated the proposed new residential development will add an additional 1,076 vehicle trips to the 1,990 currently on Forest Ridge Road on a typical weekday increasing the traffic pavement loading on the roadway. This is in addition to the impact from construction traffic for the new residential development at 275 Forest Ridge Road, Concord, MA that will use Forest Ridge Road to access the site through the traffic circle. Construction impact will include the delivery of materials, equipment, and labor; the installation of a primary electrical service line running from the CMLP service feed to the site; and the hauling of outgoing of waste and excavated materials. Forest Ridge Road accesses an adult day care facility, 3 residential condominium communities and a commercial health, tennis and swim club.



## Condition Assessment and Pavement Impact Analysis

### Background

The project site is in Concord, MA. The pavement facility is currently a non-public accepted, low volume, undivided roadway – Forest Ridge Road from Route 62 to the first terminal rotary stylized cul-de-sac, totaling 2,300 linear feet.

**Reference: Condition Study and Pavement Assessment of Forest Ridge Road, Concord, MA**

**Data Collection**

Stantec conducted a detailed network-level visual evaluation that gathered data by means of an on-ground pavement condition survey to closely document distress type, severity, and extent. Further subsurface investigation (coring and base material sampling) was performed by Stantec's subconsultant Briggs Engineering and Testing.

*Table 1: Core Log*

Core	Location	Thickness	Base Material
1	50' S of #35 Forest Ridge Dwy, 3' off W curb	3-1/8" HMA	12" Gravel Borrow
1a	300' N #35 Forest Ridge Dwy, 3' off E curb	3-1/4" HMA	12" Gravel Borrow
2	100' N of Black Birch, 3' off E curb	3" HMA	12" Gravel Borrow

**Condition Assessment**

**Forest Ridge Road from Main Street to 1<sup>st</sup> Traffic Circle**

Photo Log: IMG9650 thru IMG9658  
 Roadway: Undivided Length: 2,300' Surface Width: 24'  
 Speed Limit: 25 MPH  
 Median: None – limited to entrance  
 Sidewalks: Hot Mix Asphalt (HMA) 1 side  
 Curbs: Varies: Vertical Granite/Cape Cod Berm  
 Lanes: 2 Travel Lanes – 11' wide each, 1' wide Travel Shoulder Lanes  
 Type: Hot Mix Asphalt (HMA)  
 Thickness: 3-1/8" HMA Base: 12" Granular 'bank run' gravel borrow Subbase: Unknown  
 Shoulders: None  
 Drainage: Closed System  
 Traffic Data: ADT: 1,990 Truck %: 1.5% Station: N/A

<b>PAVEMENT DISTRESS</b>	<b>SEVERITY</b>	<b>EXTENT</b>
Non-Utility Patch/Pothole	Low	0.5%
Block/Weather Cracking	Moderate	65%
Alligator Cracking	Moderate	4.0%
Transverse & Longitudinal Cracking	High	25%
Raveling/Surface Wear	Low	<75%
Distortion	Low	<1%

70% cracking well sealed.

Pavement Condition Index (PCI) = **38**

Estimated Design Life = 5-9 years



Some pavement areas are exhibiting structural failure through localized, moderate severity alligator/fatigue cracking in the wheel path and above underground utilities within the road.

Extensive block cracking evident and due to asphalt binder aging/oxidation.

Current repair: In localized areas of fatigue cracking, cold plane existing pavement to gravel base, fine grade and compact, place 2.5" 19.0mm. Then perform curb to curb 1.5" cold planing with 1.75" overlay of 9.5mm.

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**Findings**

Based on the visual pavement evaluation of extensive block/weather cracking, frequent high severity transverse/longitudinal cracking, and approximately 70% of the observed cracking was sealed in good condition. This is an indication of aging asphalt binder in the surface pavement layer and may currently be addressed by a mill-and-overlay rehabilitation strategy. Intermittent moderate severity alligator cracking was also noted, indicating localized areas of fatigue failure. Pavement fatigue indicates a pavement structure at traffic load capacity and may currently be addressed by localized full depth pavement removal and replacement of the asphalt pavement materials. Based on current pavement conditions and traffic volume, the estimated remaining design life is five to nine (5-9) years at which point a 2" inch mill-and-overlay with localized (<20%) full-depth asphalt removal is warranted.

Any increase to pavement traffic loading, especially the number of trucks, will accelerate pavement deterioration and shorten the remaining pavement life on Forest Ridge Road. Areas of block cracking will likely develop into fatigue failure further reducing pavement structural capacity. It is anticipated with the impact of construction traffic, the areas of fatigue failure will increase beyond 50% of the pavement area, and a larger scale, complete replacement/refurbishment of the road pavement structure will be required to return the road to an accessible, safe and functional condition. It is also anticipated that the timing of the need for this scale of pavement rehabilitation will be accelerated under increased traffic conditions.

Further analysis based on truck factors from MassDOT ([PDDG Chapter 9 - Pavement Design | Mass.gov](#)) and construction logistics paper ([Environmental impact of construction transport and the effects of building certification schemes - ScienceDirect](#)), Stantec determined the expected design life of the subject pavement associated with the predicted range of construction truck traffic. 10 trucks/day over 1 year corresponds to the average number for a "complex" type project, which is defined as having the fewest transports, and 30 trucks/day over 1 year corresponds to the average number for all "housing" type projects. Table 2 illustrates the impact on roadway pavement design life associated with increasing trucks trips.

*Table 2: Construction Traffic Impact*

Daily Construction Traffic (1 year)	Design Life (years)
Existing Traffic	7.0
Existing+ 1 truck/day	6.9
Existing+ 5 truck/day	6.4
Existing+ 10 truck/day	5.8
Existing+ 20 truck/day	4.7
Existing+ 30 truck/day	3.5

The impact of construction traffic on the pavement's life is substantial depending on the range of truck traffic as a result of the proposed residential development.

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## **Stantec Conclusion**

In conclusion, it would not be desirable to have construction truck traffic on the existing pavement. The pavement life would be greatly reduced, and the pavement rehabilitation requirements would go from a relatively inexpensive maintenance mill and overlay to full-depth asphalt mat replacement which would be much more than two to three times the initial expense. Maintenance demands will also be increased during construction with anticipated increased fatigue cracking, potentially resulting in potholes.

Stantec recommends the Applicant provide a cut and fill analysis of the site development to determine the need to import material. The location of the proposed access roadway/driveway will require excessive fill potentially all coming from off-site, adding further heavy trucking than the normally anticipated construction traffic. Stantec also recommends putting in place a funding mechanism where the developer contributes funds towards the cost of pavement restoration after construction and substantial completion of the new development. The value of this fund would be based on the removal and replacement cost of the existing 3-1/8" inches of hot mix asphalt on Forest Ridge Road between Route 62 and the terminal cul-de-sac/rotary.

Stantec appreciates the opportunity to review the proposed residential development Pavement Condition and Assessment on behalf of Forest Ridge Association. Please reach out for any additional questions or comments.

Regards,

**STANTEC CONSULTING SERVICES INC.**

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