August 31, 2018

Mr. Christopher Wider, Chairman
Town of Norfolk Zoning Board of Appeals
One Liberty Lane
Norfolk, MA 02056

Re: Norfolk, MA – Abbyville Commons and the Preserve at Abbyville
Traffic Peer Review – Fifth Comment Letter

Dear Chairman Wider:

BETA Group, Inc. (BETA) has conducted a review of traffic-related information submitted to the Town of Norfolk Zoning Board of Appeals for 204 residential dwelling units (Abbyville Commons = 56 apartment units, and The Preserve at Abbyville = 148 single family homes) to be constructed off Lawrence Street in Norfolk, Massachusetts. Subsequent to our initial review in July 2017, discussions have been held with the Applicant's traffic engineering consultant (Green International Affiliates, Inc. [Green]) and supplemental documents have been submitted by the Applicant's project team in an effort to address outstanding concerns and clarify uncertainties. Throughout the Norfolk Zoning Board of Appeals process for the Abbyville Commons and The Preserve at Abbyville developments, BETA has previously provided four traffic peer review letters dated July 21, 2017, October 10, 2017, November 15, 2017, and June 28, 2018.

As part of this fifth traffic peer review letter, we have conducted a review of the following supplemental traffic-related documents that were submitted by Green for the proposed developments. This traffic peer review letter summarizes our review of and findings on these documents.

- **April 13, 2018 Memorandum:** provides updated trip-generation and trip-distribution estimates for the full build-out development.
- **July 19, 2018 Memorandum:** evaluates different off-site mitigation measures recommended to be implemented at the Main Street and Park Street intersection to offset project impacts.
- **Two August 30, 2018 Letters:**
  - The first letter provides supplemental traffic signal warrant analyses for the Main Street and Park Street intersection.
  - The second letter summarizes the traffic review process that has occurred to date and outlines the off-site traffic mitigation measures committed to by the Applicant.

GREEN'S APRIL 13, 2018 MEMORANDUM

UPDATED TRIP-GENERATION ESTIMATES

The original traffic studies prepared for the Abbyville Commons and The Preserve at Abbyville developments utilized the 9th edition of the Institute of Transportation Engineers (ITE) Trip Generation

manual to generate site trips. Although the 9th edition was the current version of the ITE Trip Generation manual at that time, the 10th was released during the local permitting process that provides an updated database for different land uses. Therefore, Green provided revised trip-generation estimates for the proposed developments utilizing the 10th edition of the ITE Trip Generation manual. Table 1 summarizes the trip-generation comparison for the proposed developments utilizing the current (10th edition) and previous (9th edition) versions of the ITE Trip Generation manual.

Comment 1: As shown, the full build-out trips for the proposed developments would be relatively consistent during the critical time periods using either of the ITE Trip Generation manual editions (difference of 4 to 10 vehicles per hour). As a result, these trip-generation methodologies would not impact the findings of the traffic evaluations. ***No further response is required.***

UPDATED TRIP-DISTRIBUTION ESTIMATES

As part of the original traffic documentation for the Abbyville Commons and The Preserve at Abbyville developments, site trips were distributed along the adjacent roadway system based on existing travel patterns observed in September 2015. These traffic counts resulted in a trip-distribution pattern of 10% of site traffic originating from/destined to the west along Lawrence Street that would access Mill Street in Franklin.

Subsequently, supplemental Automatic Traffic Recorder (ATR) counts were collected along Lawrence Street (west of Park Street), Park Street (south of Main Street), Main Street (west of Park Street), Mill Street (west of Beth Road), and Mill Street (west of Bretts Farm Road). In addition, manual Turning Movement Counts (TMCs) were collected at the Lawrence Street and Cranberry Meadow Road intersection, and at the Chestnut Street and Mill Street intersection. The trip-distribution pattern of projected site trips was reevaluated based on these additional traffic counts. As a result, an adjustment was made to the site traffic originating from/destined to the west along Lawrence Street that would access Mill Street in Franklin (increased from 10% to 15%). Accordingly, the percentage of site trips originally estimated to/from the west on Main Street (via Park Street) was reduced (decreased from 15% to 10%).

In addition to the updated trip-distribution pattern for the proposed development, the estimated travel patterns for the Park Place background development in Wrentham (residential development off Park Street) were reassessed. Based on this reevaluation, Green determined that more Park Place trips would remain south of the study area due to the proximity to Route 140, commercial areas in Franklin, Route 1A, and I-495.

Comment 2: The revised trip-distribution patterns appear to be reasonable. ***No further response is required.***

Table 1 – Trip-Generation Comparison

Time Period/ Direction	Abbyville Commons			The Preserve at Abbyville			Full Build-Out		
	Previous Trips [a]	Updated Trips [b]	Trip Difference	Previous Trips [c]	Updated Trips [d]	Trip Difference	Previous Trips [e]	Updated Trips [f]	Trip Difference
Weekday Daily:									
Enter	186	205	19	704	699	(5)	890	904	14
Exit	186	205	19	704	699	(5)	890	904	14
Total	372	410	38	1,408	1,398	(10)	1,780	1,808	28
Weekday AM Peak Hour:									
Enter	6	6	0	28	28	0	34	34	0
Exit	23	20	(3)	83	82	(1)	106	102	(4)
Total	29	26	(3)	111	110	(1)	140	136	(4)
Weekday PM Peak Hour:									
Enter	23	20	(3)	93	93	0	116	113	(3)
Exit	12	11	(1)	55	54	(1)	67	65	(2)
Total	35	31	(4)	148	147	(1)	183	178	(5)
Saturday Daily:									
Enter	179	228	49	733	706	(27)	912	934	22
Exit	179	228	49	733	706	(27)	912	934	22
Total	358	456	98	1,466	1,412	(54)	1,824	1,868	44
Saturday Midday PM Peak Hour:									
Enter	15	20	5	75	75	0	90	95	5
Exit	14	19	5	63	63	0	77	82	5
Total	29	39	10	138	138	0	167	177	10

[a] ITE Trip Generation manual, 9th edition, Land Use Code 220 (Apartment) for 56 dwelling units.
[b] ITE Trip Generation manual, 10th edition, Land Use Code 220 (Multifamily Housing [Low-Rise]) for 56 dwelling units.
[c] ITE Trip Generation manual, 9th edition, Land Use Code 210 (Single-Family Detached Housing) for 148 dwelling units.
[d] ITE Trip Generation manual, 10th edition, Land Use Code 210 (Single-Family Detached Housing) for 148 dwelling units.
[e] Abbyville Commons Previous Trips plus The Preserve at Abbyville Previous Trips.
[f] Abbyville Commons Updated Trips plus The Preserve at Abbyville Updated Trips.

UPDATED LEVEL OF SERVICE ANALYSIS

During the Town of Norfolk permitting process, the Town of Franklin requested that the site traffic impacts be evaluated at the Lawrence Street and Mill Street intersection. In addition to assessing the project's impacts at this location, the original study area intersections were reevaluated based on the updated trip-generation and trip-distribution estimates. Based on the updated intersection capacity analyses, Green projected that all critical movements at the study area intersections would operate at desirable levels (LOS C or better) with the exception of the Park Street northbound approach to Main Street (LOS F).

Comment 3: Discrepancies were noted based on a comparison of the intersection analysis worksheets provided in the memorandum's Appendix to the analysis results summarized within the body of the report. These differences are minor in nature and would not impact the findings of the traffic study. ***No further response is required.***

Comment 4: Based on the updated intersection capacity analyses, Green projected that all critical movements at the study area intersections would operate at desirable levels (LOS C or better) with the exception of the Park Street northbound approach to Main Street (LOS F). As a result, the Applicant is committed to implementing improvement measures at the Main Street and Park Street intersection to help improve operations and alleviate safety concerns. These improvements have been clarified in more detail within one of Green's August 30, 2018 letters. ***No further response is required.***

In addition to the updated trip-distribution patterns, Green provided a sensitivity analysis in which more site trips would originate from/be destined to the west along Lawrence Street rather than to the west along Main Street (via Park Street). This supplemental analysis increased the site trips to/from the west on Lawrence Street from 15% (updated) to 20% (sensitivity), which then in turn would decrease the site trips to/from the west on Main Street from 10% (updated) to 5% (sensitivity).

Comment 5: Based on the sensitivity analysis, there should be less site trips traveling along Park Street northbound that would turn left onto Main Street westbound and more site trips exiting the site onto Lawrence Street westbound. Based on the intersection analysis worksheets, however, there appears to be more or the same number of vehicles turning left from Park Street onto Main Street under the sensitivity analysis (5%) than the updated analysis (10%). Since the proposed projections for the full build-out have been reviewed and accepted (10% to/from the west on Main Street) and the sensitivity analyses are only for comparison purposes, this scenario is not required to be reevaluated. ***No further response is required.***

GREEN'S JULY 19, 2018 MEMORANDUM

SIGHT LINES

In November 2017, Green provided an aerial graphic that depicted areas at the Main Street and Park Street intersection where vegetation clearing should take place in order to improve sight lines. Within Green's July 19, 2018 memorandum, it was reconfirmed that vegetation would be trimmed within the public right-of-way to improve sight lines.

Comment 6: We concur with this improvement. ***No further response is required.***

In November 2017, Green proposed that an advance warning sign be posted along the Main Street eastbound approach west of Park Street. Within Green's July 19, 2018 memorandum, it was restated that an advance intersection warning sign with a Light Emitting Diode (LED) border be installed along the Main Street eastbound approach.

Comment 7: We concur with this improvement. ***No further response is required.***

GEOMETRIC IMPROVEMENTS

The Park Street and Main Street intersection is striped as single lane approaches. As documented in Green's July 19, 2018 memorandum, observations revealed that the Park Street northbound approach functions as two lanes with an exclusive left-turn lane and an exclusive right-turn lane.

As shown on the Pavement Marking Concept submitted with Green's July 19, 2018 memorandum, a recommendation was made to restripe Park Street from Main Street, over the bridge, and to Grove Street by providing a 10.5-foot wide northbound exclusive left-turn lane, a 10.5-foot wide northbound exclusive right-turn lane, a 13-foot wide southbound travel lane, and 1-foot wide shoulders.

Comment 8: Based on aerial imagery and field reconnaissance, we concur that two passenger vehicles can align side-by-side on the Park Street approach to Main Street. The Park Street approach is ±24 feet wide for a distance of about 25 feet back from the STOP bar at Main Street and then narrows to ±17 feet. Based on this layout, a truck stopped on the Park Street approach may require the full width of the existing striped lane to complete a turning maneuver which would hinder a vehicle from aligning beside the truck.

In accordance with Town of Norfolk Rules and Regulations for Subdivision of Land and Site Plan Approval & Special Permit Rules and Regulations (Figures 32-34), 12-foot wide travel lanes and 1-foot wide shoulders are required on two-way roadways when no on-street parking is provided. Therefore, the proposed restriping concept is not in conformance with Town design standards due to the substandard travel lane widths (i.e., 10.5 feet instead of 12 feet) and, as such, a separate review and approval/acceptance process of this concept would be required by Town of Norfolk officials. ***No further response is required.***

Comment 9: The bridge between Main Street and Grove Street is under MassDOT jurisdiction. Based on research, we were able to obtain the attached MassDOT Structures Inspection Field Report. The deck and superstructure are in fair condition (Rating 5) and provide 36 feet of pavement (two 6-foot wide shoulders and two 12-foot wide travel lanes). Although the bridge may initially appear to be able to accommodate the recommended three-lane cross section (two 1-foot wide shoulders, one 13-foot wide southbound travel lane, and two 10.5-wide northbound travel lanes), the bridge details suggest differently:

- With a reveal of 12-inches, a 3-inch offset to the curb may be too narrow as motorists tend to shy away from higher vertical curbs (MassDOT Structures Inspection Field Report – Sketch 2: Cross Section, Looking North). Therefore, wider

shoulders may need to be considered on the bridge than what are depicted on the Pavement Marking Concept.

- The bridge is super-elevated with a broken back shoulder (MassDOT Structures Inspection Field Report – Sketch 2: Cross Section, Looking North). Therefore, the improvements depicted on the Pavement Marking Concept would require the outside northbound travel lane to straddle this uneven area.
- Although there are no dedicated bicycle accommodations, the two existing 6-foot wide shoulders could be considered appropriate for bicycle use. With the reduction in shoulder width (from 6 feet to 1 foot), bicycle travel across the bridge may be considered to be unsafe.

Since the bridge is under state jurisdiction, any modifications to Park Street adjacent to and/or over the bridge (e.g., restriping) would require review and approvals from MassDOT. ***No further response is required.***

TRAFFIC SIGNAL

Green submitted supplemental traffic signal warrant analyses for the Main Street and Park Street intersection under the scenario of two travel lanes along the Park Street northbound approach from Main Street to Grove Street. In addition, the Park Street northbound right-turning traffic volumes were removed from the analyses based on engineering judgment.

Comment 10: For the purposes of the traffic signal warrant analyses, the restriping alternative depicted on Green's Pavement Marking Concept was not considered applicable because this layout would provide substandard lanes per Town of Norfolk design requirements that would necessitate a separate local review and approval/acceptance process (See Comment 8). In addition, this design would likely require modifications to the bridge between Main Street and Grove Street (i.e., restriping) which would necessitate MassDOT review and approval (see Comment 9). Therefore, the Park Street northbound approach should be considered as a two-lane approach for only ±25 feet back from the STOP bar at Main Street without modifications to the bridge as part of the traffic signal warrant analyses. Supplemental traffic signal warrant analyses were performed and submitted with one of the August 30, 2018 letters that reevaluates the Park Street northbound approach within a single lane at Main Street. ***No further response is required.***

Comment 11: In accordance with Manual on Uniform Traffic Control Devices (MUTCD) guidelines for traffic signal warrant analyses in regards to the effects of right-turning vehicles from the minor street approach:

- **Exclusive Left-Turn Lane and One Travel Lane Scenario:** "*Engineering judgment should . . . be used in applying various traffic signal warrants to cases where approaches consist of one lane plus one left-turn or right-turn lane. The site-specific traffic characteristics should dictate whether an approach is considered as one lane or two lanes. For example, for an approach with one lane for through and right-turning traffic plus a left-turn lane, if engineering judgment indicates that it should*

be considered a one-lane approach because the traffic using the left-turn lane is minor, the total traffic volume approaching the intersection should be applied against the signal warrants as a one-lane approach. The approach should be considered two lanes if approximately half of the traffic on the approach turns left and the left-turn lane is of sufficient length to accommodate all left-turn vehicles."

- If the Park Street northbound approach is considered to be an exclusive left-turn lane with the right-turn lane functioning as the main travel lane, then MUTCD guidelines recommend that the total volume on the Park Street northbound approach (i.e., left and right turns) should be combined and evaluated as a single lane approach because left turns are minor in nature (i.e., less than half the approach volume).
  - As documented in Green's July 19, 2018 memorandum, a high percentage of vehicles turn right from Park Street (65 to 75%) which would result in a minor percentage of vehicles that turn left (25 to 35%).
  - Supplemental traffic signal warrant analyses were performed and submitted with one of the August 30, 2018 letters that reevaluates the Park Street northbound approach within a single lane at Main Street. ***No further response is required.***
- Based on MUTCD guidelines, there would need to be sufficient storage available to accommodate all left turns without stacking back into the main travel lane in order to consider analyzing the minor street approach with an exclusive turn lane (i.e., two separate lanes).
  - As documented within Green's July 19, 2018 memorandum:
    - 2018 Build Weekday AM peak hour northbound right turns = 5.4 vehicles = 135 feet
    - 2018 Build Weekday PM peak hour northbound left turns = 6.5 vehicles = 162.5 feet
  - Therefore, the MUTCD traffic signal warrant analyses would need to be recalculated with all Park Street northbound vehicles (left and right turns) combined into a single lane because there is inadequate area to accommodate two lanes of traffic on Park Street approaching Main Street (±25 feet of storage for two lanes, 135 to 162.5 feet required).
  - Supplemental traffic signal warrant analyses were performed and submitted with one of the August 30, 2018 letters that reevaluates the Park Street northbound approach within a single lane at Main Street. ***No further response is required.***

- **One Travel Lane and an Exclusive Right-Turn Lane Scenario:** "*Similar engineering judgment and rationale* (as to the Exclusive Left-Turn Lane and One Travel Lane Scenario) *should be applied to a street approach with one through/left-turn lane plus a right-turn lane. In this case, the degree of conflict of minor-street right-turn traffic with traffic on the major street should be considered. Thus, right-turn traffic*

should not be included in the minor-street volume if the movement enters the major street with minimal conflict. The approach should be evaluated as a one-lane approach with only the traffic volume in the through/left-turn lane considered."

- To supplement the criteria for an exclusive left-turn lane scenario, the conflict of Park Street right turns entering the Main Street traffic stream must be considered if the Park Street approach is considered to include an exclusive right-turn lane.
  - Since there is only a one-lane receiver on Main Street eastbound east of the intersection (i.e., a single departure lane) and there is a demand of 451 to 714 vehicles per hour during the Weekday AM peak period (6-9 AM) along Main Street eastbound, engineering judgment might suggest that the conflict of Park Street northbound right turns entering the Main Street eastbound traffic stream would not be minor (151 to 285 vehicles per hour).
  - Due to the right-turn conflict with Main Street traffic and the previously identified lack of storage rationale detailed for the exclusive left-turn lane scenario, the MUTCD traffic signal warrant analyses would need to be reevaluated to include the Park Street northbound right turns.
  - Supplemental traffic signal warrant analyses were performed and submitted with one of the August 30, 2018 letters that reevaluates the Park Street northbound approach within a single lane at Main Street. ***No further response is required.***

GREEN'S AUGUST 30, 2018 LETTERS

MAIN STREET AND PARK STREET SIGNAL WARRANT ANALYSES

Green submitted an August 30, 2018 letter that provided supplemental traffic signal warrant analyses for the Main Street and Park Street intersection. These analyses considered the Park Street northbound approach as a single lane and included all turning movements.

Comment 12: We concur with this methodology in evaluating the projected traffic volumes at the Main Street and Park Street intersection. The traffic signal warrant analyses determined that the estimated traffic volumes do not satisfy the eight-hour traffic-volume warrants for eight hours throughout the course of a day. As such, the projected traffic volumes do not indicate that a traffic signal is required. ***No further response is required.***

PROPOSED TRAFFIC MITIGATION

As documented in Green's second August 30, 2018 memorandum, the following off-site mitigation measures are proposed as part of the Abbyville Commons and The Preserve at Abbyville developments:

- **Lawrence Street:**
  - To improve sight lines to and from the site driveways, vegetation is proposed to be trimmed and land will be regraded along Lawrence Street in the vicinity of the site driveways.

- Post "Thickly Settled" signs and advisory speed limit plaques along Lawrence Street west of Bretts Farm Road (at the Franklin Town Line) and east of Cranberry Meadow Road.
- Provide engineering, permitting, and a portion of construction for the:
  - Widening of Lawrence Street between Park Street and the east site driveway to 24-feet wide and replacing the bridge deck.
  - Installation of a sidewalk/walkway along the northern side of Lawrence Street between Park Street and Cranberry Meadow Road.

- **Park Street:**
  - Install radar speed feedback signs with dynamic displays along Park Street at Wrentham Town Line (for northbound travel) and north of Lawrence Street (for southbound travel).
  - Post intersection advance warning signage along Park Street:
    - North of Lawrence Street facing southbound motorists (W2-2R: side road right).
    - South of Lawrence Street facing northbound motorists (W2-2L: side road left).

- **Main Street and Park Street intersection:**
  - To improve sight lines to and from Park Street, vegetation is proposed to be trimmed in the vicinity of the Main Street intersection.
  - Install a flashing LED intersection advanced warning sign (W2-2R: side road right) and a curve ahead warning sign with a supplemental speed plaque on Main Street west of Park Street facing eastbound motorists.
  - Work with Town of Norfolk officials in evaluating the restriping of the Park Street northbound approach to Main Street to provide two separate lanes. As previously identified (Comments 8 and 9), substandard lanes per Town of Norfolk design requirements would necessitate a separate local review and approval/acceptance process and modifications to the striping along the bridge between Main Street and Grove Street would necessitate MassDOT review and approval.

- **Construction Traffic Plan:**
  - Install warning and construction signs along Lawrence Street.
  - Implement a schedule for gravel removal truck traffic with a limit to be placed on:
    - The number of gravel trucks per day.
    - A time restriction to reduce conflicts with school arrival/dismissal peaks for when children are waiting for/being dropped off by buses along the truck travel routes.
    - A time restriction to reduce conflicts during weekday commuter peak periods along the truck travel routes.

Comment 13: We concur with these improvements. The details of the Construction Traffic Plan associated with signage and schedule for gravel removal truck traffic should be reviewed and approved by Town of Norfolk officials. ***No further response is required.***

This letter should conclude our traffic peer review for the Abbyville Commons and The Preserve at Abbyville developments to be constructed off Lawrence Street. Please contact me if we can be of any further assistance.

Very truly yours,
BETA Group, Inc.

Jason R. Plourde, P.E., PTP
Project Manager

cc: Amy Brady – Norfolk Zoning Clerk

Job No: 4980