

SUBDIVISION REPORT -CONCEPT/USE ON REVIEW

►	FILE #: 7-SA-22-C	AGENDA ITEM #: 33
	7-A-22-UR	AGENDA DATE: 7/14/2022
►	SUBDIVISION:	B&B BUILDERS BEELER ROAD
►	APPLICANT/DEVELOPER:	DAVID HARBIN / BATSON HIMES NORVELL & POE
	OWNER(S):	Larry W. and Sue Bayless
	TAX IDENTIFICATION:	29 18803 View map on KGIS
	JURISDICTION:	County Commission District 8
	STREET ADDRESS:	0 Beeler Rd.
۲	LOCATION:	East & west sides of Beeler Rd., south of E. Emory Rd
	SECTOR PLAN:	Northeast County
	GROWTH POLICY PLAN:	Planned Growth Area
	WATERSHED:	Beaver Creek
۲	APPROXIMATE ACREAGE:	27.539 acres
►	ZONING:	PR (Planned Residential)
►	EXISTING LAND USE:	Agricultural/forestry/vacant
►	PROPOSED USE:	Detached and attached residential subdivision
	SURROUNDING LAND USE AND ZONING:	North: Single family residential PR (Planned Residential) South: Single family residential, rural residential, agriculture/forestry/vacant A (Agricultural) East: Agriculture/forestry/vacant PR (Planned Residential) West: Agriculture/forestry/vacant, rural residential, single family residential PR (Planned Residential)
►	NUMBER OF LOTS:	86
	SURVEYOR/ENGINEER:	David Harbin Batson, Himes, Norvell and Poe
	ACCESSIBILITY:	Access is via Beeler Road, a minor collector street with 19 ft of pavement width within 40 ft of right-of-way.
•	SUBDIVISION VARIANCES REQUIRED:	VARIANCES 1. Reduce the minimum vertical curve on Road "A" from K=25 to K=15 at STA 0+75
		ALTERNATIVE DESIGN STANDARDS REQUIRING KNOXVILLE-KNOX COUNTY PLANNING COMMISSION APPROVAL 1. None
		ALTERNATIVE DESIGN STANDARDS REQUIRING KNOX COUNTY ENGINEERING AND PUBLIC WORKS APPROVAL 1. Increase the maximum intersection grade from 1% to 3% at the intersection of Road "A" and Beeler Road
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2. Increase the maximum intersection grade from 1% to 3% at the intersection of Road "B" and Road "A"
3. Increase the maximum intersection grade from 1% to 2% at the intersection of Road "C" and Road "A"
4. Increase the maximum intersection grade from 1% to 3% at the intersection of Road "D" and Road "A"

STAFF RECOMMENDATION:

Approve the requested variance based on the justifications provided by the applicant, the recommendations of the Knox County Department of Engineering and Public Works, and the proposal will not create a safety hazard.

Approve the Concept Plan subject to 9 conditions.

1) Connection to sanitary sewer and meeting other relevant utility provider requirements.

2) Provision of street names consistent with the Uniform Street Naming and Addressing System within Knox County (County Ord. 91-1-102).

3) Providing a sight distance easement across the lots on the inside of the horizontal curves with a radius less than 200 ft per the requirements of Knox County Engineering and Public Works during the design plan phase. Any driveways on these lots must be located outside of the sight distance easement and shown on the plat, or the driveways must have a depth of 20 ft beyond the sight distance easement if they cannot be located outside of the sight distance easement.

4) Partnering with Knox County to implement the recommended turn lane improvements to Beeler Road at the E. Emory Road intersection as outlined in the Beeler Road Transportation Impact Study (AJAX Engineering, revised 6/10/2022). The developer is responsible for designing the turn lane, grading the area, and installing the base stone and binder course. Knox County is responsible for installing the surface course, striping the lane, and installing any necessary signage. The timing of the turn lane installation will be worked out during the design plan phase. The turn lanes on E. Emory Road recommended by the TIS are not required to be installed by this condition.

5) Obtaining all necessary permits from TDOT for the improvements at the Beeler Road and E. Emory Road intersection.

6) If any building construction is proposed within the 50' buffer area around the designated sinkholes/depressions (including the depressions), a geotechnical report must be prepared by a registered engineer to determine soil stability and that report must be submitted to the Knox County Department of Engineering and Public Works for consideration. Any construction in these areas is subject to approval by the County following a review of the report. Engineered footings must be designed for these areas. For those lots that do not have a building site outside of the 50' buffer, approval by Knox County will be required prior to final plat approval. The sinkholes/depressions and 50' buffer shall be designated on the final plat even if they are approved to be filled.

7) Meeting all application requirements of the Knox County Zoning Ordinance, including but not limited to the neighborhood entrance signs meeting the requirements of Article 3, Section 3.90 (Signs, billboards, and other advertising structures).

8) Meeting all applicable requirements of the Knox County Department of Engineering and Public Works and TDOT.

9) Prior to certification of the final plat for the subdivision, establish a property owners association responsible for the maintenance of the common areas, amenities, and drainage system.

Approve the development plan for a residential subdivision with up to 83 attached dwellings and 3 detached dwellings and a reduction of the peripheral setback to 25 ft for lots 23, 65-68, and the Beeler Road frontage of lots 84-86, as shown on the plan, subject to 2 conditions.

- 1) Meeting all applicable requirements of the Knox County Zoning Ordinance.
- 2) The maximum height of the attached dwellings shall be 35 feet.

COMMENTS:

This proposal is for an 86-lot residential development on 27.539 acres at a density of 3.12 du/ac. This includes 83 lots for attached dwellings and 3 lots for detached dwellings that front on the west side of Beeler Road. The property was rezoned from A (Agricultural) to PR (Planned Residential) up to 3.3 du/ac in June 2022 (5-L-22-RZ). The new internal roads are proposed to be public with 26 ft of pavement within a 50 ft right-of-way. Walking trails are proposed in the large common open space in the southwest corner of the property and to the existing pond (between lots 10-20), with the trail starting at the end of Road "B."

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The transportation impact study recommends left and right turn lanes on Beeler Road and E. Emory Road. In consultation with TDOT, the County is requesting that only the turn lanes on Beeler Road be installed. The County is proposing a cost-share partnership with the developer as outlined in condition # 4.

DEVELOPMENT PLAN ANALYSIS PER ARTICLE 6, SECTION 6.50.06 (APPROVAL OR DENIAL)

In the exercise of its administrative judgment, the Planning Commission shall determine if the proposed plan is in harmony with the general purpose and intent of the zoning ordinance and adopted plans.

1) ZONING ORDINANCE

PR (Planned Residential) up to 3.3 du/ac:

a) The PR zone allows detached- and attached-dwellings as a permitted use. The administrative procedures for the PR zone require the Planning Commission to approve the development plan before permits can be issued (Article 5, Section 5.13.15).

b) This PR zone district is approved for a maximum of 3.3 du/ac. The proposed density is 3.12 du/ac. c) The maximum height is determined by the Planning Commission for any use other than houses and duplexes. Staff recommends a maximum height of 35 ft for the attached dwellings, which is consistent with the maximum height allowed on surrounding properties.

d) The peripheral setback is 35 feet, however, the planning commission may reduce it to 15 feet when the adjacent property is zoned agricultural or residential. The applicant is requesting a peripheral setback of 25 ft for lots 23, 65-68, and the Beeler Road frontage of lots 84-86. The requested reductions are for select properties and will have minimal impact on adjacent properties. The reduction for lots 84-86 is essentially the front setback for these lots since they front Beeler Road and will help move the buildable area out of the floodplain of Kerns Branch creek. There are other houses along Beeler Road that have a similar front setback.

2) GENERAL PLAN – DEVELOPMENT POLICIES

a) Ensure that the context of new development, including scale and compatibility, does not impact existing neighborhoods and communities (Policy 9.3) – Staff is recommending a maximum height of 35 ft for the attached dwellings, which is consistent with the allowed height on adjacent properties. The proposed peripheral setback reduction should have minimal impact on adjacent properties.

b) Encourage a mixture of housing sizes and prices within planned residential developments (Policy 9.8) – This development primarily includes attached houses and a few detached houses. The existing residential development in the area consists predominantly of detached houses, so this development will help diversify the housing stock in the general area.

3) NORTHEAST COUNTY SECTOR PLAN

a) The property is classified LDR (Low Density Residential), which allows consideration of up to 5 du/ac. The development will have a density of 3.12 du/ac.

b) The three detached house lots on the west side of Beeler Road are almost entirely within the sector plan's SP (Stream Protection) classification. The plan doesn't make specific recommendations that apply to this site.

4) Knoxville – Farragut – Knox County Growth Policy Plan

a) The property is within the Planned Growth Boundary. The purposes of the Planned Growth Boundary designation are to encourage a reasonably compact pattern of development, promote the expansion of the Knox County economy, offer a wide range of housing choices, and coordinate the actions of the public and private sectors, particularly with regard to the provision of adequate roads, utilities, schools, drainage and other public facilities and services.

ESTIMATED TRAFFIC IMPACT: A traffic impact study was prepared by the applicant. The findings of that study were used in formulating the recommendations of this staff report.

ESTIMATED STUDENT YIELD: 6 (public school children, grades K-12)

Schools affected by this proposal: Gibbs Elementary, Gibbs Middle, and Gibbs High.

PAGE #:

• Potential new school population is estimated using locally-derived data on public school student yield generated by new housing.

• Students are assigned to schools based on current attendance zones as determined by Knox County Schools. Students may request transfers to different zones, and zone boundaries are subject to change.

• Estimates presume full build-out of the proposed development. Build-out is subject to market forces, and timing varies widely from proposal to proposal.

• Student yields from new development do not reflect a net addition of children in schools. Additions occur incrementally over the build-out period. New students may replace current population that ages through the system or moves from the attendance zone.

Knoxville-Knox County Planning Commission's approval or denial of this concept plan request is final, unless the action is appealed to Knox County Chancery Court. The date of the Knox County Chancery Court hearing will depend on when the appeal application is filed.

Knoxville- Knox County Planning Commission's approval or denial of this development plan request is final, unless the action is appealed to a court of competent jurisdiction. The date of the court hearing will depend on when the appeal application is filed.



Requested Variances & Alternative Design Standards

7-SA-22-C / 7-A-22-C- B&B BUILDERS -- BEELER ROAD

VARIANCES

Approve 7/17/22

1. Reduce the minimum vertical curve on Road "A" from K=25 to K=15 at STA 0+75

ALTERNATIVE DESIGN STANDARDS REQUIRING KNOXVILLE-KNOX COUNTY PLANNING COMMISSION APPROVAL

1. None

ALTERNATIVE DESIGN STANDARDS REQUIRING KNOX COUNTY ENGINEERING AND PUBLIC WORKS APPROVAL

- Increase the maximum intersection grade from 1% to 3% at the intersection of Road "A" and Beeler Road
- Increase the maximum intersection grade from 1% to 3% at the intersection of Road "B" and Road "A"
- Increase the maximum intersection grade from 1% to 2% at the intersection of Road "C" and Road "A"
- Increase the maximum intersection grade from 1% to 3% at the intersection of Road "D" and Road "A"

KNOX COUNTY ENGINEERING AND PUBLIC WORKS RECOMMENDATION:





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EXHIBIT A



Transportation Impact Study Beeler Road Subdivision Knox County, Tennessee



Revised June 2022

Prepared for: B&B Builders P.O. Box 71233 Knoxville, TN 37938

7-SA-22-C / 7-A-22-UR TIS Version 2 6/10/2022



CONCLUSIONS & RECOMMENDATIONS

The following is an overview of recommendations to minimize the transportation impacts of the proposed Beeler Road Subdivision on the adjacent transportation system while attempting to achieve an acceptable traffic flow and safety level.



- **Beeler Road at Proposed Main Entrance**: Projected level of service calculations were not completed for the Proposed Main Entrance intersection at Beeler Road due to the low expected conflicting volumes. The construction of left and right-turn lanes on Beeler Road for entering traffic is not recommended at the Proposed Main Entrance. A single exiting lane for the development's main entrance will be sufficient.
- 1a) It is recommended that a Stop Sign (R1-1) be installed, and a 24" white stop bar be applied to the Proposed Main Entrance approach at Beeler Road. The stop bar should be applied a minimum of 4 feet away from the edge of the intersecting roadway and placed at the desired stopping point that maximizes the sight distance.
- 1b) Sight distances at the Proposed Main Entrance approach must not be impacted by future landscaping, signage, or vegetation. A visual inspection determined that the intersection and stopping sight distances are available. Based on a posted speed limit of 25-mph on Beeler Road, the desirable intersection sight distance is 250 feet looking in each direction at each entrance. The required stopping sight distance is 155 feet looking to the north and the south at the Proposed Main Entrance. The site designer must ensure that these sight distances are accounted for and provided in the design plans.
- Sight distances at the individual separate driveways for the three detached houses on Beeler Road must also be accounted for and provided in the design plans.





East Emory Road at Beeler Road: The existing 2022 and projected 2027 level of service calculations for the intersection of East Emory Road at Beeler Road resulted in high vehicle delays for the northbound approach in the AM and PM peak hours.

- 2a) With this intersection operating under unsignalized conditions, it was determined that the existing 2022 intersection traffic volumes currently warrant separate left and rightturn lanes on East Emory Road and would also be warranted in the projected 2027 conditions.
 - i) Since East Emory Road is a state route, the proposed length of the warranted left-turn lane was calculated based on the guidance provided by TDOT. TDOT's <u>Highway System Access Manual</u> recommends that left-turn lane lengths at unsignalized intersections be designed based on the vehicle speed and traffic volumes. According to the Manual, "The total physical length of the exclusive turn lane should be the sum of the length for a lane change, deceleration, and storage distances." The lane change, deceleration, and storage distances can be determined in Table 3-11 and Table 3-12 in the Manual.

For a speed of 45-mph, the lane change/deceleration distance is 340 feet in Table 3-11. However, in constrained locations, a speed of 10-mph less than the design speed can be used. Thus, at a speed of 35-mph, the lane change/deceleration distance is 205 feet since this location on East Emory Road can be considered a constrained location. For the worst-case scenario in the projected 2027 PM peak hour, with a left-turn volume of 85 vehicles and an opposing volume of 766 vehicles (677 eastbound thru vehicles + 89 eastbound right-turn vehicles), the storage length required is between 50 and 75 feet as shown in Table 3-12.

The left-turn lane should include the appropriate approach taper in advance of the bay taper and storage length. The lane should include left-turn arrow pavement markings as shown in TDOT standard drawing T-M-4. For a left-turn lane width of 12 feet, the 205-foot lane change/deceleration distance should include a 180-foot bay taper length (15:1 taper) with the remaining 25 feet (205'-180' = 25 feet) added to the storage length. Thus, the proposed westbound left-turn lane on East Emory Road is recommended to have a storage length of 75 feet, as illustrated below:





ii) Based on the projected volumes, a separate eastbound right-turn lane on East Emory Road is recommended for turning vehicles onto Beeler Road. The existing features will constrain the length of the eastbound right-turn lane on East Emory Road. The previously mentioned rebuilt box culvert on East Emory Road is located 205 feet (centerline to centerline) to the west of Beeler Road. The guardrail terminates 100 feet to the west of Beeler Road's western edge.

Due to the site constraints, it is recommended that the eastbound right-turn lane have a storage length of 25 feet and a taper length of 75 feet. This total 100-foot length is not ideal, but the possibility of constructing a longer right turn lane is hindered by the existing guardrail system, box culvert, and steep side slopes. This lane length will require that the side slope be modified, and the guardrail will need to be shortened and adjusted to accommodate the turn lane. The rightturn lane should include the appropriate right-turn arrow pavement markings as shown in TDOT standard drawing T-M-4. The designer must coordinate with TDOT on this modification.

An additional software program was used to calculate the 2027 projected left-turn vehicle queues at this intersection and determine if the recommended storage lengths would be adequate. The previously mentioned Synchro Traffic Software includes SimTraffic. The Synchro portion of the software performs the macroscopic calculations for intersections, and SimTraffic performs micro-simulation and animation of vehicular traffic. SimTraffic (Version 11) software was utilized to estimate the 2027 projected vehicle queues.



The 95th percentile vehicle queue is the recognized measurement in the traffic engineering profession as the design standard used when considering queue lengths. A 95th percentile vehicle queue length means 95% certainty that the vehicle queue will not extend beyond that point. The calculated vehicle queue results were based on averaging the outcome obtained during ten traffic simulations. The vehicle queue results from the SimTraffic software are in Appendix K. The 95th percentile vehicle queue lengths at the intersection for the 2027 projected conditions are shown in Table 9.

TABLE 9TURN LANE STORAGE & VEHICLE QUEUE SUMMARY -2027 PROJECTED PEAK HOUR TRAFFIC VOLUMES (WITH THE PROJECT AND IMPROVEMENTS)

INTERSECTION	APPROACH/	PROPOSED	ADEQUATE	SIMTRAFFIC 95 th PERCENTILE QUEUE LENGTH (ft)		
	MOVEMENT	STORAGE (ft)	LENGTH?	AM PEAK HOUR	PM PEAK HOUR	
East Emory Road at	Eastbound Right	25	Yes	9	18	
Beeler Road	Westbound Left	75	Yes	37	57	
	Northbound Left/Right	N/A	N/A	95	91	

Note: 95th percentile queues were calculated in SimTraffic 11 software

This updated and revised report has determined that the documented need for separate left and right-turn lanes on East Emory Road at Beeler Road will be satisfied by the capacity provided by the TDOT widening project. This project is currently in the design phase, and TDOT proposes widening East Emory Road from 2 to 5 lanes. This project will include 2 thru lanes in each direction and a center turn lane. Thus, East Emory Road will be widened to provide a center turn lane for westbound left-turns at Beeler Road, and the two thru lanes (in each direction) will eliminate the need for a separate eastbound right-turn lane at Beeler Road.

The right-turn volume thresholds were re-examined in the projected 2027 conditions to demonstrate that a separate eastbound right-turn lane will not be required in the future condition with a 5-lane roadway section. This re-examination included the AM and PM peak hour projected 2027 volumes on East Emory Road with five lanes. The worksheet from this re-examination is shown in Appendix I and shows that a separate eastbound right-turn lane would not be required with a 5-lane roadway section on East Emory Road.

Thus, the TDOT widening project will provide the necessary capacity for the turning movements on East Emory Road at Beeler Road. However, before the widening project



is completed, a traffic sign is recommended to be posted directly across from Beeler Road outside the paved shoulder of East Emory Road. It is recommended that a "No Passing on Shoulder" (R4-18) sign be installed to address the existing illegal movements committed by some motorists occasionally using the shoulder to pass stopped westbound left-turning vehicles on East Emory Road at Beeler Road. This sign should, at a minimum, be 24" x 30" in size, and it is recommended that it be posted outside the paved shoulder, facing westbound traffic, and at least 12 feet from the white edge line.

2b) The existing and projected right-turns at the northbound approach of Beeler Road at East Emory Road have higher amounts versus left-turns. Adding an exclusive right-turn lane on this approach would reduce delays for these motorists. Several right-turning motorists were observed using the shoulder to bypass stopped vehicles waiting to turn left onto East Emory Road. Dual lanes at unsignalized intersections operating under stop conditions can be an issue due to the



View of Existing Sight Distance on East Emory Road at Beeler Road (Looking West)

potential for motorists having to compete for sight distance.

However, this approach in 2027 was projected to operate with a v/c ratio greater than 1. With the existing geometry on East Emory Road, it is anticipated that a northbound exclusive right-turn lane on Beeler Road could be constructed that would allow motorists to see in both directions freely without being obstructed by other vehicles. The sight distance concern would need to be worked on during the design of the other recommended turn lane additions at the intersection. If constructed, the overall intersection delay would be decreased, and the overall queue lengths on the northbound approach of Beeler Road would be decreased. If not constructed, it is anticipated that more right-turning motorists will become impatient due to excessive delays and queues and will utilize the shoulder more than currently occurring. Without a northbound right turn lane, the approach will operate over capacity. The results of adding a northbound right-turn lane on Beeler Road are shown in Tables 10 and 11. The LOS and vehicle queue results in these tables include the recommended eastbound left-turn lane, westbound right-turn lane, and a separate right-turn lane on Beeler Road. The worksheets for these results are provided in Appendix F and K.



TABLE 10 2027 INTERSECTION CAPACITY ANALYSIS RESULTS -PROJECTED TRAFFIC CONDITIONS (WITH THE PROJECT AND IMPROVEMENTS) INCLUDING A NORTHBOUND RIGHT-TURN LANE)

	TRAFFIC	APPROACH/	AM PEAK			PM PEAK		
INTERSECTION	CONTROL	MOVEMENT	LOS	DELAY	V/C	LOS	DELAY	V/C
				(seconds)			(seconds)	
East Emory Road (EB & WB) at	t STOP	Northbound Left	F	57.8	0.448	F	161.2	0.865
Beeler Road (NB)		Northbound Right	В	14.2	0.268	С	17.1	0.225
		Westbound Left	А	8.7	0.052	В	10.3	0.132
	Unsi							

Note: All analyses were calculated in Synchro 11 software and reported using HCM 2010 intersection methodology

^a Level of Service

^b Average Delay (sec/vehicle)

[°] Volume-to-Capacity Ratio

TABLE 11

TURN LANE STORAGE & VEHICLE QUEUE SUMMARY -2027 PROJECTED PEAK HOUR TRAFFIC VOLUMES (WITH THE PROJECT AND IMPROVEMENTS INCLUDING A NORTHBOUND RIGHT-TURN LANE)

				SIMTRAFFIC 95 th PERCENTILE			
INTERSECTION	APPROACH/	PROPOSED	ADEQUATE	QUEUE LENGTH (ft)			
	MOVEMENT	STORAGE (ft)	LENGTH?	AM PEAK HOUR	PM PEAK HOUR		
Fast Emory Road at	Eastbound Right	25	Yes	9	18		
Beeler Road	Westbound Left	75	Yes	39	57		
	Northbound Left	N/A	N/A	49	59		
	Northbound Right	75	Yes	56	52		

Note: 95th percentile queues were calculated in SimTraffic 11 software

Based on these results, it could be recommended that a northbound right-turn lane with 75 feet of storage be constructed on Beeler Road. However, this updated and revised report has determined that the TDOT widening project will eliminate the need for a separate northbound right-turn lane on Beeler Road. The additional lanes that will be provided on East Emory Road will produce more gaps in the traffic flow to allow for northbound left and right-turning vehicles from Beeler Road to enter the traffic stream. The capacity calculations and vehicle queues were re-analyzed with the intersection operating with 5-lanes on East Emory Road and a single lane on Beeler Road with the projected 2027 traffic volumes. The results of these calculations are shown in Table 12 and Table 13. The worksheets for these results are provided in Appendix F and K. The results of this re-analysis determined that a storage length of 50 feet is recommended to be designated for left-turns on East Emory Road at the intersection with Beeler Road.



This length should include the appropriate white left-turn arrow and delineation from the center turn lane that TDOT will construct.

TABLE 122027 INTERSECTION CAPACITY ANALYSIS RESULTS -PROJECTED TRAFFIC CONDITIONS (WITH THE PROJECT AND TDOT WIDENING PROJECT)WITH A SINGLE NORTHBOUND LANE ON BEELER ROAD

	TRAFFIC CONTROL	APPROACH/ MOVEMENT	AM PEAK			PM PEAK		
INTERSECTION			LOS	DELAY (seconds)	V/C	LOS	DELAY (seconds)	V/C
East Emory Road (EB & WB) at	alized	Northbound Left/Right	D	25.4	0.468	С	16.0	0.376
Beeler Road (NB)		Westbound Left	В	10.3	0.133	A	8.7	0.053
	Unsign							

Note: All analyses were calculated in Synchro 11 software and reported using HCM 2010 intersection methodology

^a Level of Service

^b Average Delay (sec/vehicle)

^c Volume-to-Capacity Ratio

TABLE 13

TURN LANE STORAGE & VEHICLE QUEUE SUMMARY -PROJECTED TRAFFIC CONDITIONS (WITH THE PROJECT AND TDOT WIDENING PROJECT) WITH A SINGLE NORTHBOUND LANE ON BEELER ROAD

				95 th PERCENTILE			
INTERSECTION	APPROACH/	PROPOSED	ADEQUATE	QUEUE LENGTH (ft)			
	MOVEMENT	STORAGE (ft)	LENGTH?	AM PEAK HOUR	PM PEAK HOUR		
East Emory Road at	Eastbound Right	N/A	N/A	-	-		
Beeler Road	Westbound Left (TWLTL)	50	Yes	12.5	5		
	Northbound Left/Right	N/A	N/A	60	42.5		
	•	•					

Note: 95th percentile queues were calculated in Synchro 11 software



2c) As a further investigation into potential remediation for this intersection, an evaluation was conducted with respect to traffic signal warrants.

<u>Methodology</u>:

The Manual on Uniform Traffic Control Devices – 2009 Edition (MUTCD) presents nine different warrants that the traffic engineering profession has developed to determine whether a traffic signal is warranted. These warrants cover a broad range of minimum elements required to indicate whether a traffic signal is justified for any particular location. These elements consist of



traffic volumes, pedestrian volumes, crash history, and other factors. The MUTCD explicitly states that a traffic control signal should not be installed unless one or more of the Manual's signal warrants are met. However, the satisfaction of a warrant does not entirely in itself justify the need for a traffic signal. Sometimes further engineering studies and judgments must be applied before justifying the need for a traffic signal installation. These additional studies are significant in ensuring that a traffic signal's installation will not degrade safety and efficiencies.

The MUTCD defines nine different warrants, two of which are potentially applicable for this intersection at this time and are explained below:



Warrant #1, Eight-Hour Vehicular Volume:

Warrant #1 is comprised of 2 conditions – A and B. The Minimum Vehicular Volume, Condition A, is intended for applications where the volume of intersecting traffic is the principal reason for consideration of signal installation. The Interruption of Continuous Traffic, Condition B, is intended for use at locations where Condition A is not satisfied and where the traffic volume on a major street is so heavy that traffic on a minor intersecting street suffers excessive delay or conflict in entering or crossing the major street.



Warrant #2, Four-Hour Vehicular Volume:

The Four-Hour Vehicular Volume signal warrant conditions are intended to be applied where the volume of intersecting traffic is the principal reason to consider installing a traffic control signal.



Even though nine warrants are offered to justify a traffic signal, according to the TDOT Traffic Signal Manual, the agency gives precedence to Warrant #1 (Eight Hour Vehicular Volume) and Warrant #7 (Crash Experience). Even though Warrant #2 is not a primary warrant used by TDOT, it is included in this study. Furthermore, TDOT does not allow installing a traffic signal on a state route based on speculative developments or unrealized traffic volumes.

The intersection of East Emory Road at Beeler Road was evaluated in the projected 2027 conditions to determine whether a traffic signal could be justified based on the MUTCD Warrants listed above. Beeler Road was used as the minor side street for the warrant analysis, and East Emory Road was the major street. Warrant #7 was not analyzed at this intersection for this study. Warrant #7 was not included because one of the primary criteria for an intersection to meet the warrant is that an "Adequate trial of alternatives with satisfactory observance and enforcement has failed to reduce the crash frequency..." It is not believed that any specific alternatives have been implemented and observed at this intersection; therefore, this warrant was not included in this study.

A spreadsheet was used to calculate the 2027 traffic volumes generated by the development being added to the intersection during the highest 8 hours of traffic based on the assumed trip distribution. This spreadsheet is shown in Appendix J. The MUTCD warrants are intentionally constructed to allow the analyst to use engineering judgment and be flexible on whether right-turn volumes are included in the analysis. When not including the northbound right-turns on Beeler Road in the analysis, it is calculated that this intersection will not meet Warrants #1 or #2 in the projected 2027 conditions. This assumption would be appropriate if an exclusive right-turn lane is not provided and 25% of the right-turning vehicles on Beeler Road are included in the analysis, then the intersection would meet Warrant #2. If 50% is included, the intersection will meet Warrant #1, Condition B, and Warrant #2. Appendix J shows the traffic signal warrant spreadsheets for these intersection evaluations.

Once again, with this updated and revised report, the potential need for a traffic signal in the projected conditions will be impacted by the TDOT widening project on East Emory Road. Traffic signal warrants for this intersection were re-analyzed with the additional lanes that will be provided on East Emory Road by the TDOT widening project. The results were similar to the outcomes obtained when not including the



additional traffic lanes provided by the widening project. Whether or not right turn movements on Beeler Road were included in the analysis greatly influenced whether a traffic signal could be justified in the projected conditions. Appendix J includes the traffic signal warrant spreadsheet for an intersection evaluation with East Emory Road having 5-lanes and right turn volumes from Beeler Road not included.

In conclusion, since TDOT does not allow for a traffic signal to be constructed on speculative or projected volumes, it is recommended that traffic counts be re-conducted in the future once the subdivisions on Beeler Road are constructed and fully occupied, and the road widening of East Emory Road is completed. Updated traffic counts will allow a re-examination of the Traffic Signal Warrants and establish a timeframe if and when this intersection could or should be signalized with the widened section of East Emory Road. Traffic crash data should also be included in the examination.





Beeler Road Subdivision Internal Roads: The layout plan shows one main entrance at Beeler Road constructed for the development, as shown in Figure 3.

- 3a) A 25-mph Speed Limit Sign (R2-1) is recommended to be posted near the beginning of the development's main entrance off Beeler Road. It is recommended that a "No Outlet" Sign (W14-2a) be installed at the front of the subdivision at Beeler Road. This sign can be installed above or below the street name sign.
- 3b) Stop Signs (R1-1) with 24" white stop bars and other traffic signage are recommended to be installed at the internal locations, as shown below:





- 3c) Sight distance at the new internal road intersections must not be impacted by signage, parked cars, or future landscaping. With a proposed speed limit of 25-mph in the development, the internal intersection sight distance is 250 feet. The required stopping sight distance is 155 feet for a level road grade. The site designer should ensure that internal sight distance lengths are met and account for different proposed road grades.
- 3d) Traffic calming measures may be needed to decrease internal vehicle speeds. Road "A" within the development has several vertical grades with a long, straight horizontal alignment. Straight road segments with steeper grades encourage higher vehicle speeds. It is recommended that the site designer consider installing speed humps or speed tables within the development to reduce internal speeds. Specifics of the traffic calming strategies should be discussed with Knox County Engineering in the detail design phase.
- 3e) All drainage grates and covers for the residential development must be pedestrian and bicycle safe.
- 3f) If directed by the local post office, the site designer should include a parking area within the development for a centralized mail delivery center. The site plan does not show a general location, and a specific plan with a parking area should be designed and provided.
- 3g) All road grade and intersection elements should be designed to AASHTO, TDOT, and Knox County specifications and guidelines to ensure proper operation.



Planning KNOXVILLE I KNOX COUNTY	Development Development Plan Planned Development Use on Review / Special Use 	t Reque subdivision Concept Plan Final Plat	est zoning Plan An S Rezonir	nendment SP 🔲 OYP
David Harbin	☐ Hillside Protection COA			
Applicant Name		۵ff	iliation	
- 5/18/2022 5-31-2022	7/14/2022		E	la Number(s)
Date Filed	Meeting Date (if applicable)	7-SA-	22-C / 7-A-2	22-UR
CORRESPONDENCE All of	correspondence related to this application sl	hould be directed to the	e approved contact	listed below.
David Harbin	Batso	n. Himes, Norvell 8		Architect
Name	Compar	γ		
4334 Papermill Drive	Knoxv	ille Tr	375	909
Address	City	Sta	ite ZIP	
865-588-6472	harbin@bhn-p.com			
Phone	Email			
CURRENT PROPERTY INFO				
Larry W. & Linda Sue Bayless	6840 Beeler Rd, Knox	ville, Tn 37918		
Property Owner Name (if different)	Property Owner Address		Property Owr	ner Phone
0 Beeler Rd		Tax Map 29, Part	of Parcel 188.03	3
Property Address		Parcel ID		- in a subscription
HPUD	NKUD			no
Sewer Provider	Water Provider			Septic (Y/N)
STAFF USE ONLY	u.			
East and west sides of Beeler Rd	, south of Emory Rd, generally west of	Tazewell Pk 2	7.59 ac	
General Location		Trac	ct Size	
Sth	PR up to 3.3 du/ac (pending)	Agricultural/fore	estrv/vacant	
District	Zoning District	Existing Land Use	<i>µ</i>	
Northeast County	LDR. SP. HP	Pla	nned Growth Are	ea
Planning Sector	Sector Plan Land Use Classification	Gro	wth Policy Plan Des	signation

November 22, 2021

DEVELOPMENT REQUEST

Development Plan	Use on Review / Special Use	Hillside Protection COA	Related City Permit Number(s)
Residential	🗌 Non-Residential		
Home Occupation (spe	cify)		
Other (specify)			

SUBDIVISION REQUEST

				Related Re	ezoning File Number
Proposed Subdivision Name					
Combine P	arcels 🔳 Divide Parcel	87			
Unit / Phase Number		Total Number of Lots	Created		
Other (specify)					
Attachments / Additional Requiremen	ts	54			
ZONING REQUEST	Ann. 2000 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100				
7 Zoning Change				Pending	Plat File Number
Proposed Zoning					
Plan Amendment Change					
Proposed	Plan Designation(s)				
Proposed Density (units/acre)	Provious Pozoning D				
	Previous Rezoning Re	quests			
STAFF USE ONLY					
PLAT TYPE		Fee 1			Total
□ Staff Review X Planning Commis	sion	108	\$ 211	0.00	42.400.00
ATTACHMENTS		108	Ş 311	5.00	\$3,100.00
Property Owners / Option Holders] Variance Request	Fee 2			
ADDITIONAL REQUIREMENTS			Ē	1	
Design Plan Certification (Final Plat)					
Use on Review / Special Use (Concept	Plan)	Fee 3			
Traffic Impact Study					
COA Checklist (Hillside Protection)					
Alexandria Contraction		3	with and a set of the		
0.011					
Ailth	David Harbi	in		5/18/	2022
Applicant Signature	Please Print			Date	2022
865-588-6472	harbin@bh	n-p.com			
Phone Number	Email				WW - 474
Property Owner Signature	Please Print			Date	



Sign Posting & Removal Requirement

Revised April 2021

The Administrative Rules and Procedures of the Knoxville-Knox County Planning Commission require a sign to be posted on the property for each application subject to consideration by the Planning Commission, including the following applications: rezoning, plan amendment, concept plan, use on review/special use, planned development, right-ofway closure, and name change.



The required public notice sign(s) will be provided by Planning to the applicant when an application is submitted. If an application is submitted electronically, Planning staff will post the required sign. If a replacement sign(s) is needed, the applicant is responsible for picking up the new sign(s) from Planning and will be charged \$10 for each replacement.

LOCATION AND VISIBILITY

The sign must be posted on the nearest adjacent/frontage street and in a location clearly visible to vehicles traveling in either direction. If the property has more than one street frontage, the sign should be placed along the street that carries more traffic. Planning staff may recommend a preferred location for the sign to be posted at the time of application.

TIMING

The sign(s) must be posted **not less than 12 days prior to the scheduled Planning Commission public hearing** and must remain in place until the day after the meeting. In the case of a postponement, the sign can either remain in place or be removed and reposted not less than 12 days prior to the next Planning Commission meeting. The applicant is responsible for removing the sign after the application has been acted upon by the Planning Commission.

The individual below is responsible for posting and removing the sign(s) provided consistent with the above guidelines and between the dates of:

(applicant or staff to post sign) and (applicant to remove sign) (applicant to remove sign)	-
Applicant Name: David Harbin Sign posted by Staff	
Date: $5 3 aa$ File Number: $7-5P-aa-C 7-P-aa-WR$ Sign posted by Applicant	