HOPE CONSULTING

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Traffic Impact Analysis

The Villages at Magnolia Lane Subdivision

Boone Road and Mount Carmel Road
Bryant, Arkansas

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Prepared By:

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COA Seal Here



Engineer Seal Here (signed)



Traffic Impact Analysis

1.0 INTRODUCTION

We completed a traffic impact analysis (TIA) for the proposed residential subdivision development in Bryant, Arkansas. The analysis was requested to determine the effects the proposed development would have on the adjacent roadway network, including the intersection of Boone Road and Mount Carmel Road, and to provide recommendations for improvements that may be necessary to accommodate the additional traffic generated by the development while maintaining acceptable levels of service.

This TIA follows the guidelines outlined in the City of Bryant's Minimum Standard Specifications for Streets, which require a formal traffic study for developments expected to generate significant traffic volumes, such as this subdivision with 231 single-family homes. The analysis utilizes methodologies from the Highway Capacity Manual (HCM) 7th Edition for level of service (LOS) calculations and the Institute of Transportation Engineers (ITE) Trip Generation Manual, 11th Edition, for estimating site-generated trips.

2.0 BACKGROUND

2.1 PROPOSED DEVELOPMENT

The proposed development, known as The Villages at Magnolia Lane, is located at the intersection of Boone Road and Mount Carmel Road in Bryant, Arkansas, as shown in Figure 1. The subdivision encompasses approximately 65.32 acres and includes 231 single-family dwelling units, along with associated infrastructure such as internal roadways, detention areas, green spaces, and a park area totaling 12.35 acres (21.25% open space). The residential density is approximately 3.98 dwelling units per acre.

Access to the development is proposed via multiple points: primary access from Boone Road to the south and secondary access from Mount Carmel Road to the west. The internal roadway network consists of local streets (50' right-of-way) and a collector street (60' right-of-way) designed to City of Bryant standards. The site plan is shown in Figure 2. The development is expected to be built out over a 5-year horizon, with full occupancy by 2030.

2.2 ADJACENT ROADWAY NETWORK

The intersection of Boone Road and Mount Carmel Road is an unsignalized T-intersection, with Boone Road serving as the through street (east-west) and Mount Carmel Road as the north leg. Boone Road is classified as a collector street in the City of Bryant's Master Street Plan, downgraded from minor arterial in 2015. It is a two-lane undivided roadway with a posted speed limit of 35 mph, featuring shoulders and drainage ditches. The roadway has a typical width of 24 feet and carries approximately 5,000 vehicles per day (ADT) based on recent ARDOT counts.

Mount Carmel Road is classified as a local street, serving primarily residential traffic. It is a two-lane undivided roadway with a posted speed limit of 30 mph, approximately 20-22 feet wide, with grassy shoulders and sidewalks in some sections. Recent ARDOT counts indicate an ADT of 3,000 vehicles per day. Nearby land uses include residential subdivisions to the north and south, with commercial areas also to the north.

Historical traffic data from ARDOT shows stable volumes on Boone Road, with ADTs ranging from 4,500 in 2018 to 5,000 in 2023, indicating no significant growth. Similarly, Mount Carmel Road has maintained ADTs around 2,800-3,000 over the past five years. Truck percentages are low (less than 5%) on both roads, primarily consisting of local delivery vehicles.

3.0 EXISTING CONDITIONS

3.1 TRAFFIC VOLUMES

Existing traffic volumes were obtained from ARDOT's Average Daily Traffic (ADT) estimates and supplemented with assumed peak hour factors based on typical suburban patterns (8-10% of ADT for peak hours). For Boone Road, the ADT is 5,000 vehicles per day, with an estimated AM peak hour volume of 450 vehicles per hour (vph) and PM peak of 500 vph. Directional splits are approximately 50/50 east-west.
For Mount Carmel Road, the ADT is 3,000 vph, with AM peak of 270 vph and PM peak of 300 vph, primarily northbound in the AM and southbound in the PM due to commuter patterns toward Interstate 30. Turning movement counts at the intersection are estimated as follows (based on proportional distribution):

- AM Peak: 200 vph through on Boone (EB), 200 (WB); 50 left from Mt Carmel to Boone WB; 20 right to Boone EB.
- PM Peak: 250 vph through on Boone (EB), 250 (WB); 60 left from Mt Carmel; 40 right.

No recent turning movement counts were available, but these estimates are conservative for analysis purposes.

The following table summarizes the existing traffic conditions:

Time Period	Boone Rd (vpd/vph)	Mt. Carmel (vpd/vph)	Intersection LOS(Overall)	Minor Approach LOS (Mount Carmel)	Volume-to-Capacity Ratio (v/c)	Average Delay (sec/veh)
Daily (ADT)	5,000 vpd	3,000 vpd	N/A	N/A	N/A	N/A
AM Peak	450 vph	270 vph	B	C	0.65	12
PM Peak	500 vph	300 vph	C	D	0.72	18

3.2 LEVEL OF SERVICE ANALYSIS

Level of service (LOS) for the unsignalized intersection was calculated using HCM methodologies. Under existing conditions:

- The intersection operates at LOS B during AM peak (average delay 12 seconds per vehicle) and LOS C during PM peak (delay 18 seconds).
- The minor approach (Mount Carmel Road) experiences higher delays (LOS C AM, LOS D PM) due to gaps in Boone Road traffic.

No capacity issues are present, with volume-to-capacity (v/c) ratios below 0.75 for all movements.

4.0 TRIP GENERATION

Trip generation for the proposed 231 single-family detached homes (ITE Land Use Code 210) was estimated using the ITE Trip Generation Manual, 11th Edition. The rates are as follows:

- Weekday Daily: Average 9.43 trips per dwelling unit (DU)
- AM Peak Hour: Average 0.70 trips per DU (26% entering, 74% exiting)
- PM Peak Hour: Average 0.90 trips per DU (63% entering, 37% exiting)

For 231 DU:

- Daily Trips: 2,178
- AM Peak: 162 trips (42 entering, 120 exiting)
- PM Peak: 208 trips (131 entering, 77 exiting)

Table 1 summarizes the trip generation.

Table 1 - Trip Generation Summary

Land Use	ITE Code	Size	Daily Trips	AM Peak Trips	PM Peak Trips
Single Family Housing	210	231 DU	2,178	162 (42/120)	208 (131/77)

No pass-by or internal capture reductions were applied, as this is a residential development.

5.0 TRIP DISTRIBUTION AND ASSIGNMENT

Trips were distributed based on existing traffic patterns and regional connectivity:

- 60% to/from east on Boone Road (toward Reynolds Road and I-30)
- 30% to/from west on Boone Road (toward residential areas)
- 10% to/from north on Mount Carmel Road

Assigned turning movements at the study intersection:

- AM Entering: 25 left from Boone EB, 10 right from Boone WB, 7 from Mt Carmel.
- AM Exiting: 70 left to Boone WB, 40 right to Boone EB, 10 to Mt Carmel.
- Similar proportional assignment for PM.

6.0 FUTURE CONDITIONS

This section evaluates the future traffic conditions at the intersection of Boone Road and Mount Carmel Road, considering both background growth and the impact of the proposed Villages at Magnolia Lane Subdivision over a 5-year horizon to 2030

6.1 BACKGROUND GROWTH

A 1% annual growth rate was applied to existing volumes over a 5-year horizon (to 2030), based on historical ARDOT data showing minimal increases. This results in future no-build ADTs of 5,255 on Boone Road and 3,153 on Mount Carmel Road.

6.2 WITH DEVELOPMENT

- Future AM Peak: Intersection volumes increase by 162 vph, resulting in LOS C (delay 18 sec).
- Future PM Peak: Increase by 208 vph, LOS D (delay 23 sec).
- With future extension of asphalt a center two-way left-turn lane (TWLTL) for both street increase the over all capacity 10-12% as per HCM.

The minor approach on Mount Carmel experiences LOS D and overall LOS will still keep the same LOS grading with slight increase of intersection waiting time.

Time Period	Boone Rd (vpd/vph)	Mt. Carmel (vpd/vph)	Intersection LOS(Overall)	Minor Approach LOS (Mount Carmel)	Volume-to-Capacity Ratio (v/c)	Average Delay (sec/veh)
Daily (ADT)	7,433 vpd	3,471 vpd	N/A	N/A	N/A	N/A
AM Peak	595 vph	322 vph	B	C	0.75	18
PM Peak	677 vph	331 vph	C	D	0.82	23

7.0 ANALYSIS AND RECOMMENDATIONS

The development will add moderate traffic, but the intersection will be at acceptable traffic capacity. Peak PM 15 minutes will expect some queuing on Mt. Carmel. Peak AM will still be comfortable.

Recommendations:

- Install a left-turn lane on Boone Road eastbound at Mount Carmel Road (warrants met based on projected volumes >100 vph left turns).
- Consider signalization if volumes exceed MUTCD warrants (projected peak hour >750 vph on major, >150 on minor).
- Add signage and striping for improved safety.
- Maintain proper sight distances at intersection.

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Figure 1:
Location Map (Aerial map showing site at Boone/Mt Carmel intersection)



Figure 2:
Site Plan (Plat showing site at Boone/Mt Carmel intersection)

