REQUEST FOR BOARD ACTION

HENDERSON COUNTY
BOARD OF COMMISSIONERS

MEETING DATE: Wednesday, May 15, 2013

SUBJECT: Continued Discussion on Rezoning Application #R-2013-01-C

PRESENTER: Parker Sloan, Planner

ATTACHMENTS:
1. Staff Memo
2. Letter from NCDOT
3. Traffic Impact Analysis – Executive Summary
4. Traffic Impact Analysis Report

SUMMARY OF REQUEST:

On April 1, 2013, the Board of Commissioners held a public hearing on rezoning application #R-2013-01-C to rezone 1.71 acres (PIN: 9539-98-3442) from a Residential Two Rural (R2R) zoning district to a Community Commercial Conditional (CC-CD) zoning district. After hearing resident's concerns, the Board requested the applicant, the Broadway Group, complete a traffic impact analysis (TIA) for the proposed retail sales and service use to determine if any improvements were needed.

The Broadway Group hired J.M. Teague Engineering, PLLC, located in Waynesville, NC, to conduct the TIA. On May 2, 2013, planning staff met with the engineer and NCDOT representatives to discuss the TIA findings. NCDOT concurs with the TIA findings and requests J.M. Teague Engineering provide a plan for traffic signal timing and optimization. NCDOT will also require the developer pay for clearing of vegetation for site visibility if the rezoning request is approved (See Attachment 2).

BOARD ACTION REQUESTED:

The Board of Commissioners may approve, approve with modifications, or deny the application to rezone the Subject Area to a Community Commercial Conditional (CC-CD) zoning district. State law requires the Board adopt a written statement of consistency with the County Comprehensive Plan (CCP).

<u>Suggested Motion:</u>

I move that the Board adopt a resolution regarding the consistency with the CCP.

I move that the Board adopt the proposed map amendment with conditions as discussed.

Planning Department
100 North King Street
Hendersonville, NC 28792

MEMORANDUM

TO: Henderson County Board of Commissioners
FROM: Parker Sloan, Planner
DATE: May 7, 2013
SUBJECT: Proposed Conditions for Rezoning Application #R-2013-01-C

On December 28, 2012, the Broadway Group LLC, submitted rezoning application #R-2013-01-C, to rezone 1.71 acres from a Residential Two Rural (R2R) zoning district to a Community Commercial Conditional (CC-CD) zoning district.

Conditional zoning district decisions are a legislative process subject to the same procedures as traditional zoning districts. Conditional zoning districts are created for the purpose of providing an optional rezoning choice where the owner of property proposes to rezone property and (in order to, among other reasons, carry out the purposes of the Comprehensive Plan) proposes to impose special limitations and conditions on the use of the property proposed for rezoning.

Planning staff suggested the applicant request a conditional rezoning to address potential concerns from adjacent property owners and to limit the commercial uses on the subject area to retail sales and services based on a proposed site plan approval. Staff suggests the following conditions be imposed on the Subject Area:

(1) Site Plan. Major *Site Plan* required in accordance with §200A-299 (Major Site Plan Review).
(2) Lighting. *Adequate lighting* shall be placed in areas used for vehicular/pedestrian access including, but not limited to: stairs, sidewalks, crosswalks, intersections, or changes in grade. *Lighting mitigation* required.
(3) Building Orientation: The building may be located within 35 feet from the edge of the ROW. The main entrance of the building should face the street and all of the parking should be located on the side and rear of the building.
(4) Hydrant: A fire hydrant must be located within 400 of any part of the building. This needs to be indicated on the site plan and confirmed.
(5) Water Supply Watershed: The subject property is located within a WS-IV-PA and allows a maximum built upon limit of 70% under the high density option. Engineered storm water controls as prescribed in the County LDC is required.
(6) Buffer: The County LDC requires a B1 buffer (20 feet) along each side of the property that is adjacent to a residential district.

(7) All required parking spaces must meet the design requirements of the Land Development Code §200A-161-165. The proposed parking spaces shall comply with the landscape design standards and off street parking provisions as outlined in the Land Development Code (LDC Article V and VI). It appears the applicant is proposing more than the required parking spaces and the spaces shown on the site plan meet the requirements of the Land Development Code.

(8) Etowah-Horse Shoe Community Plan Recommendations. All three of the following recommendations were agreed to by the applicant on March 19, 2013:

   a. Design Standards: The Etowah-Horse Shoe Community Plan recommended design standards for noresidentail uses (Goal CCD1, Objective CCD1.1). Design standards should prohibit unfinished steel or aluminum roofing and aluminum siding material and vinyl siding, and require at least 30% masonry fronts which includes stone or brick (log or timber materials may be acceptable). Where buildings are visible from the side, appropriate evergreen plantings shall be used to obscure the view from adjoining streets. The site plan should indicate compliance.
   b. Signs: The Etowah-Horse Shoe Community Plan recommended new sign requirements (Goal CCD1, Objective CCD1.3). Restrict sign height for commercially zoned areas to a maximum of eight (8) feet. Require adequate landscaping around signs to improve aesthetics of signage. The proposed sign on the subject property shall be a monument sign (sign base shall be wider than the sign). The site plan should indicate compliance.
   c. Lighting: The Etowah-Horse Shoe Community Plan recommended standards to limit light pollution (Goal CCD1, Objective CCD1.3). Incorporate standards that require semi-cutoff or full-cutoff lighting for major subdivisions and commercial developments within the Planning Area. The site plan should indicate compliance.

(9) Any signs used on site must meet current standards of Article VII of the LDC.

(10) If the applicant has plans for future expansion of the existing business, all potential modification or expansions should be noted on the site plan.

(11) TIA and other identified traffic improvements as requested by NCDOT. Refer to NCDOT letter from Steve Cannon dated May 3, 2013.

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

PATRICK L. MCCRORY
GOVERNOR

ANTHONY J. TATA
SECRETARY

May 3, 2013

Henderson County Planning Department
C/o Mrs. Autumn Radcliff, Interim Planning Director
100 North King Street
Hendersonville, NC 28792

Re: NCDOT Review of TIA for proposed Dollar Store on US 64W in Horse Shoe, NC

Dear Mrs. Radcliff,

Thank you and your staff for meeting with Mr. Stokes (J.M. Teague Engineering), Mr. Ownbey, and myself to review the TIA for the proposed Dollar Store on US 64W in Horse Shoe, NC.

NCDOT staff, to include Mr. Cook, Mr. Ownbey, and myself, has reviewed the TIA prepared by J.M. Teague Engineering on April 18, 2013 and concur with the findings within.

NCDOT has requested J.M. Teague Engineering provide additional information as follows:

- Traffic signal timing and optimization to address the eastbound left turning queue during the AM peak hour.

Additionally if the rezoning request is approved NCDOT will require the developer to fund, by means of reimbursable agreement with NCDOT, additional clearing of vegetation with the Right of Way of US 64W to provide optimal sight distance to the west from the proposed entrance. With this clearing adequate sight distance can be obtained.

If you have any questions please contact me at (828) 891-7911 or by email at slcannon@ncdot.gov

Sincerely,

Steve Cannon

Steve Cannon, PE
NCDOT
District Engineer

SLC/slc
Att (1)

Cc: Mr. Scott Cook, NCDOT Division Traffic Engineer
Mr. Carl Ownbey, NCDOT Eng Tech
Mr. Wesley Stokes, EI J.M. Teague Traffic Engineering
File

EXECUTIVE SUMMARY

For

DISCOUNT RETAIL STORE

LOCATED IN HORSESHOE
NORTH CAROLINA

Prepared For:
Melissa Ballard
The Broadway Group
132 Holmes Avenue
Huntsville, AL 35801

Prepared By:
J. M. Teague Engineering, PLLC
525 North Main Street
Waynesville, North Carolina 28786

May 2013

JMT Project 0214
Client 0310-3-10-0214

EXECUTIVE SUMMARY

The purpose of the Traffic Impact Analysis report was to analyze the traffic impact of a proposed discount retail store near the intersection of US 64 (Brevard Road) and Banner Farm Road (SR 1314). Existing turning movement volumes were obtained at this intersection and adjusted to account for the proposed site generated traffic. This data was then distributed on to the roadway network and analyzed to determine the level of service, delay, volume to capacity ratio and queue lengths (backup).

After analyzing the intersections of US 64 @ Banner Farm Road and US 64 @ Proposed Site Access at full build-out conditions, it was determined that the resulting level of service, delay, volume to capacity ratio, and queue lengths (backup) for each intersection were only minimally increased and within acceptable levels. This is due to the low volume of trips generated during the peak hours. No geometric changes are recommended at these intersections to accommodate traffic generated by the site.

A 10-year (03/01/2003 – 02/28/2013) crash analysis summary for US 64, between Cummings Road and S. Rugby Road, was provided by the North Carolina Department of Transportation (NCDOT). However, only the reported crashes near the intersection of US 64 @ Banner Farm Road, the area impacted by the site, were analyzed. There was one (1) reported crash near the proposed site access. Because no access currently exists at the site, this crash was likely an anomaly and does not represent any particular crash pattern.

However, eastbound queuing from the signal may occur past the site access and impact driver gap acceptance. Eastbound signal queues could also block site traffic wishing to turn left into the site, creating a westbound traffic queue through the signal. The anticipated eastbound queuing is only expected to occur past the site during the AM peak hour. Because of the relatively short traffic signal cycle length and low entering site traffic, these situations should only occur at minimum, and can be further reduced with appropriate and routine traffic signal timing.

During the maximum queue, driver gap acceptance may decrease and drivers may be inclined to enter US 64, even when not safe. Again, this should be a minimal occurrence and with appropriate and routine traffic signal timing optimizations can be further reduced. During non-peak hours, eastbound traffic is not expected to queue past the site.

TRAFFIC IMPACT ANALYSIS

For

DISCOUNT RETAIL STORE

LOCATED IN HORSESHOE NORTH CAROLINA

Prepared For:
Melissa Ballard
The Broadway Group
132 Holmes Avenue
Huntsville, AL 35801

Prepared By:
J. M. Teague Engineering, PLLC
525 North Main Street
Waynesville, North Carolina 28786

NORTH CAROLINA PROFESSIONAL SEAL 022948 ENGINEER J. MARK TEAGUE

4/22/13

April 2013

JMT Project 0214
Client 0310-3-10-0214

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INTRODUCTION AND BACKGROUND

The purpose of this report is to analyze the traffic impact of a proposed discount retail store near the intersection of US 64 (Brevard Road) and Banner Farm Road (SR 1314). Preliminary development plans call for a 9,100 square foot retail space connected by a single access point onto US 64. The purpose of this study is to determine the impact of the anticipated traffic associated with this development including trip generation, trip distribution, intersection delay, vehicle queue, and intersection capacity. Each of these aspects will be analyzed to determine any potential adverse traffic impacts on the adjacent roadway network from the proposed development. The site is located in the southwest quadrant of the intersection of US 64 (Brevard Road) and Banner Farm Road. (*Figure 1)*

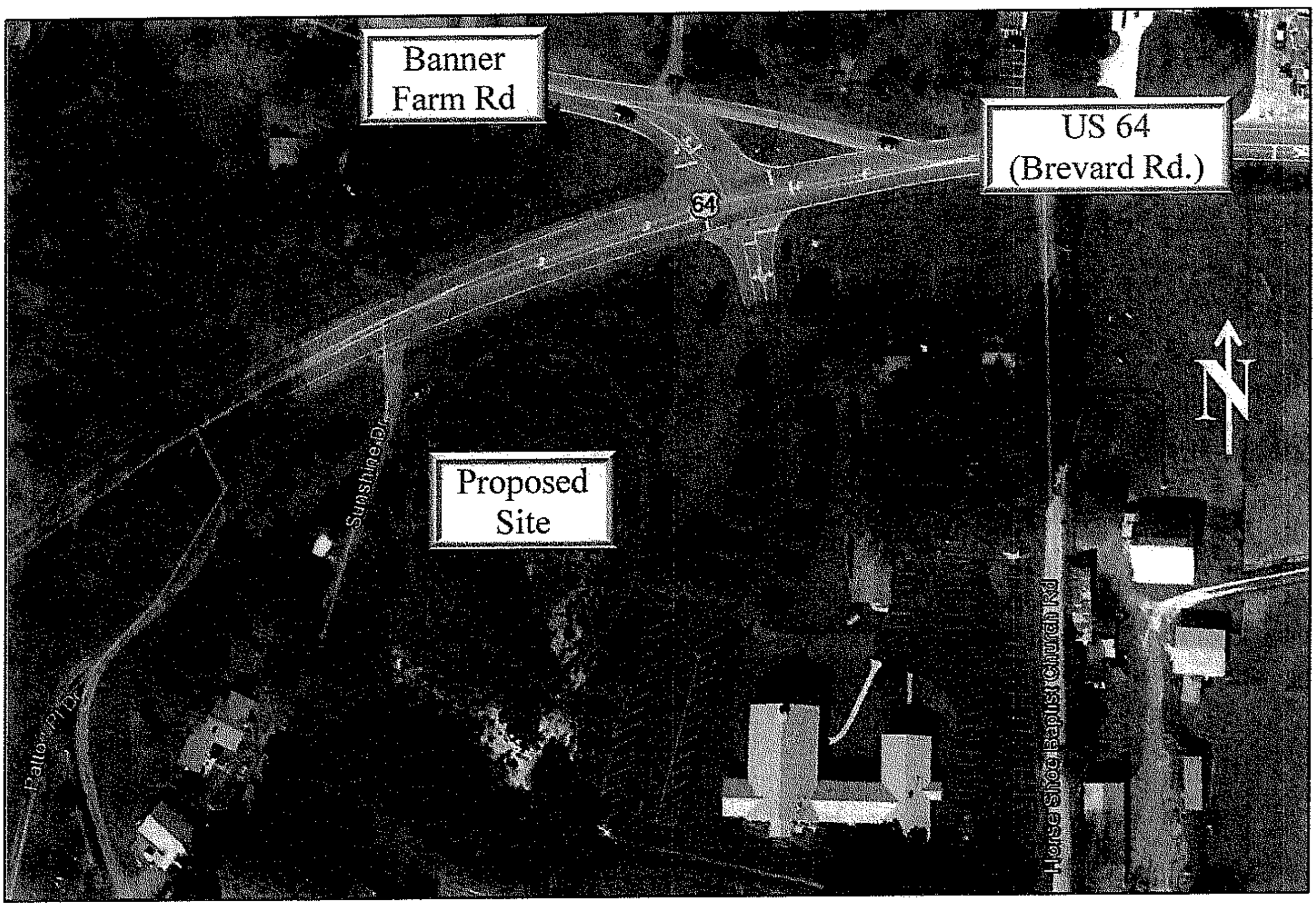


FIGURE 1 – SITE LOCATION

Proposed Site Use and Access

The site plan includes a 9,100 square foot Free Standing Discount-Store (*ITE Land Use Code 815*). The facility will have a full movement access onto US 64 (Brevard Rd.) just west of the intersection of US 64 @ Banner Farm Road. (*Figure 2)*

Parameters and Study Area

As determined through engineering judgment the study area of this TIA includes:

- US 64 (Brevard Rd.) @ Banner Farm Rd. (SR 1314)
- Site Access Point @ US 64 (Brevard Rd.)

Other parameters include:

- Assumed 17% pass-by trips for PM Peak Hour
- Assumed 2% heavy trucks

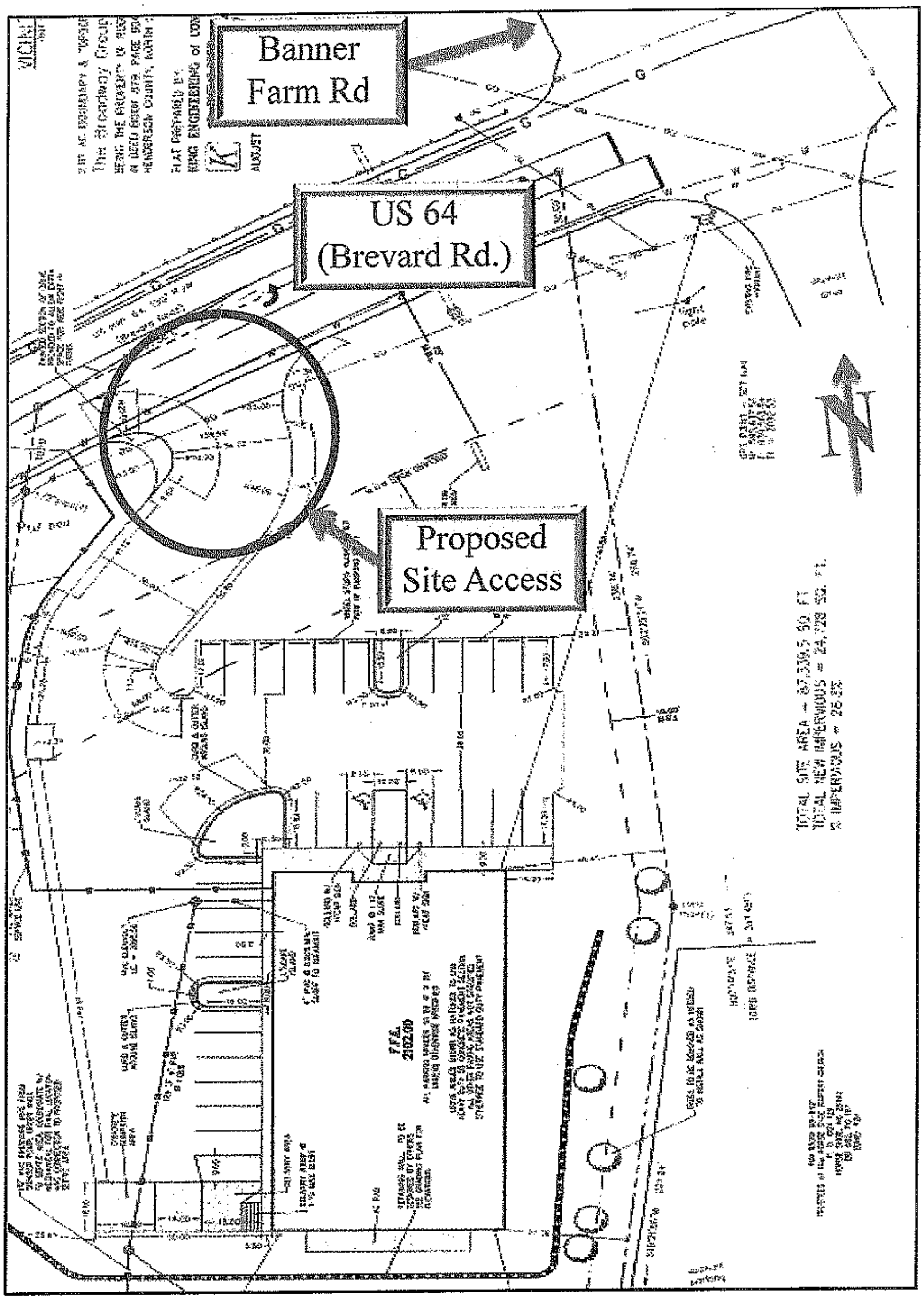


FIGURE 2 – SITE PLAN

Surrounding Roadways

US 64 is a primary east-west arterial route that connects Hendersonville to Brevard and points east and west. The posted speed limit is 45 mph east of the intersection of US 64 @ Banner Farm Road and 55 mph west of this intersection. However, due to the proximity of the signal and the built-up area of Horseshoe, 45 mph is more of a representative speed for the section of roadway leading up to the signal.

Banner Farm Road is a secondary route that connects the Mills River community to the Horseshoe community. This road often serves as an alternate route for drivers wanting to bypass Hendersonville.

Existing Traffic

Existing traffic is defined as the volume of traffic on the roadway network that is present at the time of traffic impact study preparation. This is known as the Existing Traffic Year. Existing peak hour turning movement volumes were obtained at the intersection of US 64 (Brevard Road) @ Banner Farm Road. The turning movement counts were conducted during the AM peak period (7:00AM – 9:00AM) and the PM peak period (4:00PM – 6:00PM). *(Appendix A)* The AM and PM peak hours were identified and the existing peak hour volumes are shown in *Figure 3*. The complete turning movement counts can be found in *Appendix A*.

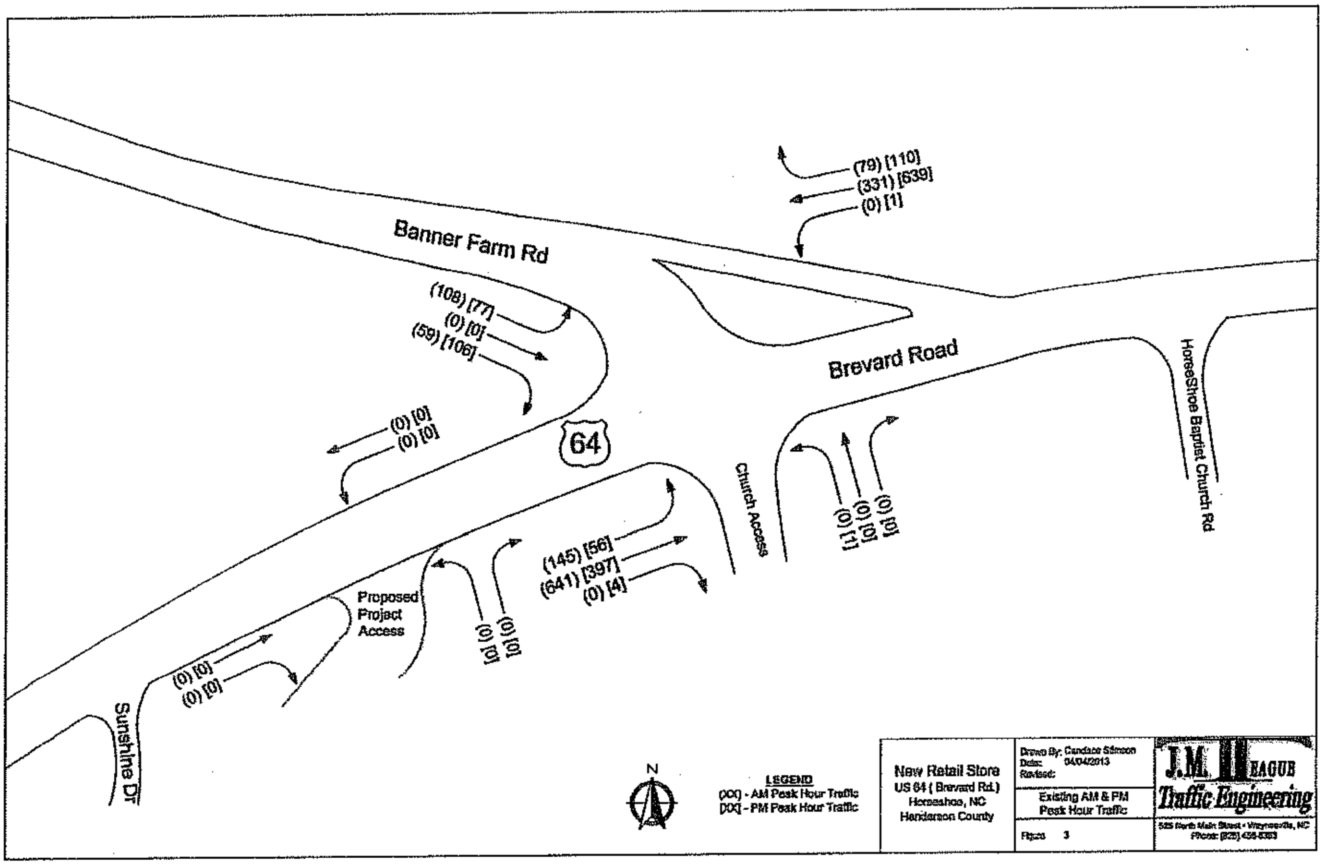


FIGURE 3 – EXISTING AM/PM PEAK HOUR TRAFFIC

Background Traffic

Background traffic is defined as the traffic that would be at the studied intersections at the time of anticipated project completion (build-out), with or without the proposed development. This is known as the Background Traffic Year. Background traffic is comprised of existing traffic and any increase or decrease in volumes which might occur from general growth trends in the surrounding area or from nearby specific developments.

Although there are several methods in determining the background traffic and the corresponding growth rate; the generally accepted method is to use 2% annual growth unless other information is available. The anticipated project completion year (build-out) is 2013. Because project completion is expected to be during the same year as the Existing Traffic Year, background traffic is not a factor with this particular study.

Trip Generation

The trip generation data was compiled from the Institute of Transportation Engineers (ITE) Trip Generation Manual, 8th Edition. The studied land use and the associated typical weekday trip generation spreadsheet and calculations are shown in *Table 1*. According to ITE Trip Generation Manual, 8th edition, the definition a *trip* is "a single or one-direction vehicle movement with either the origin or the destination (ingress or egress) inside a study site." In accordance with ITE guidelines, the "rate" method was used in lieu of the "equation" method. The corresponding trip generation data from the ITE Trip Generation Software by Microtrans can be found in *Appendix B*.

Consideration of Pass-By Trips

The method of determining pass-by trips was also obtained from the ITE Trip Generation Manual. Pass-by trips are a subset of trip generation that applies to commercial / retail developments. They are defined as trips to and from the site that occur from vehicles that are *already* on the studied roadway for other purposes. For Land Use Code *815*, ITE allows 17% pass-by trips for the PM peak hour. The 17% reduction for the PM peak hour is reflected in *Table 1*.

Typical Weekday Trip Generation

Land Use (ITE Code)	Size	Unit of Measure	ADT (vpd)	AM Peak (vph)		PM Peak (vph)	
				IN	OUT	IN	OUT
Free Standing Discount Store (815)	9.1	Th. Sq. Ft	521	7	3	23	23
Anticipated Total Site Trips			521	7	3	23	23
Total Peak Hour Pass-By Trips *(17%)*			0	0	0	4	4
Total Peak Hour Volume to Adjacent Streets			521	7	3	19	19

<TABLE 1>

TRIP DISTRIBUTION AND SITE TRIPS

The trip distribution for this development was estimated from the existing traffic volume patterns within the surrounding roadway network, the surrounding population densities, and engineering judgment. The proposed trip distribution percentages are shown in *Figure 4*. Anticipated site trips are shown in *Figure 5*.

BUILD-OUT TRAFFIC

Build-out traffic is defined as the total traffic volume that will be present on the surrounding roadway network at the time of project completion and full occupancy. This time is assumed to be 2013. Build-out traffic was calculated by adding the existing traffic and anticipated site traffic. *Figure 6* shows the anticipated build-out AM & PM Peak Hour traffic.

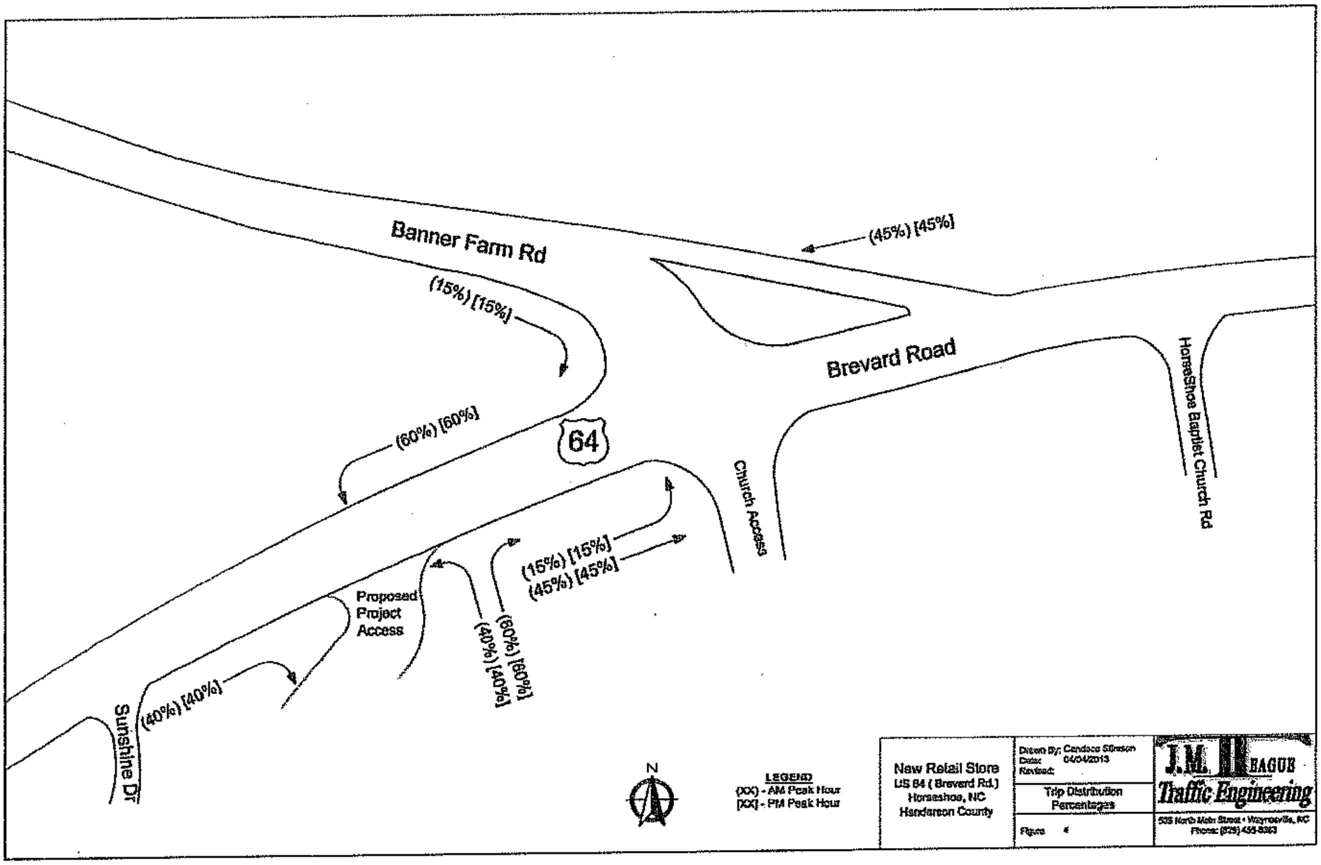


FIGURE 4 – TRIP DISTRIBUTION PERCENTAGE AM AND PM PEAK HOUR INGRESS & EGRESS

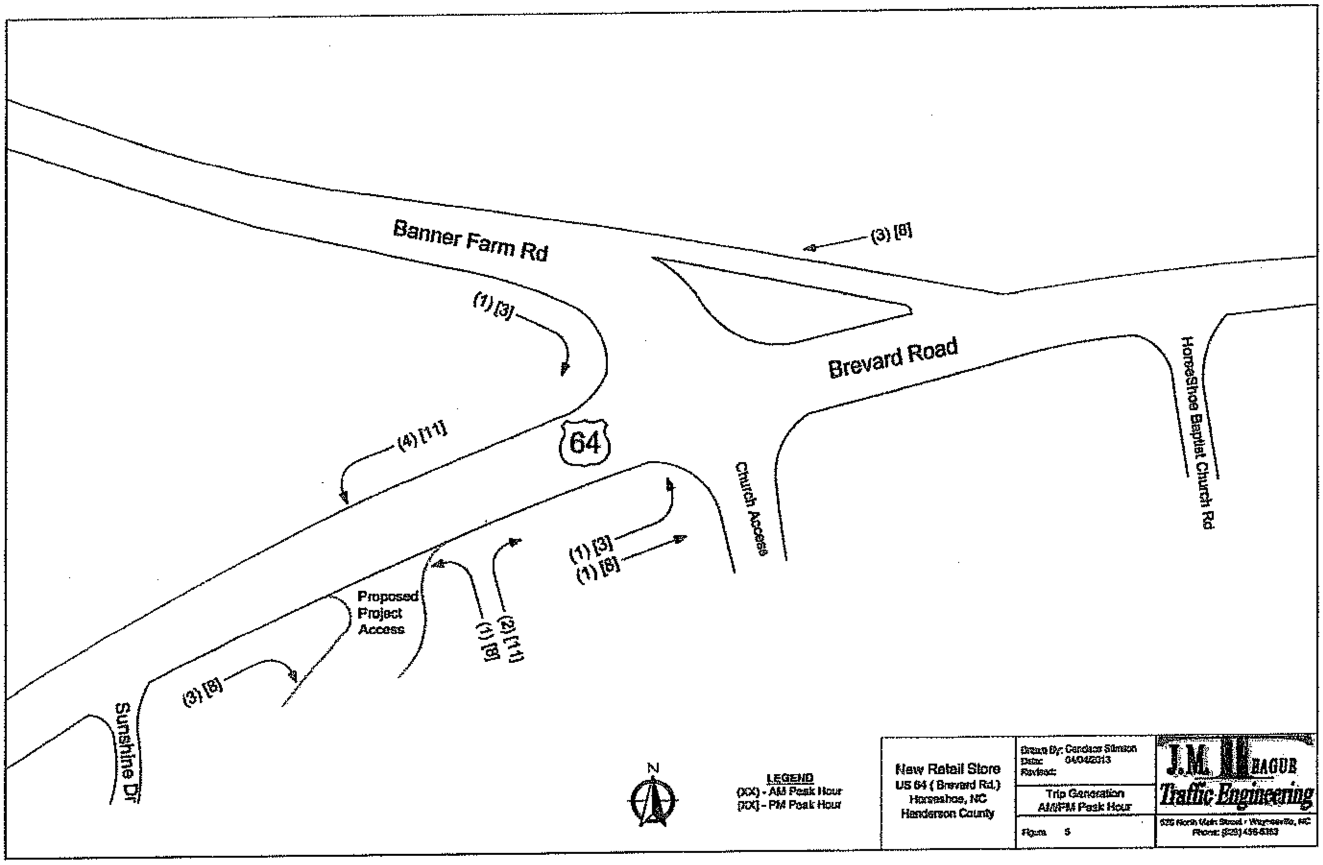


FIGURE 5 – TRIP GENERATION AM AND PM PEAK HOUR INGRESS AND EGRESS

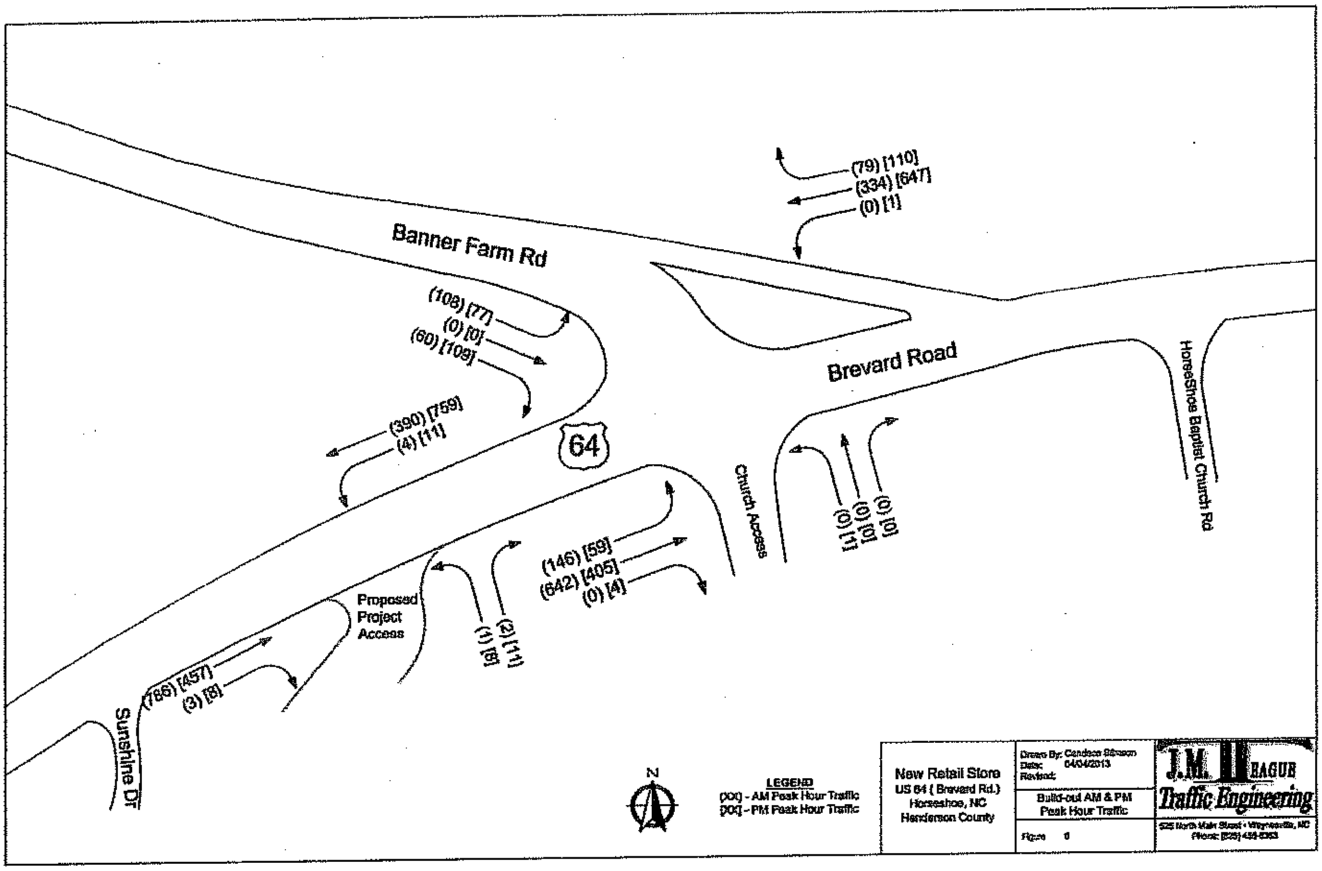


FIGURE 6 – BUILD-OUT AM AND PM PEAK HOUR TRAFFIC

CRASH ANALYSIS SUMMARY

A 10-year (03/01/2003 – 02/28/2013) crash analysis summary for US 64, between Cummings Road and S. Rugby Road, was provided by the North Carolina Department of Transportation (NCDOT). Only the reported crashes near the intersection of US 64 @ Banner Farm Road, the area impacted by the site, were analyzed. (*Figure 7*) Other reported crashes captured by the NCDOT summary were beyond the area of influence by this proposed site.

As can be seen in *Figure 5,* 11 vehicles egress the site during the PM peak hour and pass through the signalized intersection of US 64 @ Banner Farm Road. During the same peak hour, 11 vehicles pass through the signal before ingressing the site. Subsequently, during the AM peak hour 2 egress vehicles and 4 ingress vehicles pass through the signal. These site generated volumes correspond to between 0.5% and 2% of the total approach volume. This represents a very small increase in traffic volume through the signal and will likely be insignificant to future increased crash rates at this intersection.

Figure 7 also shows one (1) reported crash near the proposed site access. Because no access currently exists at the site, this crash was likely an anomaly and does not represent any particular crash pattern.

However, due to the close proximity of the proposed site access to the signal, eastbound queuing from the signal may occur past the site access. Vehicle queuing past an access point can impact driver gap acceptance. Driver gap acceptance is the available gap between approaching vehicles that a driver is willing to accept in order to enter the roadway from the side street. This value typically decreases for drivers as their wait time to enter the roadway increases.

The anticipated eastbound queuing is only expected to occur past the site during the AM peak hour. This value can be seen in *Table 5*. Because of the relatively short traffic signal cycle length and low entering site traffic, this situation should only occur at minimum.

During the maximum queue, driver gap acceptance may decrease and drivers may be inclined to enter US 64, even when not safe. Eastbound signal queues could also block site traffic wishing to turn left into the site, creating a westbound traffic queue through the signal. Again, this should be a minimal occurrence and with appropriate and routine traffic signal timing revisions and optimization can be further reduced. During non-peak hours, eastbound traffic is not expected to queue past the site.

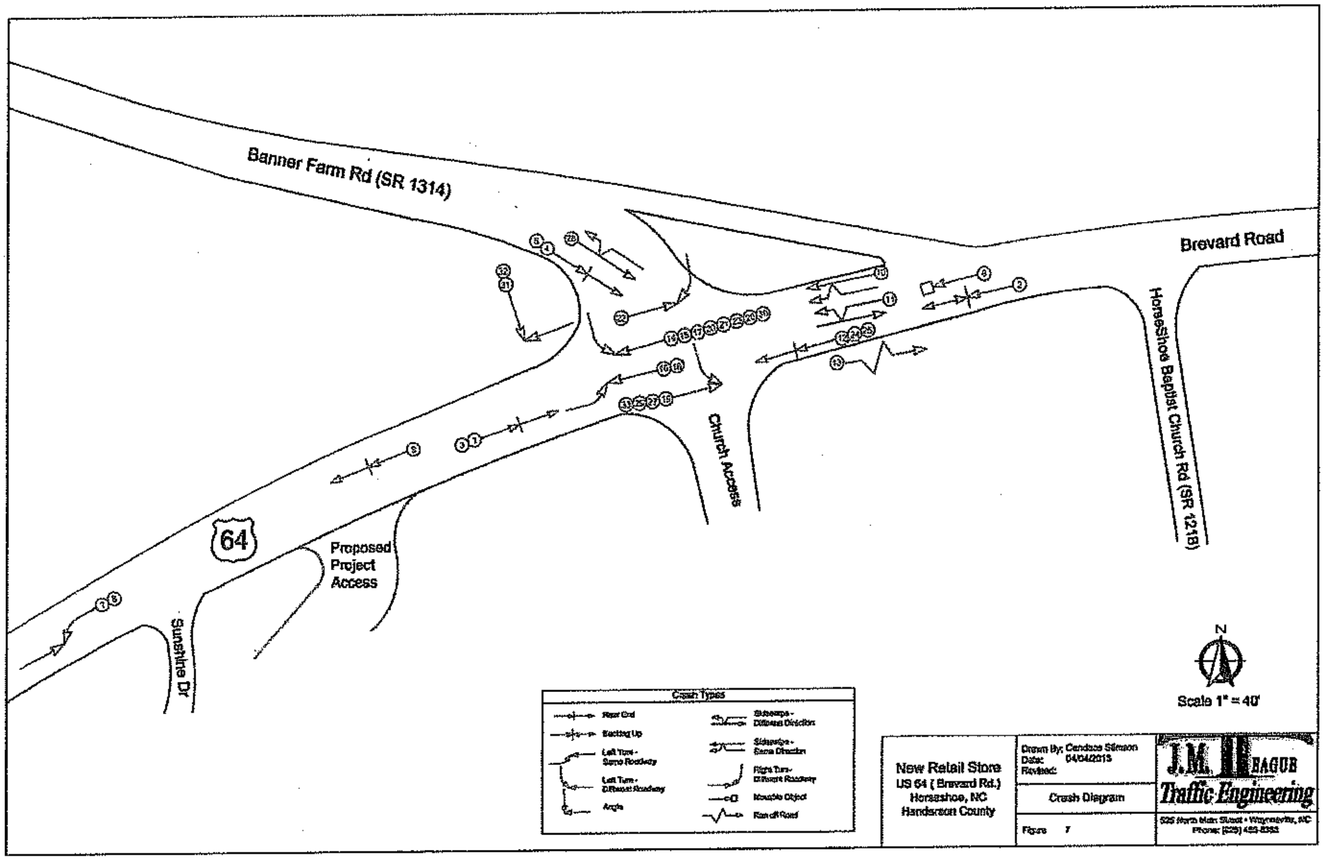


FIGURE 7 – CRASH DIAGRAM

Method of Analysis

The studied intersection was analyzed using Synchro. Synchro is a complex software package that allows the user to model intersections and roadway networks to determine levels of service (LOS), based on the thresholds specified in the Highway Capacity Manual (HCM) published by the Transportation Research Board. Synchro also provides analysis of capacity, vehicle delay, volume to capacity ratio (v/c), queue lengths, traffic signal timing, and vehicle flow rate.

The HCM defines capacity as "the maximum hourly rate at which persons or vehicles can reasonably be expected to traverse a point during a given time period under prevailing roadway, traffic, and control conditions". LOS is a term used to represent different driving conditions, primarily with respect to traffic congestion. It is defined as a "qualitative measure describing operational and perceptional conditions within a traffic stream". LOS "A" represents free flow traffic conditions with no congestion. LOS "F" represents severely impacted traffic flow due to vehicle congestion. LOS is generally determined by the total "Control Delay" experienced by drivers. Control delay is vehicle delay that is ultimately caused by the traffic control device. This includes deceleration delay, queue move-up time delay, stopped delay, and acceleration delay. (*Table 2)*

HIGHWAY CAPACITY MANUAL
LEVEL OF SERVICE AND DELAY

Un-Signalized Intersection		**Signalized Intersection**	
Level of Service	**Average Control Delay Per Vehicle (Seconds)**	**Level of Service**	**Average Control Delay Per Vehicle (Seconds)**
A	**0-10**	**A**	**0-10**
B	**10-15**	**B**	**10-20**
C	**15-25**	**C**	**20-35**
D	**25-35**	**D**	**35-55**
E	**35-50**	**E**	**55-80**
F	**>50**	**F**	**>80**

<Table 2>

Usually, at a signalized intersection LOS "D" is considered the lowest acceptable LOS. However, it is not unusual for a side street or private driveway at an un-signalized intersection to experience LOS "F" during a peak hour. The analysis for un-signalized intersections can project very high delays on the side street, thus it is recommended to use LOS measurements as a comparative tool rather than a design tool. The volume to capacity ratio can sometimes be an indication of roadway LOS. *(Table 3)*

LEVEL OF SERVICE	V/C Ratio	PERCENT OF FREE FLOW SPEED (PEAK HOUR)
A	0.50 AND BELOW	90% OR GREATER
B	0.60 TO 0.69	70% TO 90%
C	0.70 TO 0.79	50%
D	0.80 TO 0.89	40%
E	0.90 TO 0.99	33%
F	1.00 and Above	25% or less

<Table 3>

It can be seen as the v/c ratio approaches 1.0 (the point where volume equals capacity), the LOS deteriorates dramatically.

The 95th Queue is defined to be the vehicle queue (back-up) that has only a 5% probability of being exceeded during the analysis period. At un-signalized intersections, p0 is the probability of a queue free state.

ANALYSIS OF EXISTING CONDITIONS

In order to estimate the current 95th queue length, LOS and delay, and v/c ratios at the study intersections, the existing traffic volumes were analyzed using existing lane configurations and traffic control conditions. *(Table 4)* The capacity analysis (Synchro Reports) for the existing conditions can be found in *Appendix C*. The estimated delay was field verified and found to generally coincide with the Synchro calculations.

US 64 (BREVARD RD) @ BANNER FARM RD
ANALYSIS OF EXISTING AM/PM PEAK HOUR TRAFFIC CONDITIONS

APPROACH	AM PEAK HOUR			PM PEAK HOUR		
	95th Queue Length (feet)	LOS and Delay (sec)	V/C Ratio	95th Queue Length (feet)	LOS and Delay (sec)	V/C Ratio
EB Left Turn	66	A 7.9	0.54	38	A 8.7	0.53
EB Thru & Right	294	B 13.4	0.82	137	A 5.3	0.44
WB Left Turn	2	A 4.5	0.00	2	A 3.6	0.00
WB Thru & Right	160	A 7.1	0.55	377	B 14.8	0.86
NB Left Turn	4	B 16.7	0.01	5	C 22.5	0.01
NB Thru & Right	5	B 16.7	0.01	7	C 22.6	0.01
SB Left Turn	88	C 23.4	0.62	92	C 27.6	0.56
SB Thru & Right	41	B 17.5	0.27	93	C 28.1	0.60

<TABLE 4>

Analysis of Build-out Traffic Conditions

In order to estimate the build-out 95th queue length, LOS and delay, and v/c ratios at the study intersections, the existing traffic volumes were analyzed using existing lane configurations and traffic control conditions *Tables 5 & 6.* The capacity analysis (Synchro Reports) for the existing conditions can be found in *Appendix C.* The estimated delay was field verified and found to generally coincide with the Synchro calculations.

US 64 (Brevard Rd) @ Banner Farm Rd
Analysis of Build-out AM/PM Peak Hour Traffic Conditions

Approach	AM Peak Hour			PM Peak Hour		
	95th Queue Length (feet)	LOS and Delay (sec)	V/C Ratio	95th Queue Length (feet)	LOS and Delay (sec)	V/C Ratio
EB Left Turn	67	A 8.0	0.55	42	B 10.6	0.57
EB Thru & Right	296	B 13.5	0.82	142	A 5.4	0.45
WB Left Turn	2	A 4.5	0.00	2	A 3.6	0.00
WB Thru & Right	162	A 7.2	0.55	386	B 15.1	0.87
NB Left Turn	4	B 16.7	0.01	5	C 23.0	0.01
NB Thru & Right	5	B 16.7	0.01	7	C 23.0	0.01
SB Left Turn	88	C 23.4	0.62	92	C 28.0	0.56
SB Thru & Right	41	B 17.6	0.27	95	C 29.0	0.61

<Table 5>

US 64 (Brevard Rd) @ Proposed Site Access
Analysis of Build-out AM/PM Peak Hour Traffic Conditions

Approach	AM Peak Hour			PM Peak Hour		
	Percent Queue Free (%)	LOS and Delay (sec)	V/C Ratio	Percent Queue Free (%)	LOS and Delay (sec)	V/C Ratio
Eastbound	NA	A 0.0	0.50	NA	A 0.0	0.30
Westbound	99	A 0.2	0.01	99	A 0.3	0.01
Northbound	99	C 18.6	0.01	95	C 18.9	0.07

<Table 6>

Comparison of Existing and Build-out Conditions

A comparison of the existing and build-out 95th queue length, LOS and delay, and v/c ratios at the intersection of US 64 (Brevard Road) @ Banner Farm Road is shown in *Tables 7 & 8.*

US 64 (Brevard Rd) @ Banner Farm Rd
Comparison of Existing and Build-out **AM** Peak Hour Traffic Conditions

Approach	Existing			Build-out		
	95th Queue Length (feet)	AM Peak Hour LOS & Delay (s)	V/C Ratio	95th Queue Length (feet)	AM Peak Hour LOS & Delay (s)	V/C Ratio
EB Left Turn	66	A 7.9	0.54	67	A 8.0	0.55
EB Thru & Right	294	B 13.4	0.82	296	B 13.5	0.82
WB Left Turn	2	A 4.5	0.00	2	A 4.5	0.00
WB Thru & Right	160	A 7.1	0.55	162	A 7.2	0.55
NB Left Turn	4	B 16.7	0.01	4	B 16.7	0.01
NB Thru & Right	5	B 16.7	0.01	5	B 16.7	0.01
SB Left Turn	88	C 23.4	0.62	88	C 23.4	0.62
SB Thru & Right	41	B 17.5	0.27	41	B 17.6	0.27

<Table 7>

US 64 (BREVARD RD) @ BANNER FARM RD
COMPARISON OF BACKGROUND AND BUILD-OUT PM PEAK HOUR TRAFFIC CONDITIONS

APPROACH	EXISTING			BUILD-OUT		
	95th Queue Length (feet)	PM Peak Hour LOS & Delay (s)	V/C Ratio	95th Queue Length (feet)	PM Peak Hour LOS & Delay (s)	V/C Ratio
EB Left Turn	38	A 8.7	0.53	42	B 10.6	0.57
EB Thru & Right	137	A 5.3	0.44	142	A 5.4	0.45
WB Left Turn	2	A 3.6	0.00	2	A 3.6	0.00
WB Thru & Right	377	B 14.8	0.86	386	B 15.1	0.87
NB Left Turn	5	C 22.5	0.01	5	C 23.0	0.01
NB Thru & Right	7	C 22.6	0.01	7	C 23.0	0.01
SB Left Turn	92	C 27.6	0.56	92	C 28.0	0.56
SB Thru & Right	93	C 28.1	0.60	95	C 29.0	0.61

<Table 8>

CONCLUSIONS AND RECOMMENDATIONS

US 64 (Brevard Road) @ Banner Farm Road:

As can be seen in *Tables 7 & 8*, the difference in LOS, Delay, v/c ratio, and Queue between existing traffic and the anticipated trips generated by the project is only minimally increased. The resulting LOS, delay, v/c ratio, and queue are within acceptable levels. However, even though the eastbound queue is within acceptable levels, it is expected to occasionally queue past the proposed site access during the AM peak hour. This was previously referenced in the Crash Analysis Summary section of the report.

This should be a minimal occurrence and with appropriate and routine traffic signal timing revisions and optimization can be further reduced. It is recommended and expected that the NCDOT will routinely optimize the traffic signal at this intersection to ensure proper timing with respect to adjacent intersections and measured traffic volumes.

No geometric changes are recommended at this intersection to accommodate traffic generated by the site. The addition of site generated traffic is not anticipated to degrade general roadway or driver safety at this intersection.

Site Access Point @ US 64 (Brevard Road):

As can be seen in *Tables 6*, the build-out LOS, delay, v/c ratio, and percent queue free are within acceptable levels and no geometric changes are recommended at this intersection to accommodate traffic generated by the site. The addition of site generated traffic is not anticipated to degrade general roadway operation at this intersection.

However, as referenced in the Crash Analysis Summary section of the report, eastbound queuing from the signal may occur past the site access and impact driver gap acceptance. Eastbound signal queues could also block site traffic wishing to turn left into the site, creating a westbound traffic queue through the signal. Because of the relatively short traffic signal cycle length and low entering site traffic, these situations should only occur at minimum, and can be further reduced with appropriate and routine traffic signal timing.

Another potential challenge to site access safety is the available sight distance to the west. It is recommended that the site access provide at least 500 feet of intersection sight distance per the 2011 American Association of State and Highway Transportation Officials (AASHTO) "A Policy on Geometric Design of Highways and Structures" manual. Conversations with NCDOT have indicated a willingness to assist in achieving this sight distance at areas beyond the site property. If this assistance is desired, the property owner will need to contact NCDOT directly at the Mills River office in Henderson County.

Appendix A

TURNING MOVEMENT COUNTS

J. M. Teague Engineering, PLLC

525 North Main Street
Waynesville, NC 28786

Serial Number : TU-0416
Count By : RCS
Weather : 60's
School In Session

File Name : US 64 @ Banner Farm AM Existing
Site Code : 41020131
Start Date : 4/10/2013
Page No : 1

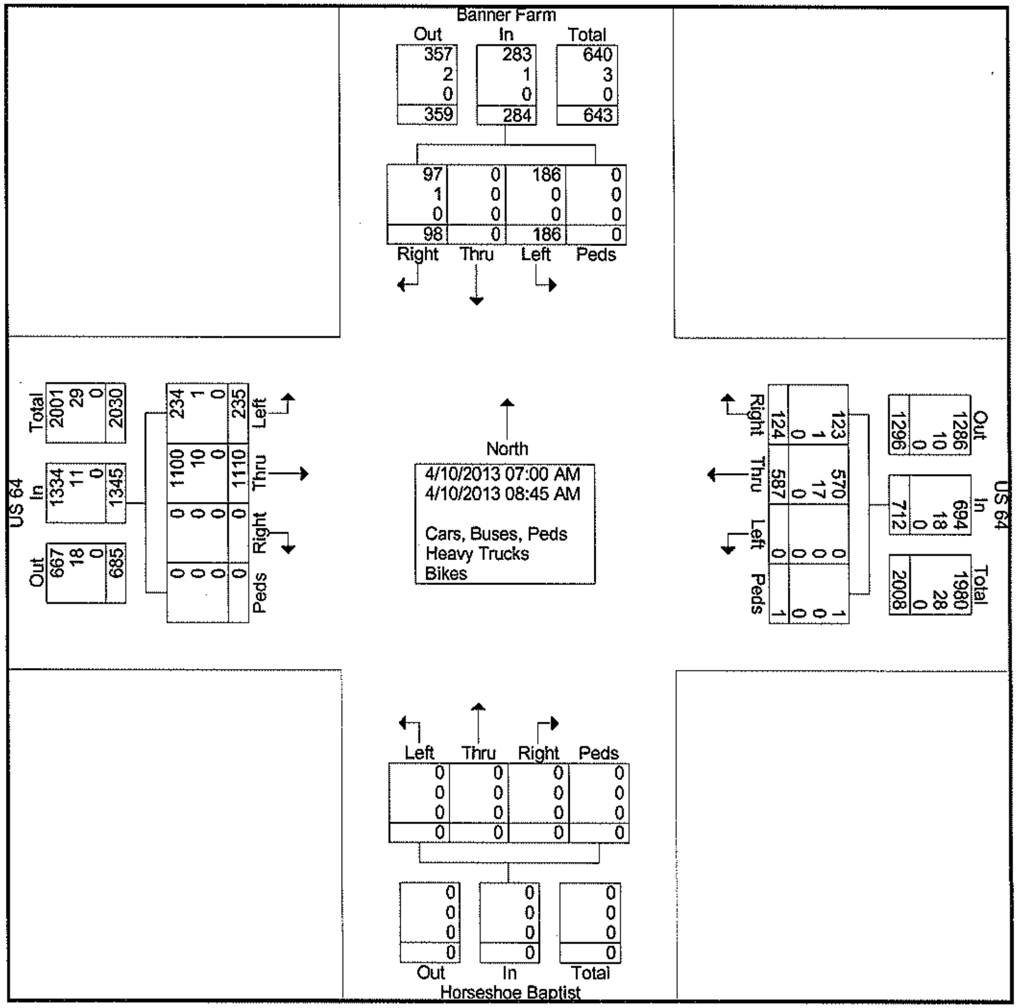
Groups Printed- Cars, Buses, Peds - Heavy Trucks - Bikes

	Banner Farm Southbound					US 64 Westbound					Horseshoe Baptist Northbound					US 64 Eastbound					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
07:00 AM	6	0	16	0	22	9	51	0	0	60	0	0	0	0	0	0	123	31	0	154	236
07:15 AM	12	0	24	0	36	13	60	0	0	73	0	0	0	0	0	0	149	41	0	190	299
07:30 AM	12	0	36	0	48	17	84	0	1	102	0	0	0	0	0	0	210	57	0	267	417
07:45 AM	20	0	31	0	51	31	110	0	0	141	0	0	0	0	0	0	146	22	0	168	360
Total	50	0	107	0	157	70	305	0	1	376	0	0	0	0	0	0	628	151	0	779	1312
08:00 AM	15	0	17	0	32	18	77	0	0	95	0	0	0	0	0	0	136	25	0	161	288
08:15 AM	12	0	21	0	33	13	62	0	0	75	0	0	0	0	0	0	128	24	0	152	260
08:30 AM	12	0	19	0	31	16	69	0	0	85	0	0	0	0	0	0	97	18	0	115	231
08:45 AM	9	0	22	0	31	7	74	0	0	81	0	0	0	0	0	0	121	17	0	138	250
Total	48	0	79	0	127	54	282	0	0	336	0	0	0	0	0	0	482	84	0	566	1029
Grand Total	98	0	186	0	284	124	587	0	1	712	0	0	0	0	0	0	1110	235	0	1345	2341
Apprch %	34.5	0	65.5	0		17.4	82.4	0	0.1		0	0	0	0		0	82.5	17.5	0		
Total %	4.2	0	7.9	0	12.1	5.3	25.1	0	0	30.4	0	0	0	0	0	0	47.4	10	0	57.5	
Cars, Buses, Peds	97	0	186	0	283	123	570	0	1	694	0	0	0	0	0	0	1100	234	0	1334	2311
% Cars, Buses, Peds	99	0	100	0	99.6	99.2	97.1	0	100	97.5	0	0	0	0	0	0	99.1	99.6	0	99.2	98.7
Heavy Trucks	1	0	0	0	1	1	17	0	0	18	0	0	0	0	0	0	10	1	0	11	30
% Heavy Trucks	1	0	0	0	0.4	0.8	2.9	0	0	2.5	0	0	0	0	0	0	0.9	0.4	0	0.8	1.3
Bikes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bikes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

J. M. Teague Engineering, PLLC
525 North Main Street
Waynesville, NC 28786

Serial Number : TU-0416
Count By : RCS
Weather : 60's
School In Session

File Name : US 64 @ Banner Farm AM Existing
Site Code : 41020131
Start Date : 4/10/2013
Page No : 2



J. M. Teague Engineering, PLLC

525 North Main Street
Waynesville, NC 28786

Serial Number : TU-0416
Count By : RCS
Weather : 60's
School In Session

File Name : US 64 @ Banner Farm AM Existing
Site Code : 41020131
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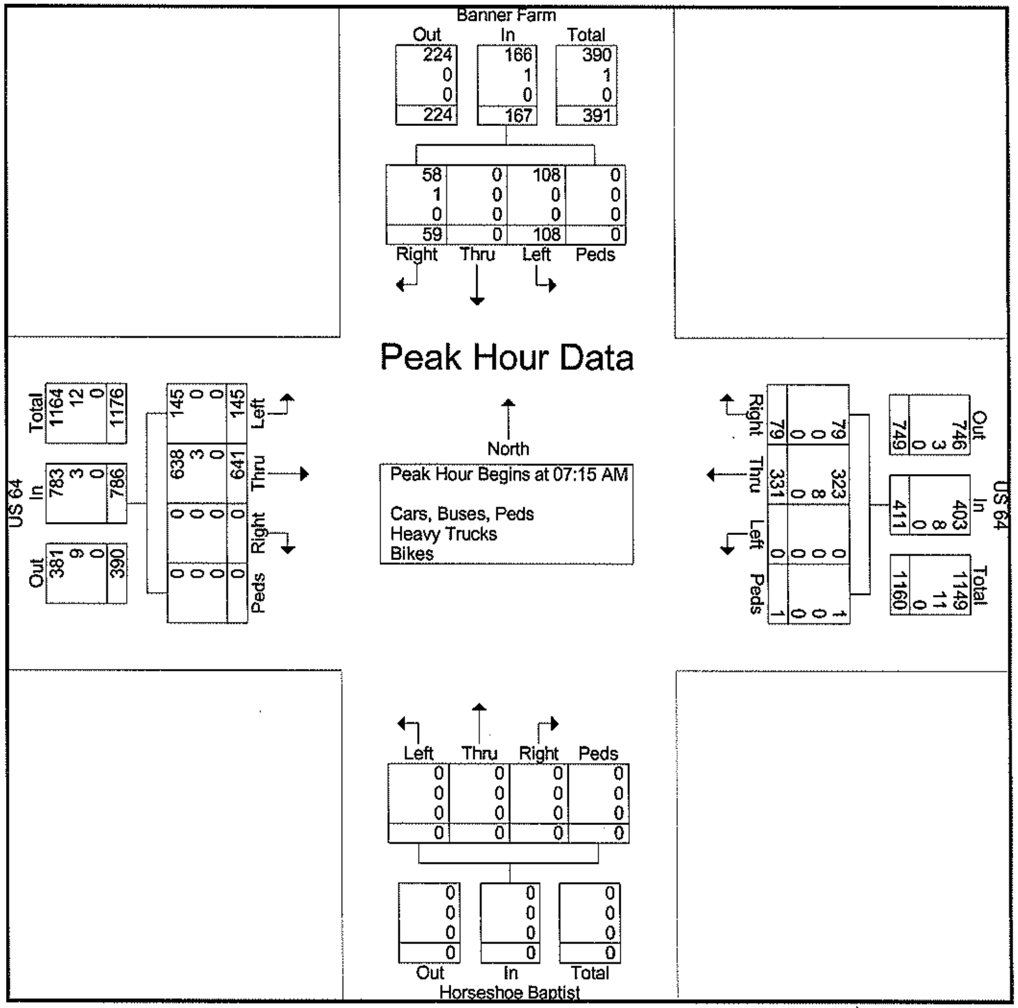
	Banner Farm Southbound					US 64 Westbound					Horseshoe Baptist Northbound					US 64 Eastbound					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:15 AM																					
07:15 AM	12	0	24	0	36	13	60	0	0	73	0	0	0	0	0	0	149	41	0	190	299
07:30 AM	12	0	**36**	0	48	17	84	0	**1**	102	0	0	0	0	0	0	**210**	**57**	0	**267**	**417**
07:45 AM	**20**	0	31	0	**51**	**31**	**110**	0	0	**141**	0	0	0	0	0	0	146	22	0	168	360
08:00 AM	15	0	17	0	32	18	77	0	0	95	0	0	0	0	0	0	136	25	0	161	288
Total Volume	59	0	108	0	167	79	331	0	1	411	0	0	0	0	0	0	641	145	0	786	1364
% App. Total	35.3	0	64.7	0		19.2	80.5	0	0.2		0	0	0	0		0	81.6	18.4	0		
PHF	.738	.000	.750	.000	.819	.637	.752	.000	.250	.729	.000	.000	.000	.000	.000	.000	.763	.636	.000	.736	.818
Cars, Buses, Peds	58	0	108	0	166	79	323	0	1	403	0	0	0	0	0	0	638	145	0	783	1352
% Cars, Buses, Peds	98.3	0	100	0	99.4	100	97.6	0	100	98.1	0	0	0	0	0	0	99.5	100	0	99.6	99.1
Heavy Trucks	1	0	0	0	1	0	8	0	0	8	0	0	0	0	0	0	3	0	0	3	12
% Heavy Trucks	1.7	0	0	0	0.6	0	2.4	0	0	1.9	0	0	0	0	0	0	0.5	0	0	0.4	0.9
Bikes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bikes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

J. M. Teague Engineering, PLLC

525 North Main Street
Waynesville, NC 28786

Serial Number : TU-0416
Count By : RCS
Weather : 60's
School In Session

File Name : US 64 @ Banner Farm AM Existing
Site Code : 41020131
Start Date : 4/10/2013
Page No : 4



J. M. Teague Engineering, PLLC

525 North Main Street
Waynesville, NC 28786

Serial Number : TU-0416
Count By : RCS
Weather : 70's
School In Session

File Name : us 64 @ banner farm pm existing
Site Code : 41020132
Start Date : 4/10/2013
Page No : 1

Groups Printed- Cars, Buses, Peds - Heavy Trucks - Bikes

	Banner Farm Rd Southbound					US 64 Westbound					Horseshoe Baptist Rd Northbound					US 64 Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
04:00 PM	19	0	25	0	44	0	124	20	0	144	0	0	0	0	0	10	92	0	0	102	290
04:15 PM	10	0	20	0	30	0	125	34	0	159	0	0	0	0	0	20	124	0	0	144	333
04:30 PM	21	0	15	0	36	0	101	24	0	125	0	0	0	0	0	22	97	0	0	119	280
04:45 PM	29	0	23	0	52	0	128	31	0	159	1	0	0	0	1	14	109	2	0	125	337
Total	79	0	83	0	162	0	478	109	0	587	1	0	0	0	1	66	422	2	0	490	1240
05:00 PM	14	0	29	0	43	0	149	26	0	175	0	0	0	0	0	19	85	1	0	105	323
05:15 PM	17	0	20	1	38	0	199	33	0	232	0	0	0	0	0	11	99	0	0	110	380
05:30 PM	17	0	34	0	51	1	163	20	0	184	0	0	0	0	0	12	104	1	0	117	352
05:45 PM	24	0	19	0	43	0	115	20	0	135	0	0	1	0	1	16	88	0	0	104	283
Total	72	0	102	1	175	1	626	99	0	726	0	0	1	0	1	58	376	2	0	436	1338
Grand Total	151	0	185	1	337	1	1104	208	0	1313	1	0	1	0	2	124	798	4	0	926	2578
Apprch %	44.8	0	54.9	0.3		0.1	84.1	15.8	0		50	0	50	0		13.4	86.2	0.4	0		
Total %	5.9	0	7.2	0	13.1	0	42.8	8.1	0	50.9	0	0	0	0	0.1	4.8	31	0.2	0	35.9	
Cars, Buses, Peds	151	0	184	1	336	1	1095	207	0	1303	1	0	1	0	2	124	784	3	0	911	2552
% Cars, Buses, Peds	100	0	99.5	100	99.7	100	99.2	99.5	0	99.2	100	0	100	0	100	100	98.2	75	0	98.4	99
Heavy Trucks	0	0	1	0	1	0	9	1	0	10	0	0	0	0	0	0	14	1	0	15	26
% Heavy Trucks	0	0	0.5	0	0.3	0	0.8	0.5	0	0.8	0	0	0	0	0	0	1.8	25	0	1.6	1
Bikes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bikes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

J. M. Teague Engineering, PLLC
525 North Main Street
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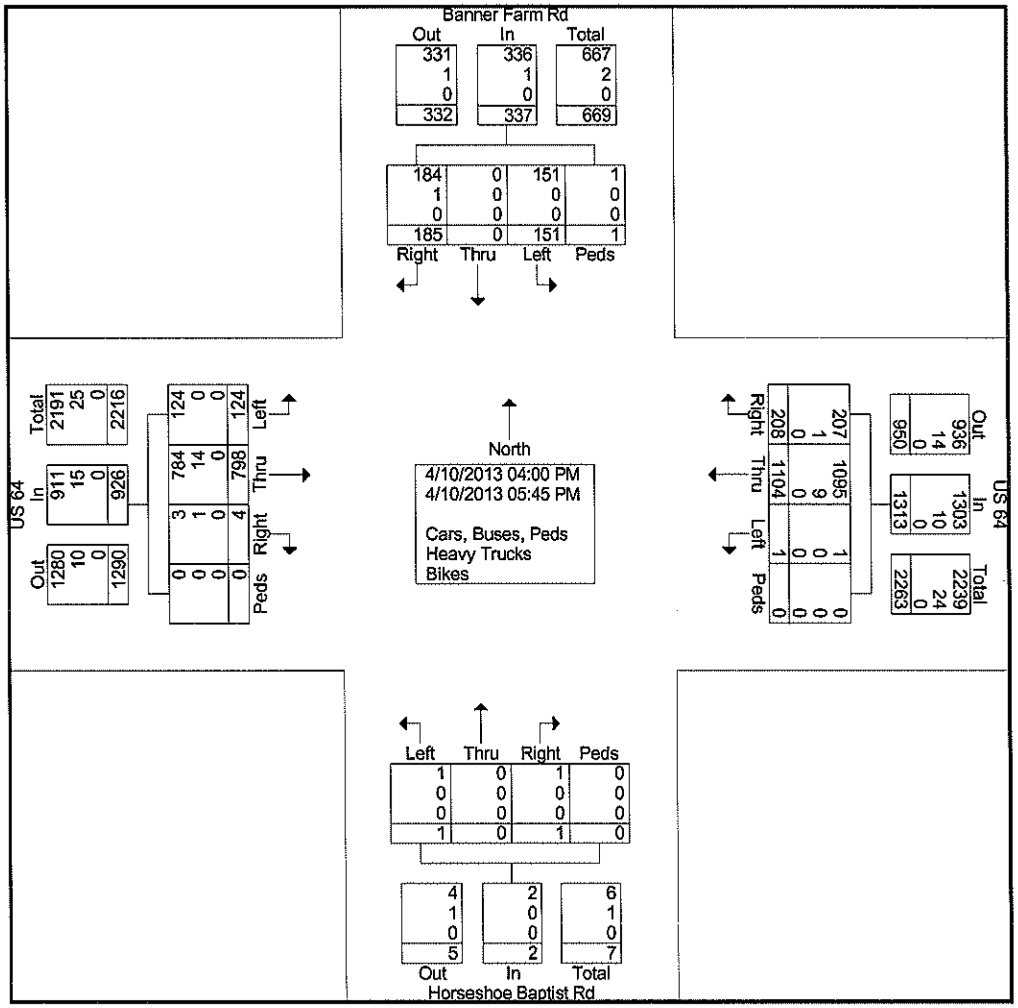

J. M. Teague Engineering, PLLC

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	Banner Farm Rd Southbound					US 64 Westbound					Horseshoe Baptist Rd Northbound					US 64 Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:45 PM																					
04:45 PM	**29**	0	23	0	**52**	0	128	31	0	159	**1**	0	0	0	**1**	14	**109**	**2**	0	**125**	337
05:00 PM	14	0	29	0	43	0	149	26	0	175	0	0	0	0	0	**19**	85	1	0	105	323
05:15 PM	17	0	20	**1**	38	0	**199**	**33**	0	**232**	0	0	0	0	0	11	99	0	0	110	**380**
05:30 PM	17	0	**34**	0	51	**1**	163	20	0	184	0	0	0	0	0	12	104	1	0	117	352
Total Volume	77	0	106	1	184	1	639	110	0	750	1	0	0	0	1	56	397	4	0	457	1392
% App. Total	41.8	0	57.6	0.5		0.1	85.2	14.7	0		100	0	0	0		12.3	86.9	0.9	0		
PHF	.664	.000	.779	.250	.885	.250	.803	.833	.000	.808	.250	.000	.000	.000	.250	.737	.911	.500	.000	.914	.916
Cars, Buses, Peds	77	0	105	1	183	1	632	109	0	742	1	0	0	0	1	56	392	3	0	451	1377
% Cars, Buses, Peds	100	0	99.1	100	99.5	100	98.9	99.1	0	98.9	100	0	0	0	100	100	98.7	75.0	0	98.7	98.9
Heavy Trucks	0	0	1	0	1	0	7	1	0	8	0	0	0	0	0	0	5	1	0	6	15
% Heavy Trucks	0	0	0.9	0	0.5	0	1.1	0.9	0	1.1	0	0	0	0	0	0	1.3	25.0	0	1.3	1.1
Bikes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bikes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

J. M. Teague Engineering, PLLC

525 North Main Street
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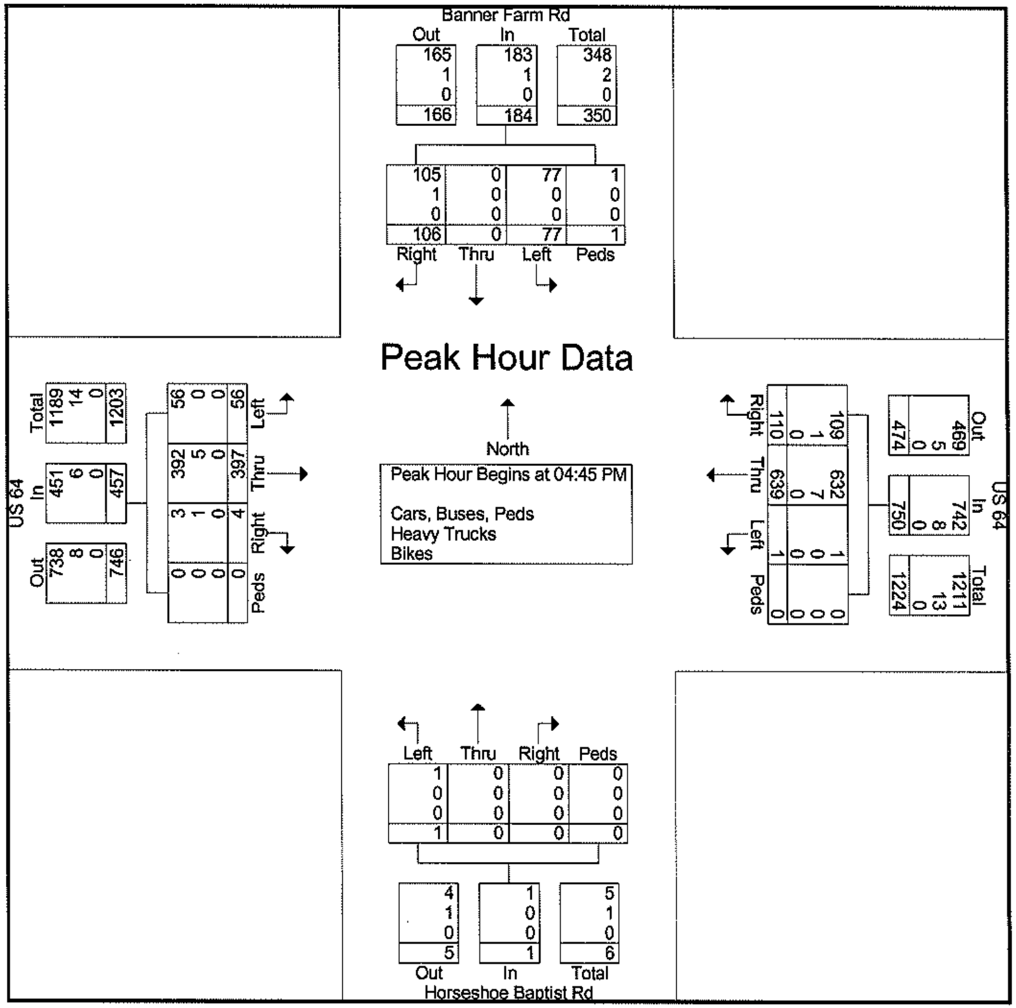


Appendix B

TRIP GENERATION

Summary of Trip Generation Calculation
For 9.1 Th.Sq.Ft. GFA of Free-Standing Discount Store
April 18, 2013

	Average Rate	Standard Deviation	Adjustment Factor	Driveway Volume
Avg. Weekday 2-Way Volume	57.24	19.54	1.00	521
7-9 AM Peak Hour Enter	0.72	0.00	1.00	7
7-9 AM Peak Hour Exit	0.34	0.00	1.00	3
7-9 AM Peak Hour Total	1.06	1.22	1.00	10
4-6 PM Peak Hour Enter	2.50	0.00	1.00	23
4-6 PM Peak Hour Exit	2.50	0.00	1.00	23
4-6 PM Peak Hour Total	5.00	2.60	1.00	46
Saturday 2-Way Volume	71.07	15.44	1.00	647
Saturday Peak Hour Enter	3.77	0.00	1.00	34
Saturday Peak Hour Exit	3.62	0.00	1.00	33
Saturday Peak Hour Total	7.39	3.10	1.00	67

Note: A zero indicates no data available.
Source: Institute of Transportation Engineers
Trip Generation, 8th Edition, 2008.

TRIP GENERATION BY MICROTRANS

Appendix C

INTERSECTION ANALYSIS REPORTS

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	145	641	1	1	331	79	1	1	1	108	1	59
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	11	12	12	12	14	9	9	12	12	12	15
Grade (%)		-2%			0%			-4%			9%	
Total Lost time (s)	6.6	6.6		6.6	6.6		6.0	6.0			5.5	5.5
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	1.00
Frt	1.00	1.00		1.00	0.97		1.00	0.93			1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00			0.95	1.00
Satd. Flow (prot)	1728	1818		1770	1802		1624	1582			1695	1663
Flt Permitted	0.41	1.00		0.20	1.00		0.66	1.00			0.73	1.00
Satd. Flow (perm)	737	1818		372	1802		1137	1582			1293	1663
Peak-hour factor, PHF	0.64	0.76	0.92	0.92	0.75	0.64	0.92	0.92	0.92	0.75	0.92	0.74
Adj. Flow (vph)	227	843	1	1	441	123	1	1	1	144	1	80
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	227	844	0	1	564	0	1	2	0	0	145	80
Turn Type	Perm			Perm			Perm			Perm		Perm
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		8
Actuated Green, G (s)	27.5	27.5		27.5	27.5		8.2	8.2			8.7	8.7
Effective Green, g (s)	27.5	27.5		27.5	27.5		8.2	8.2			8.7	8.7
Actuated g/C Ratio	0.57	0.57		0.57	0.57		0.17	0.17			0.18	0.18
Clearance Time (s)	6.6	6.6		6.6	6.6		6.0	6.0			5.5	5.5
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0			3.0	3.0
Lane Grp Cap (vph)	420	1035		212	1026		193	269			233	300
v/s Ratio Prot		c0.46			0.31			0.00				
v/s Ratio Perm	0.31			0.00			0.00				c0.11	0.05
v/c Ratio	0.54	0.82		0.00	0.55		0.01	0.01			0.62	0.27
Uniform Delay, d1	6.5	8.4		4.5	6.5		16.7	16.7			18.3	17.1
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	1.00
Incremental Delay, d2	1.4	5.0		0.0	0.6		0.0	0.0			5.1	0.5
Delay (s)	7.9	13.4		4.5	7.1		16.7	16.7			23.4	17.5
Level of Service	A	B		A	A		B	B			C	B
Approach Delay (s)		12.2			7.1			16.7			21.3	
Approach LOS		B			A			B			C	

Intersection Summary			
HCM Average Control Delay	11.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	48.3	Sum of lost time (s)	12.1
Intersection Capacity Utilization	73.7%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBT	SBR
Lane Group Flow (vph)	227	844	1	564	1	2	145	80
v/c Ratio	0.48	0.73	0.00	0.49	0.00	0.01	0.45	0.19
Control Delay	13.2	16.0	7.0	9.8	18.0	18.5	23.6	18.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	13.2	16.0	7.0	9.8	18.0	18.5	23.6	18.6
Queue Length 50th (ft)	40	190	0	99	0	1	43	22
Queue Length 95th (ft)	66	294	2	160	4	5	88	41
Internal Link Dist (ft)		740		755		506	419	
Turn Bay Length (ft)	150		100					50
Base Capacity (vph)	489	1206	247	1194	445	619	522	671
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.46	0.70	0.00	0.47	0.00	0.00	0.28	0.12

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	56	397	1	1	639	110	1	1	1	77	1	106
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	11	12	12	12	14	9	9	12	12	12	15
Grade (%)		-2%			0%			-4%			9%	
Total Lost time (s)	6.6	6.6		6.6	6.6		6.0	6.0			5.5	5.5
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	1.00
Frt	1.00	1.00		1.00	0.97		1.00	0.93			1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00			0.95	1.00
Satd. Flow (prot)	1728	1818		1770	1816		1624	1582			1695	1663
Flt Permitted	0.14	1.00		0.45	1.00		0.69	1.00			0.73	1.00
Satd. Flow (perm)	253	1818		833	1816		1180	1582			1294	1663
Peak-hour factor, PHF	0.64	0.76	0.92	0.92	0.75	0.64	0.92	0.92	0.92	0.75	0.92	0.74
Adj. Flow (vph)	88	522	1	1	852	172	1	1	1	103	1	143
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	88	523	0	1	1024	0	1	2	0	0	104	143
Turn Type	Perm			Perm			Perm			Perm		Perm
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		8
Actuated Green, G (s)	39.5	39.5		39.5	39.5		8.2	8.2			8.7	8.7
Effective Green, g (s)	39.5	39.5		39.5	39.5		8.2	8.2			8.7	8.7
Actuated g/C Ratio	0.66	0.66		0.66	0.66		0.14	0.14			0.14	0.14
Clearance Time (s)	6.6	6.6		6.6	6.6		6.0	6.0			5.5	5.5
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0			3.0	3.0
Lane Grp Cap (vph)	166	1191		546	1190		160	215			187	240
v/s Ratio Prot		0.29			c0.56			0.00				
v/s Ratio Perm	0.35			0.00			0.00				0.08	c0.09
v/c Ratio	0.53	0.44		0.00	0.86		0.01	0.01			0.56	0.60
Uniform Delay, d1	5.5	5.0		3.6	8.2		22.5	22.5			24.0	24.2
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	1.00
Incremental Delay, d2	3.2	0.3		0.0	6.6		0.0	0.0			3.6	3.9
Delay (s)	8.7	5.3		3.6	14.8		22.5	22.6			27.6	28.1
Level of Service	A	A		A	B		C	C			C	C
Approach Delay (s)		5.8			14.8			22.5			27.9	
Approach LOS		A			B			C			C	

Intersection Summary			
HCM Average Control Delay	13.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	60.3	Sum of lost time (s)	12.1
Intersection Capacity Utilization	67.8%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBT	SBR
Lane Group Flow (vph)	88	523	1	1024	1	2	104	143
v/c Ratio	0.49	0.41	0.00	0.80	0.01	0.01	0.40	0.43
Control Delay	19.9	7.1	5.0	16.2	28.0	27.5	31.7	30.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	19.9	7.1	5.0	16.2	28.0	27.5	31.7	30.9
Queue Length 50th (ft)	16	88	0	283	0	1	37	51
Queue Length 95th (ft)	38	137	2	377	5	7	92	93
Internal Link Dist (ft)		740		755		506	419	
Turn Bay Length (ft)	150		100					50
Base Capacity (vph)	208	1493	684	1491	370	495	418	537
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.42	0.35	0.00	0.69	0.00	0.00	0.25	0.27

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱		↰	↱		↰	↱			↰	↱
Volume (vph)	146	642	1	1	334	79	1	1	1	108	1	60
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	11	12	12	12	14	9	9	12	12	12	15
Grade (%)		-2%			0%			-4%			9%	
Total Lost time (s)	6.6	6.6		6.6	6.6		6.0	6.0			5.5	5.5
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	1.00
Frt	1.00	1.00		1.00	0.97		1.00	0.93			1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00			0.95	1.00
Satd. Flow (prot)	1728	1818		1770	1802		1624	1582			1695	1663
Flt Permitted	0.40	1.00		0.20	1.00		0.66	1.00			0.73	1.00
Satd. Flow (perm)	731	1818		369	1802		1137	1582			1293	1663
Peak-hour factor, PHF	0.64	0.76	0.92	0.92	0.75	0.64	0.92	0.92	0.92	0.75	0.92	0.74
Adj. Flow (vph)	228	845	1	1	445	123	1	1	1	144	1	81
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	228	846	0	1	568	0	1	2	0	0	145	81
Turn Type	Perm			Perm			Perm			Perm		Perm
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		8
Actuated Green, G (s)	27.5	27.5		27.5	27.5		8.2	8.2			8.7	8.7
Effective Green, g (s)	27.5	27.5		27.5	27.5		8.2	8.2			8.7	8.7
Actuated g/C Ratio	0.57	0.57		0.57	0.57		0.17	0.17			0.18	0.18
Clearance Time (s)	6.6	6.6		6.6	6.6		6.0	6.0			5.5	5.5
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0			3.0	3.0
Lane Grp Cap (vph)	416	1035		210	1026		193	269			233	300
v/s Ratio Prot		c0.47			0.32			0.00				
v/s Ratio Perm	0.31			0.00			0.00				c0.11	0.05
v/c Ratio	0.55	0.82		0.00	0.55		0.01	0.01			0.62	0.27
Uniform Delay, d1	6.5	8.4		4.5	6.5		16.7	16.7			18.3	17.1
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	1.00
Incremental Delay, d2	1.5	5.1		0.0	0.7		0.0	0.0			5.1	0.5
Delay (s)	8.0	13.5		4.5	7.2		16.7	16.7			23.4	17.6
Level of Service	A	B		A	A		B	B			C	B
Approach Delay (s)		12.3			7.2			16.7			21.3	
Approach LOS		B			A			B			C	

Intersection Summary			
HCM Average Control Delay	11.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	48.3	Sum of lost time (s)	12.1
Intersection Capacity Utilization	73.8%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBT	SBR
Lane Group Flow (vph)	228	846	1	568	1	2	145	81
v/c Ratio	0.49	0.73	0.00	0.49	0.00	0.01	0.45	0.19
Control Delay	13.4	16.1	7.0	9.8	18.0	18.5	23.6	18.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	13.4	16.1	7.0	9.8	18.0	18.5	23.6	18.6
Queue Length 50th (ft)	40	191	0	100	0	1	43	22
Queue Length 95th (ft)	67	296	2	162	4	5	88	41
Internal Link Dist (ft)		740		755		506	419	
Turn Bay Length (ft)	150		100					50
Base Capacity (vph)	485	1206	245	1195	445	619	522	671
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.47	0.70	0.00	0.48	0.00	0.00	0.28	0.12

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	59	405	4	1	647	110	1	1	1	77	1	109
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	11	12	12	12	14	9	9	12	12	12	15
Grade (%)		-2%			0%			-4%			9%	
Total Lost time (s)	6.6	6.6		6.6	6.6		6.0	6.0			5.5	5.5
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	1.00
Frt	1.00	1.00		1.00	0.98		1.00	0.93			1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00			0.95	1.00
Satd. Flow (prot)	1728	1817		1770	1816		1624	1582			1695	1663
Flt Permitted	0.13	1.00		0.44	1.00		0.69	1.00			0.73	1.00
Satd. Flow (perm)	245	1817		815	1816		1180	1582			1294	1663
Peak-hour factor, PHF	0.64	0.76	0.92	0.92	0.75	0.64	0.92	0.92	0.92	0.75	0.92	0.74
Adj. Flow (vph)	92	533	4	1	863	172	1	1	1	103	1	147
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	92	537	0	1	1035	0	1	2	0	0	104	147
Turn Type	Perm			Perm			Perm			Perm		Perm
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		8
Actuated Green, G (s)	40.5	40.5		40.5	40.5		8.4	8.4			8.9	8.9
Effective Green, g (s)	40.5	40.5		40.5	40.5		8.4	8.4			8.9	8.9
Actuated g/C Ratio	0.66	0.66		0.66	0.66		0.14	0.14			0.14	0.14
Clearance Time (s)	6.6	6.6		6.6	6.6		6.0	6.0			5.5	5.5
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0			3.0	3.0
Lane Grp Cap (vph)	161	1197		537	1196		161	216			187	241
v/s Ratio Prot		0.30			c0.57			0.00				
v/s Ratio Perm	0.38			0.00			0.00				0.08	c0.09
v/c Ratio	0.57	0.45		0.00	0.87		0.01	0.01			0.56	0.61
Uniform Delay, d1	5.7	5.1		3.6	8.3		22.9	23.0			24.5	24.7
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	1.00
Incremental Delay, d2	4.8	0.3		0.0	6.8		0.0	0.0			3.6	4.3
Delay (s)	10.6	5.4		3.6	15.1		23.0	23.0			28.0	29.0
Level of Service	B	A		A	B		C	C			C	C
Approach Delay (s)		6.1			15.1			23.0			28.6	
Approach LOS		A			B			C			C	

Intersection Summary			
HCM Average Control Delay	13.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	61.5	Sum of lost time (s)	12.1
Intersection Capacity Utilization	70.1%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBT	SBR
Lane Group Flow (vph)	92	537	1	1035	1	2	104	147
v/c Ratio	0.53	0.42	0.00	0.80	0.01	0.01	0.41	0.45
Control Delay	23.1	7.2	5.0	16.6	28.0	28.0	31.9	31.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	23.1	7.2	5.0	16.6	28.0	28.0	31.9	31.5
Queue Length 50th (ft)	18	94	0	297	0	1	38	55
Queue Length 95th (ft)	42	142	2	386	5	7	92	95
Internal Link Dist (ft)		944		755		506	419	
Turn Bay Length (ft)	150		100					50
Base Capacity (vph)	197	1469	658	1468	360	482	407	523
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.47	0.37	0.00	0.71	0.00	0.00	0.26	0.28

Intersection Summary

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	786	3	4	390	1	2
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	854	3	4	424	1	2
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			858		1289	856
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			858		1289	856
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		99	99
cM capacity (veh/h)			783		180	357

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	858	428	3
Volume Left	0	4	1
Volume Right	3	0	2
cSH	1700	783	269
Volume to Capacity	0.50	0.01	0.01
Queue Length 95th (ft)	0	0	1
Control Delay (s)	0.0	0.2	18.6
Lane LOS		A	C
Approach Delay (s)	0.0	0.2	18.6
Approach LOS			C

Intersection Summary			
Average Delay	0.1		
Intersection Capacity Utilization	51.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	457	8	11	759	8	11
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	497	9	12	825	9	12
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			505		1350	501
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			505		1350	501
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		95	98
cM capacity (veh/h)			1059		164	570

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	505	837	21
Volume Left	0	12	9
Volume Right	9	0	12
cSH	1700	1059	279
Volume to Capacity	0.30	0.01	0.07
Queue Length 95th (ft)	0	1	6
Control Delay (s)	0.0	0.3	18.9
Lane LOS		A	C
Approach Delay (s)	0.0	0.3	18.9
Approach LOS			C

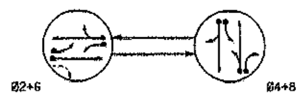
Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	58.7%	ICU Level of Service	B
Analysis Period (min)	15		

Appendix D

TRAFFIC SIGNAL PLAN OF RECORD

PROJECT REFERENCE NO.	SHEET NO.
W-4090	Sig. 1

PHASING DIAGRAM



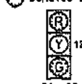
PHASING DIAGRAM DETECTION LEGEND

- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION			
SIGNAL FACE	PHASE		
	Ø2+6	Ø4+8	FLASH
21, 22	G	R	Y
41, 42	R	G	R
61, 62	G	R	Y
81, 82, 83	R	G	R

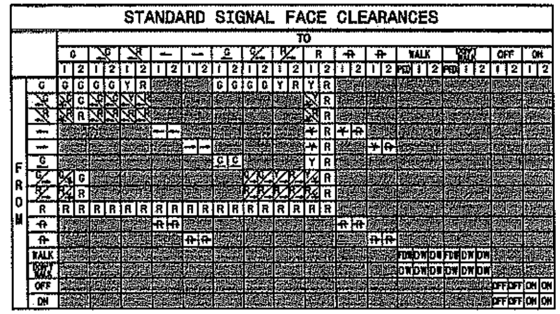
SIGNAL FACE I.D.

◯ Denotes L.E.D.



21, 22
41, 42
61, 62
81, 82, 83

STANDARD SIGNAL FACE CLEARANCES

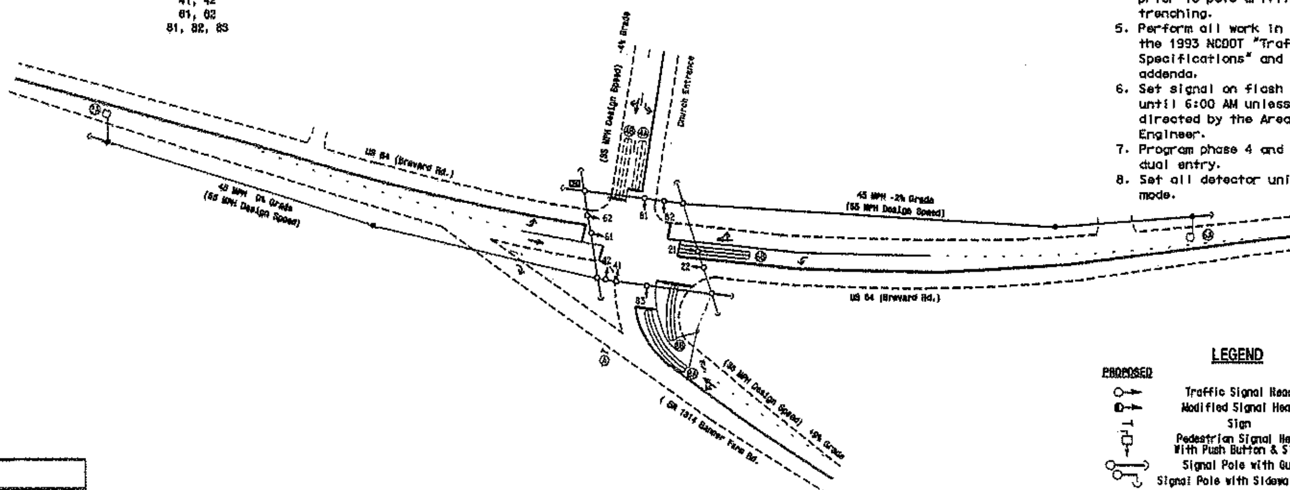


W - WALK
FDW - FLASHING DON'T WALK
DW - DON'T WALK

2 Phase
Fully Actuated
(Isolated)

NOTES

1. Coordinate sawcutting and loop placement with pavement markings as shown in the traffic control and pavement marking plans.
2. Place cabinet so as not to obstruct sight distance of vehicles turning right on red.
3. Locate proposed poles a minimum of 6 feet behind face of curb or 10 feet from edge of travel way unless otherwise shown on the plans.
4. Locate all underground utilities prior to pole drilling and conduit trenching.
5. Perform all work in accordance with the 1993 NCDOT "Traffic Signal Specifications" and any subsequent addenda.
6. Set signal on flash from 11:00 PM until 6:00 AM unless otherwise directed by the Area Traffic Engineer.
7. Program phase 4 and phase 8 for dual entry.
8. Set all detector units to presence mode.



LEGEND

PROPOSED		EXISTING
	Traffic Signal Head	
	Modified Signal Head	N/A
	Sign	
	Pedestrian Signal Head With Push Button & Sign	
	Signal Pole with Guy	
	Signal Pole with Sidewalk Guy	
	Inductive Loop Detector	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
N/A	Right of Way with Marker	
	Directional Arrow	
	Pavement Marking Arrow	
	"YIELD" Sign (R1-2)	

TIMING CHART NEMA CONTROLLER				
PHASE	02	04	06	08
MINIMUM GREEN	14 SEC.	7 SEC.	14 SEC.	7 SEC.
PASSAGE/GAP	6.0 SEC.	1.0 SEC.	6.0 SEC.	2.0 SEC.
YELLOW CHANGE INT.	5.1 SEC.	4.0 SEC.	5.1 SEC.	4.0 SEC.
RED CLEARANCE	1.5 SEC.	2.0 SEC.	1.5 SEC.	2.0 SEC.
MAX. 1	90 SEC.	25 SEC.	90 SEC.	25 SEC.
RECALL POSITION	MIN. RECALL	NONE	MIN. RECALL	NONE
VEH. CALL MEMORY	LOCK	NONLOCK	LOCK	NONLOCK
WALK	- SEC.	- SEC.	- SEC.	- SEC.
FLASHING DON'T WALK	- SEC.	- SEC.	- SEC.	- SEC.
VOLUME DENSITY	ON	OFF	ON	OFF
ACTUATION B4 ADD	0 VEH.	- VEH.	0 VEH.	- VEH.
SEC. PER ACTUATION	2.5 SEC.	- SEC.	2.5 SEC.	- SEC.
MAX. INITIAL	46 SEC.	- SEC.	46 SEC.	- SEC.
TIME B4 REDUCTION	15 SEC.	- SEC.	15 SEC.	- SEC.
TIME TO REDUCE	45 SEC.	- SEC.	45 SEC.	- SEC.
MINIMUM GAP	3.0 SEC.	- SEC.	3.0 SEC.	- SEC.

LOOP & DETECTOR UNIT INSTALLATION CHART NEMA CONTROLLER WITH TS-2 CABINET												
INDUCTIVE LOOPS						DETECTOR UNITS						
LOOP NO.	SIZE (ft)	TURNS	DIST. FROM STOPBAR (ft)	NEW	EXISTING	NEMA PHASE	NEW	EXISTING	TIMING FEATURE	TIMING TIME	PLACE CALL DURING PHASE	INHIBIT DELAY DURING GREEN
2A	6X6	4	420	X		2	X		NONE	- SEC.	ALL	NO
4A	6X40	2-4-2	0		X	4	X		NONE	- SEC.	ALL	NO
4B	6X50	2-4-2	0		X	4	X		DELAY	10 SEC.	ALL	YES
6A	6X6	4	420	X		6	X		NONE	- SEC.	ALL	NO
6B	6X60	2-4-2	0	X		6	X		DELAY	3 SEC.	ALL	NO
8A	6X60	2-4-2	0	X		8	X		DELAY	3 SEC.	ALL	YES
8B	6X60	2-4-2	0	X		8	X		DELAY	15 SEC.	ALL	YES

Plan of Record

PREPARED BY: Amy Hembright DATE: March 2002
REVIEWED BY: [signature] DATE: 5/22/02

COMMENTS

This Plan of Record reflects changes submitted by field personnel. Other elements of the plan may be modified from its original state in order to provide an electronic version of the plan.

New Installation

US 64 (Brevard Rd.)
At
SR 1314 (Banner Farm Rd.)

Division: 1 Henderson County Hendersonville

PLAN DATE:	July 2000	REVIEWED BY:	T. H. Agnew
PREPARED BY:	Saur/Hamdan	REVIEWED BY:	Saur/Hamdan

SCALE 0 50
1"=50'

SEAL

Originally Sealed by
Boniface Nadambuchukwu
#25475 1/12/01

SIG. INVENTORY NO. 14-1082