

TRANSPORTATION IMPACT STUDY CASCADE FALLS (LOBETTI ROAD) KNOX COUNTY, TENNESSEE

-Prepared For-

Cascade Falls, LLC c/o Terry Patton 7918 Gatekeeper Way Knoxville, TN 37923



11812 Black Road / Knoxville, TN 37932 • (865) 556-0042 • ajaxengineering@gmail.com

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EXECUTIVE SUMMARY

Preface:

Cascade Falls, LLC is proposing a residential development in between Ball Road and Ball Camp Pike in Knox County, TN adjacent to Lobetti Road. For this report, this development will be referred to as "Cascade Falls". The purpose of this study is to determine and evaluate the potential impacts of the proposed development on the adjacent transportation system. The study includes a review of the operating characteristics of the transportation system that will provide access to the proposed site. Recommendations and mitigation measures will be analyzed and offered if traffic operations are estimated to be below traffic engineering standards.

Study Results:

The findings of this study include the following:

- At full build-out, the proposed 187 lot residential development (66 townhouses and 121 single family residential lots) is expected to generate approximately 1,701 new trips on an average weekday. Approximately 133 of these new trips will occur during the AM peak hour and 168 trips will occur in the PM peak hour at full build-out.
- This development is being proposed to be constructed in 2 phases. The intersections studied for this development are anticipated to operate adequately in the future conditions for vehicular traffic for Phase 1 up to the year 2019. Phase 2 of the development is proposed to occur after the new Schaad Road Extension is completed in west Knox County. Based on the study's assumptions, the proposed future intersection of Lobetti Road at the new Schaad Road Extension could experience unacceptable levels of delay in the year 2022.

Recommendations:

The following recommendations are offered based on the study analyses:

- The development should widen Lobetti Road from the proposed new north Road "A" on Lobetti Road to the existing intersection with Ball Road.
- The development should widen Lobetti Road in between the residential development footprint and the extents of the Schaad Road Extension project that

will be constructed by Knox County. To the north of the Schaad Road Extension, the development should widen Lobetti Road for an additional 42.2 feet in between the Schaad Road Extension and the proposed Road "A" intersection. This road widening "gap" in between the two projects should be coordinated between Knox County and the developer. To the south of the Schaad Road Extension construction, it is recommended that the development provide a full width of 20 feet on Lobetti Road within the entire footprint of the proposed Road "C" intersection at Lobetti Road. Lobetti Road should be designed and constructed to transition 100 feet to the south of the intersection down to the existing pavement width. This widening in between the two projects should be coordinated between Knox County and the developer.

- The development should provide sidewalks internally and also tie into the proposed sidewalk system constructed by the Schaad Road Extension. It is recommended that the development include external sidewalks on the western side of the improved Lobetti Road. These sidewalks should tie the internal residential development sidewalks with the sidewalks that are being constructed for the Schaad Road Extension. For Lobetti Road to the north of the Schaad Road Extension, approximately 325 feet of sidewalk will need to be constructed on the west side of Lobetti Road to tie the two projects together. For Lobetti Road to tie the south of the Schaad Road Extension, approximately 375 feet of sidewalk will need to be constructed on the west side of Lobetti Road to the west side of Lobetti Road to tie the two projects together.
- It is the recommendation of this report that Phase 2 of the development begin only once the Schaad Road Extension is completed, traffic has stabilized, and an additional traffic impact study be completed. Due to the highly speculative nature of the impact of the Schaad Road Extension in the area with respect to traffic volumes; it is recommended that this development be re-examined to determine the future development approach for Phase 2. In the future conditions, more practical assumptions and observable traffic patterns will allow for definitive recommendations to incorporate Phase 2 into the adjacent road system.

To summarize the phasing of the proposed residential development:

- o <u>Phase 1</u>:
 - ➢ 66 townhouses will be constructed on the northern portion of the property (to the north of the Schaad Road Extension)
 - A new road, Road "A", will be constructed to tie into Lobetti Road and will be to the south of the existing intersection at Ball Road
 - Lobetti Road will be widened by the developer northwards approximately 400 feet from the new roadway entrance (Road "A") to the existing intersection with Ball Road (widened from 14 to 20 feet)
 - Phase 1 assumed to be completed and occupied by 2019
- o <u>Phase 2</u>:
 - 121 single family residential home sites on the southern portion of the property will be constructed after the Schaad Road Extension is completed
 - A new road, Road "C", will tie into Lobetti Road south of the Schaad Road Extension and will be constructed for the southern portion of the development
 - Road "C" will also intersect the Schaad Road Extension on the northwest side of Phase 2. The extension will not include a median opening and thus will only allow for right turns in and right turns out for the south side (Phase 2) of the development.
 - Phase 2 assumed to be completed by 2022

DESCRIPTION OF EXISTING CONDITIONS

STUDY AREA:

The proposed location of this new residential complex is shown on a map in Figure 1. The development is to be located adjacent to Lobetti Road in west Knox County, TN. The site is located in between Ball Camp Pike and Ball Road and to the western side of Lobetti Road. The proposed new development is to be comprised of several internal paved roadways and will contain 66 single family residential attached lots (townhouses) and 121 single family residential home lots on nearly 38 acres. The development will be bisected by the future Schaad Road Extension. The townhouses will be constructed on the north side of the future Schaad Road proposed roadways and the single family lots will be constructed on the south side. In order to analyze the transportation impacts associated with the proposed development, the following existing and proposed roadways and intersections where reviewed where the greatest impact is expected:

- o Ball Road
- o Lobetti Road
- o Ball Camp Pike
- o Future Schaad Road Extension
- o Existing Ball Road at Lobetti Road intersection
- o Existing Ball Camp Pike at Lobetti Road intersection
- o Future Subdivision Road Entrances at Lobetti Road
- o Future Schaad Road Extension intersections

In the adjacent vicinity of this property, there are several residential areas and unused/agricultural properties. Some of the adjacent residential areas are within existing subdivisions and others exist as single residential properties. The proposed development site currently consists of undeveloped wood areas, meadow, and scrubland. Some existing residential structures are present on the south portion of the property bordering Lobetti Road. A few of these residential structures are currently abandoned. A CSX railroad line is adjacent to the property and bounds it on the south side. The development property is bound by Lobetti Road to the east, single family residences off of Ball Road to the north, and unused property to the west. The Schaad Road Extension will bisect the proposed residential subdivision in the near future. A large portion of the property directly across Lobetti Road on the eastern side is a working farm and is currently listed as for sale.



Figure 1 Location Map

Cascade Falls (Lobetti Road) Knox County, TN

• EXISTING ROADWAYS:

Table 1 shows the characteristics of the key existing roadways included in the study:

NAME	CLASSIFICATION ¹	SPEED LIMIT	LANES	ROAD WIDTH ²	TRANSIT ³	PEDESTRIAN FACILITIES	BICYCLE FACILITIES
Ball Road	Major Collector	40 mph	2 undivided	22 feet	None	No sidewalks along Ball Road at Lobetti Road	No bike lanes
Lobetti Road	Local Street	20 mph	Less than 2 undivided	14 feet	None	No sidewalks along roadway	No bike lanes
Ball Camp Pike	Minor Arterial	40 mph	2 undivided	21 feet	None	No sidewalks along Ball Camp Pike at Lobetti Road	No bike lanes

 TABLE 1

 STUDY CORRIDOR CHARACTERISTICS

¹ Major Road Plan - May 2011 by Knoxville/Knox County Metropolitan Planning Commission

² Edge of curb to edge of curb or edge of pavements near project site

³ According to Knoxville Area Transit System Map

Ball Road traverses in a general northeast-southwest direction and runs parallel to Oak Ridge Highway on its northeast side and Ball Camp Pike to the southwest. The total length of Ball Road is nearly 2.75 miles. Ball Road adjacent to the Lobetti Road intersection consists of 2 - 10foot vehicular lanes with roughly one foot (or less) paved shoulders outside the white edge line. At the intersection of Lobetti Road, the edge of the roadway is composed of relatively gentle sloping roadway grassed ditches. Ball Road in the study area has a few vertical curves in its roadway alignment and has a fairly straight horizontal alignment. Roadway lighting is not present on Ball Road near the intersection with Lobetti Road.

Lobetti Road intersects Ball Road to the north of the project site at a 4-legged intersection. The Lobetti Road approaches are stop-controlled and the Ball Road approaches operate freely. Lobetti Road intersects Ball Camp Pike to the south of the project site at a 3-legged intersection. At this intersection, the Lobetti Road approach is stop-controlled and the Ball Camp Pike approaches operate freely. Lobetti Road traverses in a general northwest-southeast direction and the total length is just at 2,600 feet. Lobetti Road is an extremely narrow roadway with less than 2 full lanes for opposing traffic in between Ball Road and Ball Camp Pike. The pavement width varies from 13.5 feet to 14 feet for the majority of the length of the road. The edge of the paved roadway is composed of grass and wheel rutting can be observed along the road due to traffic maneuvering off of the pavement to pass oncoming vehicles. Lobetti Road has a straight horizontal alignment; however, it does have an extreme vertical curve midway in its length which presents nearly zero sight distance. Lobetti Road is posted with signage at the beginning of each end indicating "Narrow Road / 20 MPH". Roadway lighting is not present on Lobetti Road.

A CSX Railroad line crosses Lobetti Road on its southern end near the intersection at Ball Camp Pike. This CSX Railroad line is named the KD Subdivision line and is part of the Appalachian Division. The KD Subdivision line runs from Corbin, KY to Etowah, TN for a total of 161.4 miles. The northbound approach on Lobetti Road at the railroad crossing is posted with a Yield Sign (R1-2)and the southbound



approach at the crossing is posted with a Stop Sign (R1-1). The southbound approach at the crossing is posted with a Stop Sign due to the limited sight distance available looking to the west. The railroad crossing has Railroad Grade Crossing (crossbuck) signs (R15-1) on both approaches but does not have railroad crossing signals or crossing gates. A Railroad Grade Crossing Advance Warning (W10-1) sign is posted for the southbound approach to the railroad line but not for the northbound approach due to the short distance from the tracks to the intersection of Lobetti Road at Ball Camp Pike. Grade Crossing and Intersection Advance Warning signs (W10-3) are posted on Ball Camp Pike indicating a railroad crossing will be encountered for turning vehicles onto Lobetti Road.

Ball Camp Pike traverses in a general northwest-southeast direction in between Middlebrook Pike and the first completed phase of the Schaad Road Extension. Ball Camp Pike somewhat parallels Ball Road in this area. The total length of Ball Camp Pike is just over 5 miles in between Middlebrook Pike and the Schaad Road Extension. Ball Camp Pike adjacent to the intersection of Lobetti Road consists of 2 - 10 foot vehicular lanes with roughly one-half foot (or less) paved shoulders outside the white edge line. Ball Camp Pike in the study area has a fairly level vertical roadway alignment and has a straight horizontal alignment. Ball Camp Pike has fairly sharp roadside ditch drops at the intersection with Lobetti Road. Roadway lighting is not present on Ball Camp Pike at the intersection with Lobetti Road.

Schaad Road Extension is a roadway project in west Knox County that is being constructed in 3 phases (see Appendix A for a map showing the 3 phases). As of this traffic study date, only the first phase of the extension has been constructed and opened. This completed roadway section is located to the east of the proposed site and traverses in between Oak Ridge Highway to just west of Amherst Elementary School. The second phase is anticipated to start in mid-2018 and will construct the western side of the roadway extension in between Middlebrook Pike and Ball Road. The third phase will connect the first two phases and this section will be constructed in the general area of the proposed Cascade Falls development. According to the Knox County Chief Engineer, the third phase will also be bid and constructed with the second phase. Construction for both phases is expected to take several years and is contingent on permitting and other factors. The Schaad Road Extension will traverse in a general northeastsouthwest direction and will provide an important and upgraded road link in west Knox County. The road extension is being developed with 4 lanes. The road will have concrete curb and gutter with sidewalks and a grassed median that allows for exclusive left turn lanes at major intersections. It is expected that the third phase of the Schaad Road Extension will be posted at a speed limit of 45 mph as it is currently for the first phase.

Figure 2 shows the lane configurations of the study area roadways and intersections and also shows the study intersection locations. The pages following Figure 2 give an overview of the site study area with photographs.



PHOTO EXHIBITS







November 2017 Transportation Impact Study Cascade Falls (Lobetti Road) Knox County, TN





Cascade Falls (Lobetti Road) Knox County, TN

EXISTING TRANSPORTATION VOLUMES PER MODE:

- Existing vehicular roadway traffic:
 - Average Daily Traffic (ADT) on Ball Road east of the project site was reported by the Tennessee Department of Transportation (TDOT) at 5,753 vehicles per day in 2015.
 - Average Daily Traffic (ADT) on Ball Camp Pike east of the project site was reported by Knoxville Regional Transportation Planning Organization (KRTPO) at 6,530 vehicles per day in 2015. Historical traffic count data can be viewed in Appendix B for both count stations.
- Existing bicycle and pedestrian volumes: The average daily pedestrian and bicycle traffic along the study corridor is not known. However, during the manual traffic counts (discussed in Existing Traffic Conditions) a couple of bicycle riders were observed on Ball Camp Pike and on Ball Road.

LAND USE/ZONING:

The development site recently has been requested and approved to be re-zoned from Planned Commercial (PC) to Planned Residential (PR) for the northern portion of the property. The southern portion of the property was zoned to Planned Residential back in 2008 as part of another unrelated proposed and uncompleted project. The property currently lies within the Knox County Planned Growth Area and is just adjacent to the Knoxville Urban Growth Boundary.

• **ON-STREET PARKING:**

Currently, on-street parking is not allowed on any of the streets in the study area adjacent to the project site.

PEDESTRIAN AND BICYCLE FACILITIES:

Sidewalks and bicycle facilities are not available within the project site study area on Lobetti Road, Ball Road, or Ball Camp Pike for these forms of non-motorized travel.

WALK SCORE:

A private company offers an online website that grades and gives scores to locations within the United States based on "walkability". According to the website, the numerical value assigned (the Walk Score) is based on the distance to the closest amenity in various relevant categories (businesses, schools, parks, etc.).

Appendix C shows a map and gives information for the proposed site development Walk Score at Lobetti Road. Based on the project location, the site is given a Walk Score of 0. This Walk Score indicates that the site is exclusively dependent on vehicles for errands and travel.

TRANSIT SERVICES:

The City of Knoxville has a network of public transit opportunities offered by Knoxville Area Transit (KAT). Bus service is not available in this area of Knox County. The overall KAT bus system map is located in Appendix D. The closest public transit bus service is located approximately 5 miles away (by roadway) to the southeast near the intersection of Middlebrook Pike and Francis Road (near Bearden Middle School). This KAT service is Route 90 "Crosstown Connector" and operates on weekdays and Saturdays and this route map is also included in Appendix D.

PROJECT DESCRIPTION

LOCATION AND SITE PLAN:

The proposed plan layout designed by Batson, Himes, Norvell, and Poe is shown in Figure 3. As can be seen in the figure, this residential development will be bisected by the future Schaad Road Extension into two portions. The northern portion of the subdivision will contain 66 single family attached lots (townhouses) on approximately 10 acres and the southern portion will contain 121 single family lots on approximately 28 acres for a total of 187 lots on 38 acres.

The proposed subdivision is expected to be comprised of several new internal roadways within the development. The residential lots on the south side will vary just less than 1/4 acre to over 1/3 acres in size. See Figure 3 which shows the proposed phasing of the residential development.

Phase 1 will construct the development's northern portion and will contain 66 lots. Phase 1 will include constructing a roadway entrance to tie into Lobetti Road. This proposed entrance for the development on Lobetti Road will be located approximately 400 feet to the south of the intersection with Ball Road and is identified as Road "A". Phase 1 of the development will also involve the widening of Lobetti Road from the new roadway entrance of Road "A" at Lobetti Road up to the existing intersection at Ball Road for a total of approximately 400 feet. The existing width of Lobetti Road within this roadway section is approximately 14 feet. The road widening will add pavement to one side of the existing roadway for a total width of 20 feet. An asphalt pavement overlay will then cap the entire width of the road. No vertical or horizontal alignment changes are proposed for this road widening. It is anticipated that Phase 1 will begin construction in Spring 2018 and the townhouses being completed by Fall 2018. For this study, it is assumed that the full-build out and occupancy of Phase 1 will occur in 2019 and will occur before the Schaad Road Extension is completed.



Figure 3 Proposed Plan Layout Cascade Falls

Cascade Falls (Lobetti Road) Knox County, TN Phase 2 of the development will involve constructing the remaining lots in the development which will consist of 121 single family home sites. The developer of Cascade Falls has agreed to hold off on opening Phase 2 for home construction and sales until the entire Schaad Road Extension is completed. As part of the Schaad Road Extension construction, a significant length of Lobetti Road will be upgraded and widened. During construction of Phase 2, an additional roadway entrance tie-in will be provided on Lobetti Road for the southern portion of the development (this road tie-in is identified as Road "C"). This proposed entrance on Lobetti Road is to be located approximately 1,120 feet to the north of the intersection with Ball Camp Pike and 530 feet to the south of the proposed intersection of the Schaad Road Extension and Lobetti Road.

The Schaad Road Extension will include a median at the Road "C" intersection on the northwest side of Phase 2 and thus will only allow for right turns in and right turns out for the south side of the development. For this study, it is assumed that the full-build out and occupancy of the 2nd phase will occur by 2022 and after the Schaad Road Extension is completed.

To summarize the phasing of the proposed residential development:

- o <u>Phase 1</u>:
 - ➢ 66 townhouses will be constructed on the northern portion of the property (to the north of the Schaad Road Extension)
 - A new road, Road "A", will be constructed to tie into Lobetti Road and will be to the south of the existing intersection at Ball Road
 - Lobetti Road will be widened by the developer northwards approximately 400 feet from the new roadway entrance (Road "A") to the existing intersection with Ball Road (widened from 14 to 20 feet)
 - Phase 1 assumed to be completed and occupied by 2019
- o <u>Phase 2</u>:
 - 121 single family residential home sites on the southern portion of the property will be constructed after the Schaad Road Extension is completed
 - A new road, Road "C", will tie into Lobetti Road south of the Schaad

Road Extension and will be constructed for the southern portion of the development

- Road "C" will also intersect the Schaad Road Extension on the northwest side of Phase 2. The extension will not include a median opening and thus will only allow for right turns in and right turns out for the south side (Phase 2) of the development.
- Phase 2 assumed to be completed by 2022

PROPOSED USES AND ZONING REQUIREMENTS:

At the end of the two phases, the proposed residential development is expected to be comprised of several new internal roadways with 187 lots on 38 acres. At this stage of design, the development is being shown to include common areas for the development for various residential and recreational activities. The site will also have several areas dedicated as green space that will incorporate the stormwater controls for the development.

The northern portion of the development site was recently requested and was successfully re-zoned from Planned Commercial (PC) to Planned Residential (PR). The southern portion of the property was zoned to PR back in 2008 as part of another unrelated and uncompleted proposed project. The surrounding land uses are the following:

- The properties to the north are zoned Agricultural (A) and General Business (CA) and consist of single family residences
- The properties to the west are zoned PC and PR and are currently undeveloped
- To the south, the site is bounded by the CSX Railroad line and Ball Camp Pike
- Directly across Lobetti Road to the east, all the properties are zoned A and the properties contain single family residences, a large farm, and undeveloped property

Planned Residential allows for a variety of land uses. Dwelling units permitted in this zone include houses (not including mobile homes), duplexes, and multi-dwelling developments. Some commercial developments, schools, parks, churches and other similar land uses are also allowed in Planned Residential. The current zoning map from the Knoxville Geographic Information System (KGIS) is located in Appendix E.

DEVELOPMENT DENSITY:

The proposed density for the residential development is 5.00 dwelling units per acre based on 187 lots on 37.33 acres. This density is equal to 5 units per acre as allowed in this PR zone.

• **ON-SITE CIRCULATION:**

The internal roadways will be constructed with a ringed pattern inside the development and with several cul-de-sacs. The total length of the internal roadways on the north and south side will be approximately 6,300 feet in length. The roads shown on the plans have been labeled as Road "A" and Road "B" for the northern portion of the development. Road "C" thru "Road "H" is shown on the plans for the southern portion of the development, for a total of 8 roads for the entire development. The internal roadways for the development shown in Figure 3 will be paved, include 8" extruded concrete curbing, and each travel lane will be 13 feet for a total pavement width of 26 feet.

SERVICE AND DELIVERY VEHICLE ACCESS AND CIRCULATION:

The internal roadways will also provide access for service, delivery, maintenance vehicles, and fire protection vehicles. It is not expected that any of these vehicles will interfere with offsite adjacent roadway operations other than that these vehicles will occasionally be entering and exiting the development. The internal roadways in the subdivision are expected to be able to accommodate these types of vehicles along with passenger vehicles.

TRAFFIC ANALYSIS OF EXISTING AND PROPOSED CONDITIONS

TRIP GENERATION, DISTRIBUTION, AND ASSIGNMENT:

EXISTING TRAFFIC CONDITIONS

Traffic counts were conducted at the following existing intersections:

- o Ball Road at Lobetti Road
- o Ball Camp Pike at Lobetti Road

The traffic counts at both studied intersections were obtained on Thursday, March 9th, 2017 for a total of 6 hours at each intersection. The counts were conducted during the morning and afternoon peak periods. The local schools were in session when the traffic counts were conducted. Based on the traffic volumes counted, the AM peak hour of traffic was observed at 7:15 - 8:15 at Ball Road and Lobetti Road and slightly later at 7:30 – 8:30 at Ball Camp Pike and Lobetti Road. The PM peak hour was from 5:00 - 6:00 at both intersections. The manual tabulated traffic counts can be reviewed in Appendix F and the existing peak hour volumes at the intersections are shown in Figure 4.

No pedestrians were observed at the study intersections during the traffic counts. One bicyclist was observed heading westbound in the morning at the intersection of Ball Camp Pike at Lobetti Road. Another bicyclist was observed heading eastbound during the afternoon at the intersection of Ball Road at Lobetti Road.

Several school buses were observed passing through the intersections in the morning and afternoon. A large school bus was observed heading north on Lobetti Road in the afternoon and one small bus was observed heading south on Lobetti Road in the morning.

During the traffic counts, no trains were observed on the CSX Railroad track near the intersection of Ball Camp Pike at Lobetti Road. CSX Railroad was contacted to determine the amount of rail traffic on this track. According to CSX, an average of 9 trains per day pass through the area but is subject to change depending on customer demand. Trains on this track operate 24 hours a day, seven days a week, 365 days a year. About half of the trains operate during daylight hours and about half operate after 10 pm. The trains have diesel locomotive

engines with approximately 2 locomotives per train. The car count per train can vary widely but generally trains have between 40 and 100 cars. The maximum track speed is 45 mph for freight trains. This railroad crossing does not operate within a Quiet Zone. According to the Federal Railroad Administration, all crossings require 4 whistles – 2 long, 1 short, and 1 long.

The email response in regards to this rail crossing (#347556D) from CSX is included in Appendix G. Appendix G also includes the U.S. DOT Crossing Inventory Form from the Federal Railroad Administration website for this railroad crossing.



Capacity analyses were undertaken to determine the existing Level of Service (LOS) for the studied intersections with respect to vehicular traffic. The capacity analyses were calculated by following the methods outlined in the Highway Capacity Manual and using Synchro Traffic Software (Version 8). LOS is a qualitative measurement developed by the transportation profession of how well an intersection or roadway performs based on a driver's perception. LOS designations include LOS A through LOS F. The designation of LOS A signifies a roadway or intersection operating at best, while LOS F signifies road operations at the worst. This grading system provides a reliable straightforward means to communicate road operations to the public. The Highway Capacity Manual (HCM) lists level of service criteria for unsignalized intersections and is presented in this report as Table 2. For unsignalized intersections, Level of Service is measured in terms of delay (in seconds). This measure is an attempt to quantify delay that includes travel time, driver discomfort, and fuel consumption. The LOS for a two-way stop (or yield) controlled intersection is defined by the delay for each minor approach and major street left-turn movement. Generally, LOS D is considered the lowest acceptable LOS by government agencies.



(Source: FDOT)

From the capacity calculations, the results from the existing peak hour vehicular traffic can be seen in Table 3 for the intersections. The intersections are shown with a LOS designation, delay (in seconds), and V/C ratio (volume/capacity) for the AM and PM peak hours in the table. A V/C ratio of 1 would indicate that the traffic volumes are at the roadway capacity. Appendix H includes the worksheets from the capacity analyses for the existing peak hour vehicular traffic. For the intersections, the existing peak hour levels of service are shown to operate at a good level during the AM and PM peak hours for vehicular traffic. Average delays were observed at both southbound approaches of Lobetti Road at the two intersections due to the large conflicting volumes on the mainline roadways.

TABLE 2



LEVEL OF SERVICE AND DELAY FOR UNSIGNALIZED INTERSECTIONS



LEVEL OF SERVICE	DESCRIPTION	DELAY RANGE (seconds/vehicle)
А	Little or no delay	≤ 10
В	Short Traffic Delays	>10 and ≤15
С	Average Traffic Delays	>15 and ≤25
D	Long Traffic Delays	>25 and \leq 35
Е	Very Long Traffic Delays	$>$ 35 and \leq 50
F	Extreme Traffic Delays	>50

Source: Highway Capacity Manual

TABLE 3 2017 PEAK HOUR LEVEL OF SERVICE & DELAY - EXISTING TRAFFIC CONDITIONS

	TRAFFIC	FIC AM PEAK					PM PEAK			
INTERSECTION	CONTROL	APPROACH	LOS	DELAY	V/C	LOS	DELAY	V/C		
				(seconds)			(seconds)			
Ball Road at	q	Northbound Left/Thru/Right	А	9.8	0.021	В	14.3	0.030		
Lobetti Road	gnalize	Eastbound Left	А	9.0	0.004	А	8.1	0.007		
		Westbound Left	А	7.9	0.058	А	9.2	0.009		
	Jusi	Southbound Left/Thru/Right	С	21.4	0.098	С	20.3	0.078		
	1									
Ball Camp Pike at	q	Eastbound Left	А	8.7	0.004	А	8.0	0.007		
Lobetti Road	izec	Southbound Left/Right	С	20.5	0.257	С	18.9	0.030		
	Unsigna									

Note: All analyses were calculated in Synchro 8 software and reported with HCM 2010 methodology

OPENING YEAR TRAFFIC CONDITIONS (WITHOUT PROJECT):

Opening year traffic volume estimates represent the future condition the proposed study area is potentially subject to without the studied project being developed (no-build option). As previously stated, the build-out and full occupancy for this proposed new residential development was assumed to occur in 2 phases.

Traffic growth on Ball Road and Ball Camp Pike has shown flat and negative growth over the past 10 years (historical traffic data is shown in Appendix B). Part of this lower growth could be contributed to traffic shifting to the opening of the first phase of the Schaad Road Extension. Currently, there is one known relevant development located adjacent to the proposed site that would indicate increased traffic volumes in the study area in the future. This is development is a residential subdivision located at the corner of Ball Camp Pike at Bakertown Road to the south and west of the Cascade Falls development. This residential development is currently under construction and will have approximately 40 residential lots. Besides this project, however, there are also several properties in the vicinity that could be potentially attractive for other future residential development.

Since this area will undergo significant future changes due to the remaining phases of the Schaad Road Extension being constructed, the Knoxville Regional Transportation Planning Organization (KRTPO) was contacted and was requested to assist in obtaining future estimates of traffic growth in the study area. Mike Conger, PE, with the KRTPO provided traffic data for the future conditions. The KRTPO operates a regional long range software modeling program that allows the organization to model future traffic volumes. As part of this study's request, traffic model outputs were generated in the area of this development from the modeling program. The KRTPO model is set up to run for the years of 2014, 2022, 2030, and 2040. For this study, the data from the years of 2014 and 2022 were used.

The KRTPO gave modeling data for the year 2014, year 2022 with the Schaad Road Extension not being constructed and for the year 2022 with the Schaad Road Extension being constructed. The model outputs are presented in Appendix I.

The travel model predicted traffic volume increases on the existing roads of Ball Road and Ball Camp Pike up until the remaining Schaad Road Extension phases are completed. Based on the model results from the year 2014 to the year 2022, the model shows and thus assumed for this study that Ball Road will undergo 3.5% annual growth and Ball Camp Pike will have 6% annual growth up until the future Schaad Road Extension is completed (assumed to be in 2022). This growth pattern is a departure from what the historical TDOT and MPO counts would possibly indicate on these roads. To insure a reasonable conservative estimate for this study, however, these growth factors from the KRTPO model were used instead of the lower rates indicated in the historical traffic counts from the TDOT and the MPO.

Opening year traffic volumes for this project were calculated by applying the annual growth rates from the KRTPO model to the existing traffic volumes shown in Figure 4 for the year 2019 and 2022 when Phase 1 and 2 is assumed to be constructed and opened.

The results of applying this growth rate to the existing traffic volumes can be seen in Figure 5a for the year 2019. The traffic model from the KRTPO was utilized to estimate the future traffic volumes for the year 2022. By the year 2022, when the Schaad Road Extension is completed, the model estimates that large amounts of traffic that are currently traveling along Ball Road and Ball Camp Pike will shift to the new Schaad Road Extension. Figure 5b shows the estimated traffic volumes on the Schaad Road Extension in the year 2022. The volumes shown in Figure 5b for the Schaad Road Extension are estimated using several assumptions. For a typical rural road, the design hourly volume is about 12% to18% of the ADT. For urban roads, the design hourly volumes are from 8% to 12% of the ADT. Therefore, given this existing quasi-rural area transitioning to a more urban environment, for this study, it is estimated that 12% of the ADT would arrive during each peak hour in the year 2022. The KRTPO model produced an estimated ADT of 12,510 in the year 2022 on the Schaad Road Extension near Lobetti Road.

During the traffic counts on Ball Road and Ball Camp Pike, it was determined that during the AM peak hour, approximately 65% of traffic was headed west and 35% was headed east. During the PM peak hour of traffic, approximately 35% of traffic was headed west and 65% was headed east. The results of the assumptions can be seen in Figure 5b and shows an estimate of the traffic volumes during the AM and PM peak in the year 2022 with the new Schaad Road Extension being completed. The volumes shown on Lobetti Road are the existing observed

traffic volumes adjusted upwards to the year 2022.

The application of opening year traffic (without project) in 2019 shown in Figure 5a to the existing intersections did not substantially change (lower) the LOS designations from the existing traffic volume analysis for the AM and PM peak hours. Table 4 reports the LOS designation, delay (in seconds), and V/C ratio (volume/capacity) for the intersections in the assumed future conditions in the year 2019. Appendix H contains the LOS capacity worksheets for the opening year conditions (without project). It is important to point out that these projected LOS designations for the intersections would potentially exist in the future even without the proposed residential subdivision being constructed and developed.

	TRAFFIC			AM PEAK		PM PEAK		
INTERSECTION	CONTROL	APPROACH	LOS	DELAY	V/C	LOS	DELAY	V/C
				(seconds)			(seconds)	
Ball Road at	р	Northbound Left/Thru/Right	А	9.9	0.024	С	15.1	0.036
Lobetti Road	lize	Eastbound Left	А	9.2	0.005	А	8.2	0.007
	STOP) PUS	Westbound Left	А	8.0	0.062	А	9.4	0.010
	Jusi	Southbound Left/Thru/Right	С	23.5	0.110	С	22.3	0.088
	1							
Ball Camp Pike at	q	Eastbound Left	А	8.9	0.004	А	8.1	0.008
Lobetti Road	lize	Southbound Left/Right	D	25.3	0.338	С	22.0	0.036
	Jnsi							

 TABLE 4

 2019 PEAK HOUR LEVEL OF SERVICE & DELAY - OPENING YEAR (WITHOUT PROJECT)

Note: All analyses were calculated in Synchro 8 software and reported with HCM 2010 methodology

Note: Since the vast majority of traffic generated in the year 2022 will shift to the new Schaad Road Extension, the existing intersections of Lobetti Road at Ball Road and Ball Camp Pike were not analyzed for the year 2022.




TRIP GENERATION

The estimated amount of traffic that will be generated by the proposed residential development was calculated based upon rates and equations for peak hour trips provided by <u>Trip Generation Manual</u>, 9th Edition, a publication of the Institute of Transportation Engineers. A generated trip is a single or one-direction vehicle movement that is either entering or exiting the study site. The <u>Trip Generation Manual</u> is the traditional and most-sourced resource for determining trip generation rates when traffic impact studies are produced. The Manual lists and includes data for a variety of land uses. The data from ITE for the proposed land uses are shown in Appendix J. A summary of this information is presented in the following tables. The tables show the potential generated traffic for the northern portion of the development (townhouses) and Table 5b shows the potential generated traffic by the southern portion of the development (single family homes).

TABLE 5A TRIP GENERATION FOR CASCADE FALLS PHASE 1 - 66 dwellings

ITE LAND USE CODE	LAND USE DESCRIPTION	UNITS	GENERATED DAILY TRAFFIC	GENERATED TRAFFIC AM PEAK HOUR			GE , PM :	NERATE FRAFFIC PEAK HO	ED DUR
				ENTER	EXIT	TOTAL	ENTER	EXIT	TOTAL
	Residential			17%	83%		67%	33%	
#230	Condominium / Townhouse	66 Dwellings	449	6	32	38	29	14	43
Total New Volume Site Trips		449	6	32	38	29	14	43	

ITE Trip Generation Manual, 9th Edition

With a total of 66 townhouses on the northern site in Phase 1, based on the calculations, it is expected that 6 vehicles will enter the development, 32 will exit, for a total of 38 new generated trips during the AM Peak Hour in the year 2019. Similarly, it is expected that 29 vehicles will enter the development, 14 will exit, for a total of 43 new generated trips during the PM Peak Hour in the year 2019. The calculated trips generated for an average weekday are expected to be approximately 449 vehicles for Phase 1 of the northern townhouse development. No trip reductions were included either for pass-by or internal trips.

ITE LAND USE CODE	LAND USE DESCRIPTION	UNITS	GENERATED DAILY TRAFFIC	GENERATED TRAFFIC AM PEAK HOUR			GE PM 1	NERATE I'RAFFIC PEAK HO	D UR
				ENTER	EXIT	TOTAL	ENTER	EXIT	TOTAL
	0' 1 E 'I			25%	75%		63%	37%	
#210	Detached Housing	121 Lots	1,252	24	71	95	79	46	125
Total New Volume Site Trips		1,252	24	71	95	79	46	125	

TABLE 5B TRIP GENERATION FOR CASCADE FALLS PHASE 2 - 121 lots

ITE Trip Generation Manual, 9th Edition

With a total of 121 single family lots on the southern site in Phase 2, based on the calculations, it is expected that 24 vehicles will enter the development, 71 will exit, for a total of 95 new generated trips during the AM Peak Hour in the year 2022. Similarly, it is expected that 79 vehicles will enter the development, 46 will exit, for a total of 125 new generated trips during the PM Peak Hour in the year 2022. The calculated trips generated for an average weekday are expected to be approximately 1,252 vehicles for Phase 2 of the southern phase of the development. No trip reductions were included either for pass-by or internal trips.

TRIP DISTRIBUTION

Figure 6a shows the projected distribution for traffic entering/exiting Phase 1 of the new residential development during the future peak hours in the year 2019. The percentages shown only pertain to the new trips generated by the new residential townhouses in Phase 1 of the development. For Phase 1, it is assumed that 70% of traffic will enter and exit the intersection of Lobetti Road and Ball Road via the widened Lobetti Road. A smaller portion (30%) of the development traffic in Phase 1 was assumed to enter and exit from the south on Lobetti Road from Ball Camp Pike.

There are a variety of developments and destinations that will potentially "attract" the projected traffic to and from the new residential development and will be accessed by utilizing Oak Ridge Highway to the north and east, Pellissippi Parkway to the west, and Middlebrook Pike to the south and west. All will serve as access to various industries and businesses for employment and for other activities.

A variety of public and private elementary, middle, and high schools will be also highly traveled to and from. At the time of this report, this proposed development is zoned for Amherst Elementary School, Karns Middle School, and Karns High School. This property lies outside the Parental Responsibility Zone (PRZ) which would mean that bus service would be provided to the students attending the public schools. According to the Knox County School system, the PRZ is defined as being 1.5 miles for grades 6 - 12 (1.0 mile for grades K - 5) from the point where the students parcel is accessed to the point where the busses unload at the school.

The turning movements that were counted at the existing intersections were also used to help assume projected trip distributions and were surmised from the aforementioned surrounding concentrations of development and population.



For Phase 2 of the development, the directional distribution of traffic includes the addition of the Schaad Road Extension in the study area which is assumed to be constructed by 2022. For Phase 2, several of the same assumptions that were made for Phase 1 were also utilized to estimate future travel directions once the development is fully built-out. The inclusion of the Schaad Road Extension, for the future condition of the year 2022, results in different study intersections and additional assumptions. These new study intersections for the year 2022 include Road "C" at Schaad Road Extension, Lobetti Road at Schaad Road Extension, and Road "C" at Lobetti Road.

The percentages shown for the year 2022 in Figure 6b give an approximation of the residential lot dispersion in the development for both phases and their propensity to use a specific intersection into and out of the development. The zigzag lines in Figure 6b show these divisions within Phase 2. For example, for the area containing 35% of single family lots in the southeast corner of the property, it was assumed these residents would be much more likely to use the Road "C" at Lobetti Road intersection to access the Schaad Road Extension rather than traversing thru the subdivision roads. In addition to these divisions, assumptions were made about the direction of traffic in the future year of 2022. Based on the existing directional distributions and from the new geometrics created by the new Schaad Road Extension, it is assumed that 10% of the subdivision generated traffic will traverse the eastern approach of Ball Road and 25% will traverse the western approach of Ball Camp Pike during the AM and PM peaks. The remaining generated traffic will be split with 45% of traffic heading westbound and 20% heading eastbound in the AM peak on the Schaad Road Extension. Similarly, during the PM peak the splits will be 20% of traffic heading westbound and 45% heading eastbound on the Schaad Road Extension. These eastbound and westbound splits on the Schaad Road Extension closely follow the existing patterns observed on Ball Road and Ball Camp Pike. To facilitate these calculations, a spreadsheet was developed and the results are shown in Appendix K.

From these assumptions and with the aid of a spreadsheet, the directional distributions of generated traffic are shown in Figures 6c and 6d for the AM and PM peak hours. Figure 6c shows the distribution of generated traffic from Phase 1 with 66 townhouses. Figure 6d shows the distribution of generated traffic from Phase 2 with the 121 single family homes. The distributions are shown over two figures to delineate the patterns from each phase of the development. This was also necessary due to the different rates of traffic generation between the proposed two development types – townhouses and single family homes.







TRIP ASSIGNMENT

Figure 7a shows the Traffic Assignment of the computed trips that will be generated by the development for Phase 1 in 2019 (as shown in Table 5a - <u>Trip Generation</u>) that is applied to the various intersection movements based on the assumed distribution of trips shown in Figure 6a.

Figure 7b shows the Traffic Assignment of the computed trips that will be generated by the development for all Phases in 2022 (as shown in Tables 5a and 5b - <u>Trip Generation</u>) that is applied to the various intersection movements based on the assumed distribution of trips shown in Figures 6c & 6d. These trips shown are generated from the spreadsheet described in <u>Trip</u> <u>Distribution</u>. (Please note that the numbers in the traffic assignment volumes have been rounded due to the nature of the spreadsheet calculations.)





OPENING YEAR TRAFFIC CONDITIONS (WITH PROJECT)

Overall, several additive steps were taken to estimate the <u>total</u> opening year traffic with the project traffic volumes at the studied intersections when the residential development is fully constructed and occupied at the end of each phase. The steps are illustrated below for clarity:



To calculate the total future projected traffic volumes at the studied intersections, the calculated peak hour traffic generated by the new proposed residential development was added to the 2019 and 2022 opening year traffic volumes (shown in Figures 5a and 5b) in accordance with the predicted directional distributions and assignments (shown in Figures 6a thru 6d and Figures 7a & 7b). This procedure was necessary to obtain the total projected traffic volumes at the time the development is fully built-out and fully occupied at the end of each phase. Figures 8a and 8b shows the projected AM and PM peak hour volumes at the studied intersections for Phase 1 (2019) and Phase 1 & Phase 2 (2022).





Capacity analyses were once again undertaken to determine the projected Level of Service (LOS) for vehicles at the studied intersections. Appendix H includes the worksheets for these capacity analyses.

The results of the capacity calculations of the projected peak hour vehicular traffic can be seen in Tables 6a and 6b for the studied intersections. For the intersections, the peak hour levels of service are shown to operate at acceptable levels during both the AM and PM peak hours for Phase 1 (2019). In the year 2022 when Phase 2 is completed along with the Schaad Road Extension, the northbound and southbound movements at Lobetti Road at the Schaad Road Extension intersection are calculated to operate at LOS F. For Phase 2, the westbound and eastbound left turns at the intersection of Lobetti Road at the Schaad Road Extension plans for Schaad Road. The intersection of Lobetti Road at the Schaad Road Extension in the construction plans shows 150 feet of storage length for eastbound and westbound left turns.

TABLE 6a 2019 PEAK HOUR LEVEL OF SERVICE & DELAY - OPENING YEAR (WITH PROJECT) PHASE 1

	TRAFFIC			AM PEAK			PM PEAK	
INTERSECTION	CONTROL	APPROACH	LOS	DELAY	V/C	LOS	DELAY	V/C
				(seconds)			(seconds)	
Ball Road at	þ	Northbound Left/Thru/Right	С	20.5	0.176	С	20.4	0.103
Lobetti Road	lize	Eastbound Left	А	9.2	0.005	А	8.2	0.007
	STOP E	Westbound Left	А	8.0	0.067	А	9.6	0.042
	Jusi	Southbound Left/Thru/Right	С	24.3	0.114	D	25.2	0.101
	1							
Ball Camp Pike at	J	Eastbound Left	А	9.0	0.009	А	8.2	0.017
Lobetti Road		Southbound Left/Right	D	28.0	0.416	С	18.4	0.047
	STOP							
	Uns							
Road "A" at	H	Northbound Left	А	7.3	0.001	А	7.3	0.006
Lobetti Road	lize	Eastbound Left/Right	А	8.8	0.037	А	8.7	0.016
	STOP 40							
	Jnsi							
	ſ							

	TRAFFIC			AM PEAK			PM PEAK	
INTERSECTION	CONTROL	APPROACH	LOS	DELAY (seconds)	V/C	LOS	DELAY (seconds)	V/C
Schaad Road at	p	Northbound Left/Thru/Right	F	138.5	0.750	F	130.1	0.700
Lobetti Road *	dize	Eastbound Left	В	10.6	0.010	А	8.9	0.010
	STOP E	Westbound Left	А	8.7	0.010	В	10.8	0.030
	Uns	Southbound Left/Thru/Right	F	113.2	0.790	F	75.0	0.430
	_							
Schaad Road at	g	Northbound Right	В	10.2	0.021	В	12.6	0.020
Road "C"	Unsignalize							
Road "A" at	р	Northbound Left	А	7.3	0.004	А	7.3	0.018
Lobetti Road	dize	Eastbound Left/Right	А	8.7	0.035	А	8.5	0.015
	Unsigna							
Road "C" at Lobetti Road	σ	Northbound Left	А	7.3	0.004	А	7.3	0.014
	lize	Eastbound Left/Right	А	9.1	0.067	А	9.1	0.045
	Unsigna							

TABLE 6b 2022 PEAK HOUR LEVEL OF SERVICE & DELAY - OPENING YEAR (WITH PROJECT) DILASE 1 % 2

Note: All analyses were calculated in Synchro 8 software and reported with HCM 2010 methodology unless noted otherwise

* Schaad Road at Lobetti Road calculated using HCM 2000 methodology (2010 methodology will not compute results due to severe delays)

POTENTIAL SAFETY ISSUES

The study area was investigated for potential safety issues. Several features of the adjacent transportation system were identified and are discussed in the following pages as having potential safety issues.

SPOT SPEED STUDY

As a further investigation of the study area, a spot speed study was conducted. The spot speed study was conducted on Ball Road to sample and tabulate the existing vehicle speeds along the road in the vicinity of the proposed development. The equipment used for the speed study was a Bushnell Speedster III Radar Speed Gun. The vehicles that were counted for the study were the eastbound and westbound motorists along Ball Road near the intersection with Lobetti Road.

The results of the study indicate that the majority of the traffic along Ball Road travels at a greater speed than the posted speed limit. The posted speed limit for Ball Road is 40 mph. The results of the spot speed study indicate that the observed 85th percentile speed was nearly 47 mph for westbound traffic and 49 mph for eastbound traffic. The spot speed field observations are provided in Appendix L.

EVALUATION OF TURN LANE THRESHOLDS

Since the existing intersection of Ball Road at Lobetti Road is assumed to take on the majority of traffic in Phase 1 prior to the Schaad Road Extension being completed, this intersection was evaluated for the need for separate left and right turn lanes on Ball Road. Based on the existing traffic volumes at the intersection on Ball Road and according to "Knox County's Access Control and Driveway Design Policy", it appears that a separate westbound left turn lane is currently warranted due to the existing AM peak hour volumes. A separate eastbound right turn lane is not currently warranted according to the Knox County policy. Under the proposed conditions in the year 2019 when Phase 1 is completed, a separate westbound left turn would still be warranted and a separate eastbound right turn lane would be under the required threshold again. The Knox County turn lane policy worksheets are located in Appendix M and the results shown in the Appendix are based on the largest existing volumes.

The design policy for turn lane warrants relate volume thresholds based on prevailing speeds for two-lane roadways. The speed classification that was chosen for this evaluation was based on the spot speed study that showed the 85th percentile speed was 49 mph for eastbound traffic and 47 mph for westbound traffic. Therefore, this study evaluation used the Knox County classification for speeds of 46 to 55 mph and the calculated projected volumes.

Even though a westbound left turn lane is currently warranted based on the Knox County thresholds, the existing level of service and the projected level of service in 2019 for Phase 1 westbound left turn movements during the AM and PM peak hour was calculated to be at LOS A. In addition to the level of service calculations, vehicle queue lengths were also calculated to determine the impact of the westbound left turning movements. To estimate these projected lengths, SimTraffic (Version 8) software was utilized which performs micro-simulation and animation of vehicular traffic and also calculates various vehicle parameters such as intersection queue lengths. The queue results from the SimTraffic software are located in Appendix N. The 95th percentile queue is a traditional measurement used when considering queue distances. A 95th percentile queue means that there is a 95% certainty the queue will not extend beyond that point. The queue results were based on averaging the model outcome obtained during 10 traffic simulations.

The results indicated that the queues for the westbound left turns are projected to be the following in the existing conditions (2017) and in the year 2019:

<u>AM Peak Hour Westbound 95th percentile queue lengths</u>: Existing Conditions = 42 feet Projected Conditions with Phase 1 in the year 2019 = 50 feet

<u>PM Peak Hour Westbound 95th percentile queue lengths</u>: Existing Conditions = 16 feet Projected Conditions with Phase 1 in the year 2019 = 52 feet

This would indicate that there are not excessive queues during the AM and PM peak hour for either the existing conditions or with the proposed volumes from Phase 1 in the year 2019.

EVALUATION OF SIGHT DISTANCE

Based on a speed of 50 mph on Ball Road (85th percentile observed speed for the study was 49 mph); the recommended intersection sight distance is 500 feet looking east and west at the intersection of Lobetti Road and Ball Road.

There are some roadside features on Ball Road near the intersection with Lobetti Road that could potentially interfere with having the recommended sight distance. There is a utility pole, chain link fence, and existing vegetation that potentially obstruct views looking to the west from the south side of Lobetti Road. Looking to the east, there is also vegetation and a vertical curve approximately 500 feet away in front of Ball Road Baptist Church that could reduce the recommended sight distance.

Sight distance looking to the east and west at Lobetti Road and Ball Road needs to be verified by a land surveyor. The visual observation for this report was made in late winter, so spring and summer growth of vegetation could be more of an issue.

Sight distance at the intersection of Lobetti Road at Ball Camp Pike was visually inspected and appears to be adequate. A spot speed study was not



conducted on Ball Camp Pike since it is assumed that the vast majority of generated traffic for this development in the future will not utilize this intersection. The sight distances at the proposed new intersections at Roads "A" and "C" on Lobetti Road should be adequate especially once the Schaad Road Extension is completed.

EXISTING RAILROAD CROSSING

The adjacent railroad crossing within the study area was reviewed for potential safety issues. Lobetti Road in the study area has a railroad crossing at its southern reach near the intersection with Ball Camp Pike. From the edge of the south rail track to the edge of Ball Camp Pike is approximately 90 feet. This spacing does not allow for more than 2 to 3 vehicles to queue in between the railway and the intersecting road. Due to the low expected development generated volumes from the south and the relatively low train volumes, it is not expected that vehicles would frequently queue back and interfere with traffic movements on Ball Camp Pike.

As described earlier, this railroad crossing is an active CSX railroad line. The railroad crossing has a Grade Crossing Advance Warning sign (W10-1) for southbound traffic but does not have one for the northbound approach due to the short distance in between the railroad and Ball Camp Pike. There is Grade Crossing and Intersection Advance Warning signs (W10-3) posted on Ball Camp Pike. This crossing does not have railroad crossing signals or crossing gates but does have a Railroad Grade Crossing (crossbuck) sign (R15-1). Additionally, the advance railroad pavement markings are missing and/or worn away at both approaches to the railroad crossing.

EVALUATION OF LOBETTI ROAD

As described earlier in the report, Lobetti Road is being proposed to be widened. Lobetti Road has several existing safety issues. There is an extreme vertical curve and the pavement width is less than adequate for vehicles passing each other in opposite directions as evidenced by the ground rutting along the roadway outside the edge of pavement. The developer is proposing to widen



View of wheel rutting along Lobetti Road

November 2017 Transportation Impact Study Cascade Falls (Lobetti Road) Knox County, TN Lobetti Road from the current width of 14 feet to a total of 20 feet from the Road "A" intersection to the Ball Road intersection. This widening should be adequate for the vehicular traffic to and from the residential subdivision during Phase 1. The Schaad Road Extension will greatly improve Lobetti Road on each approach at its intersection. Road grades will be reduced, the extreme existing vertical curve will be eliminated and Lobetti Road will be widened and improved. To the north of the Schaad Road Extension, Lobetti Road will be widened and improved for approximately 425 feet and to the south it will be improved for approximately 625 feet. Appendix O includes the construction plans by Robert G. Campbell & Associates for the Knox County Schaad Road Extension in the study area.

As stated earlier, this study has made assumptions that very small amounts of the proposed generated traffic for this development will utilize the intersection of Lobetti Road at Ball Camp Pike. This existing intersection is not particularly conducive for southbound turning movements. The southbound approach at this intersection has a fairly steep grade and a small turning radius with a significant pavement drop-off for southbound right turning vehicles.



CONCLUSIONS & RECOMMENDATIONS

The following is an overview of recommendations and observations to minimize the impacts of the development with the surrounding transportation system while achieving an acceptable level of traffic flow and safety.

1) Ball Road at Lobetti Road:

- 1a) Sight distance at this intersection is recommended to be 500 feet based on the observed speeds. The site designer should ensure that these sight distance lengths are met and they should be labeled on the plans. A land surveyor should measure the sight distance available and verify these estimates. The overall required sight distance should be measured at the intersection at a minimum of 15 feet off of the edge of the roadway per Knox County subdivision regulations (Section 62-88).
- 1b) From the capacity calculations, it has been shown that the traffic movements at this existing intersection should operate acceptably during the AM and PM peak periods when Phase 1 is completed for the development. Table 7a gives a summary for the existing and Phase 1 LOS at the intersection.

	TRAFFIC		AM PEAK			PM PEAK		
INTERSECTION	CONTROL	APPROACH	LOS	DELAY	V/C	LOS	DELAY	V/C
				(seconds)			(seconds)	
Ball Road at	р	Northbound Left/Thru/Right	А	9.8	0.021	В	14.3	0.030
Lobetti Road	dize	Eastbound Left	А	9.0	0.004	А	8.1	0.007
	angisnl	Westbound Left	А	7.9	0.058	А	9.2	0.009
EXISTING		Southbound Left/Thru/Right	С	21.4	0.098	С	20.3	0.078
	1							
Ball Road at	р	Northbound Left/Thru/Right	С	20.5	0.176	С	20.4	0.103
Lobetti Road	lize	Eastbound Left	А	9.2	0.005	А	8.2	0.007
	STOP PUS	Westbound Left	А	8.0	0.067	А	9.6	0.042
PHASE 1 (2019)	Jnsi	Southbound Left/Thru/Right	С	24.3	0.114	D	25.2	0.101

TABLE 7a SUMMARY OF BALL ROAD AT LOBETTI ROAD

As can be seen in the table, the level of service is lowered as the development and time progresses.

The results from the existing / proposed level of service and the queue lengths suggest that a separate westbound left turn lane or separate eastbound right turn lane is not obligatory at this intersection even though Knox County policy suggests that it is currently warranted for westbound left turns. These calculations are based on Phase 1 estimated volumes prior to the construction of the Schaad Road Extension. It is highly likely that the construction of a westbound turn lane at Ball Road could be a waste of resources and would shortly no longer be warranted once the majority of the traffic will shift off of Ball Road onto the Schaad Road Extension as indicated in the KRTPO model.

2) **Ball Camp Pike at Lobetti Road:** From the capacity calculations, it has been shown that the traffic movements at this existing intersection should operate acceptably during the AM and PM peak periods when Phase 1 is completed for the development. Table 7b gives a summary for the existing and Phase 1 LOS at the intersection. As can be seen in the table, the level of service is lowered as the development progresses. This intersection is not expected to experience but a handful of generated trips from the new development. From the existing traffic count, it appears that currently several dozen vehicles utilize Lobetti Road as a cut-thru from Ball Road to Ball Camp Pike and this contributes to the lower level of service for the southbound approach.

	TRAFFIC			AM PEAK		PM PEAK		
INTERSECTION	CONTROL	APPROACH	LOS	DELAY	V/C	LOS	DELAY	V/C
				(seconds)			(seconds)	
Ball Camp Pike at	q	Eastbound Left	А	8.7	0.004	А	8.0	0.007
Lobetti Road	lize	Southbound Left/Right	С	20.5	0.257	С	18.9	0.030
EXISTING	Unsigna							
Ball Camp Pike at	q	Eastbound Left	А	9.0	0.009	А	8.2	0.017
Lobetti Road	lize	Southbound Left/Right	D	28.0	0.416	С	18.4	0.047
PHASE 1 (2019)	Unsigna							

TABLE 7b SUMMARY OF BALL CAMP PIKE AT LOBETTI ROAD

3) **Road "A" at Lobetti Road:** From the capacity calculations, it has been shown that the traffic movements at this intersection should operate acceptably during the AM and PM peak periods during both phases for the development. Table 7c gives a summary for the Phase 1 and Phase 2 LOS at the intersection.

	TRAFFIC		AM PEAK			PM PEAI		
INTERSECTION	CONTROL	APPROACH	LOS	DELAY	V/C	LOS	DELAY	V/C
				(seconds)			(seconds)	
Road "A" at	р	Northbound Left	А	7.3	0.001	А	7.3	0.006
Lobetti Road	lize	Eastbound Left/Right	А	8.8	0.037	А	8.7	0.016
PHASE 1 (2019)	Cunsigna							
Road "A" at	q	Northbound Left	А	7.3	0.004	А	7.3	0.018
Lobetti Road	lize	Eastbound Left/Right	А	8.7	0.035	А	8.5	0.015
PHASE 2 (2022)	Unsigna							

TABLE 7c SUMMARY OF ROAD "A" AT LOBETTI ROAD

- 3a) From the analyses, an exclusive left turn lane or an exclusive right turn lane on Lobetti Road into the development at Road "A" is not required due to the overall projected low volumes turning into the development and the low opposing volumes.
- 3b) From the results of the capacity calculations, separate eastbound left and right turn lanes are not required at the intersection for exiting vehicles out of the development at Road "A" and Lobetti Road. A single exiting lane for the development for left and right turners should be sufficient according to the calculations. The delays associated with these vehicle movements are projected to be minimal.
- 3c) It is recommended that the new entrance approach Road "A" at the intersection with Lobetti Road be designed and constructed with a 24" white stop bar and with a Stop Sign (R1-1) for the eastbound approach.

- 3d) Intersection sight distance at the new proposed entrance at Lobetti Road must not be impacted by new signage, future landscaping, any existing vegetation, or utility poles.
- 3e) Based on a posted speed of 20 mph on Lobetti Road, the recommended intersection sight distance requirement is 200 feet. This distance should be readily available at this intersection location.
- 4) **Road "C" at Lobetti Road:** From the capacity calculations, it has been shown that the traffic movements at this intersection should operate acceptably during the AM and PM peak periods when both phases are completed for the development. Table 7d gives a summary for the Phase 2 LOS at the intersection.

	TRAFFIC			AM PEAK			PM PEAK	
INTERSECTION	CONTROL	APPROACH	LOS	DELAY	V/C	LOS	DELAY	V/C
				(seconds)			(seconds)	
Road "C" at	q	Northbound Left	А	7.3	0.004	А	7.3	0.014
Lobetti Road	lize	Eastbound Left/Right	А	9.1	0.067	А	9.1	0.045
PHASE 2 (2022)	Unsigna							

TABLE 7d SUMMARY OF ROAD "C" AT LOBETTI ROAD

- 4a) From the analyses, an exclusive left turn lane or an exclusive right turn lane on Lobetti Road into the development at Road "C" is not required due to the overall projected low volumes turning into the development and the low opposing volumes.
- 4b) From the results of the capacity calculations, separate eastbound left and right turn lanes are not required at the intersection for exiting vehicles out of the development at Road "C" and Lobetti Road. A single exiting lane for the development for left and right turners should be sufficient according to the calculations. The delays associated with these vehicle movements are projected to be minimal.

- 4c) It is recommended that the new entrance approach Road "C" at the intersection with Lobetti Road be designed and constructed with a 24" white stop bar and with a Stop Sign (R1-1) for the eastbound approach.
- 4d) Intersection sight distance at the new proposed entrance at Lobetti Road must not be impacted by new signage, future landscaping, any existing vegetation, or utility poles.
- 4e) Based on a posted speed of 20 mph on Lobetti Road, the recommended intersection sight distance requirement is 200 feet. This distance should be readily available at this intersection location.

- 5) <u>**Cascade Falls Internal Roads**</u>: The current layout plan shows several new roadways being constructed within the development as shown on Figure 3.
 - 5a) Stop Signs (R1-1) should be installed at internal intersections as shown below.



- 5b) Sight distance at all of the new internal "T" and 4-way intersections must not be impacted by new signage, future landscaping, or parked vehicles.
- 5c) The residential subdivision is to be posted with signage at the entrances to the development at 25 mph. These signs should be placed within the development at the three entrances into the subdivision.

- 5d) Road "D" at its southwestern terminus should be posted with signage indicating the roadway ending. See TDOT Standard Drawing T-S-18.
- 5e) All road grade and intersection elements internally and externally should be designed to AASHTO, TDOT, and Knox County Engineering specifications and guidelines to ensure proper operation.

6) <u>Lobetti Road</u>:

- 6a) Lobetti Road is being proposed to be widened from the proposed Road "A" intersection to the existing intersection at Ball Road. This widening will increase the width from approximately 14 feet to 20 feet. It is assumed that there is enough right-of-way for this to be accomplished without having to acquire property.
- 6b) Even though the volumes are projected to be minimal, it is recommended that the advance railroad crossing pavement markings be re-applied. It is not know if these pavement markings are the responsibility of Knox County or CSX Railroad. The recommended railroad pavement markings and signage at railroad crossings in the Manual on Uniform Traffic Control Devices (MUTCD) is shown in Appendix P. Consideration should be given to installing a 24" white stop bar in advance of the southbound approach on Lobetti Road to complement the existing Stop Sign (R1-1).
- 6c) According to the concept plan for the development and the Schaad Road Extension road plans, the Road "A" intersection is being proposed to be constructed 468.79 feet to the north of the Schaad Road Extension from centerline to centerline. The Schaad Road Extension will improve Lobetti Road northward towards the Road "A" intersection for 426.62 feet. The distance between the two is 42.17 feet. For the first 326.62 feet of the north Lobetti Road improvement for the Schaad Road Extension, Lobetti Road will be widened to a total of 20 feet. The remaining 100 feet of the improvement will transition the Lobetti Road widening from 20 feet to 14 feet. It is recommended that in addition to the widening of Lobetti Road by the development northward to Ball

Road, the development should also widen Lobetti Road for the additional 42.17 feet in between the two projects. This widening gap in between the two projects should be coordinated between Knox County and the developer. See Figure 9 for an illustration of the proposed widening on Lobetti Road to the north of the Schaad Road Extension.



Figure 9 Road "A" at Lobetti Road Improvements

6d) The proposed Road "C" intersection on Lobetti Road will mostly fall within the scope of the Schaad Road Extension improvements for Lobetti Road. According to the concept plan for the development and the Schaad Road Extension road

plans, Road "C" is being proposed to be constructed 530.79 feet to the south of the Schaad Road Extension from centerline to centerline. The Schaad Road Extension will improve Lobetti Road southward towards the Road "C" intersection for 623.38 feet. For the first 523.38 feet of the south Lobetti Road improvement, Lobetti Road will be widened to a total of 20 feet. The remaining 100 feet of the improvement will transition the Lobetti Road widening from 20 feet to 14 feet. The centerline of Road "C" will be constructed within the Lobetti Road widening where the transition from a width of 20 feet is transitioning to 14 feet. It is recommended that the development provide a full width of 20 feet on Lobetti Road for the entire footprint of the intersection on Lobetti Road and then transition Lobetti Road 100 feet to the south of the intersection down to the existing pavement width. This widening should be coordinated between Knox County and the developer. See Figure 10 for an illustration of the proposed widening on Lobetti Road to the south of the Schaad Road Extension.



Figure 10 Road "C" at Lobetti Road Improvements

- 6e) The proposed lots within the development that are adjacent to Lobetti Road should not be allowed to have direct access.
- 7) **Pedestrian and Bicycle Considerations**: Due to the lack of nearby destinations for amenities/services, it is not expected that the proposed development will generate large amounts of pedestrian or bicycle traffic. However, with the Schaad Road Extension being constructed adjacent to the residential development, it is anticipated that residents of the development could make use of the sidewalk system being constructed for Schaad Road for exercise or for other purposes. According to the Knox County Chief Engineer, the Schaad Road Extension is not proposing to include exclusive bike lanes but will have 5 foot wide concrete sidewalks.
 - 7a) Much like it is recommended that Lobetti Road be widened in between the proposed Road "A" and Road "C" intersections; it is also recommended that the development include sidewalks on the western side of the improved Lobetti Road. These sidewalks should tie the internal residential development sidewalks with the sidewalks that are being constructed for the Schaad Road Extension. According to the roadway plans, the sidewalk construction for the Schaad Road Extension will terminate at the end of the Lobetti Road intersection's radii. The construction of these sidewalks should be coordinated between Knox County and the development. For Lobetti Road to the north of the Schaad Road Extension, approximately 325 feet of sidewalk would need to be constructed on the west side of Lobetti Road to the south of the Schaad Road Extension, approximately 375 feet of sidewalk would need to be constructed on the west side of Lobetti Road to the west side of Lobetti Road to the two projects together.
 - 7b) Internal sidewalks are recommended for this development and should have appropriate ADA compliant curbed ramps at intersection corners. The sidewalks are recommended to be 5 feet minimum in width and should at a minimum be at one side of each internal roadway. This internal sidewalk system will provide pedestrian activity to access the sidewalk system that will be constructed by the Schaad Road Extension.

APPENDIX A

SCHAAD ROAD EXTENSION PHASE DIAGRAM

Schaad Road Phase 2



APPENDIX B

HISTORICAL TRAFFIC COUNT DATA




Historical Traffic Counts

Organization: Knoxville Regional Transportation Planning Organization

Station ID #: M063

Location: Ball Camp Pike (2000' west of Oak Ridge Highway)



2005 - 2015 Growth Rate = -3.1%

Annual Growth Rate = -0.3%

Historical Traffic Counts

Organization: TDOT

Station ID #: 000079

Location: Ball Road (just east of Branch Hill Lane)



2005 - 2015 Growth Rate = -20.9%

Annual Growth Rate = -2.3%

APPENDIX C

WALK SCORE

WALK SCORE

(from walkscore.com)



About this Location



Lobetti Road has a Walk Score of 0 out of 100. This location is a Car-Dependent neighborhood so almost all errands require a car.

This location is in Knoxville. The closest park is Karns Community Park.



City of Knoxville

This location is in the city of Knoxville, TN. Knoxville has an average Walk Score of 31 and has 178,874 residents.





APPENDIX D

KNOXVILLE AREA TRANSIT MAP AND INFORMATION







CROSSTOWN CONNECTOR (Weekdays and Saturdays)

SERVES:

640 Plaza

- Knoxville Center Mall
- Knox Road/Kroger





Information Updated: August 24, 2015

	Going toward West Town Mall									Go	oing to	oward	d Knoxvil	le Cer	nter N	1all		
	Transfe	er to:	Rts. 22	2&24		Rt.	12		Rt.	11		Rt.	12		Rts. 22	2&24		Rt. 33
	Knoxville Center Mall	Northgate Terrace	Founta Supe (Arrives)	in City rstop (Leaves)	Merchants at Expo Center	I-640 (Arrives)	Plaza (Leaves)	Vanosdale at Middlebrook	West M (Arrives)	Town all <i>(Leaves)</i>	Vanosdale at Middlebrook	I-640 (Arrives)	Plaza (Leaves)	Merchants at Marguerite	Founta Super (Arrives)	iin City rstop <i>(Leaves)</i>	Northgate Terrace	Knoxville Center Mall
	1	2	3		4			6			8	9		10	1	1	12	13
							١	VEEKD	AY SO	CHE	DULE							
A.M.										6:01	6:06	6:20	6:22	6:37	7:00	7:05	7:11	7:25
				6:05	6:15	6:34	6:36	6:43	6:59	7:01	7:06	7:20	7:22	7:37	8:00	8:05	8:11	8:25
	6:30	6:45	7:00	7:05	7:15	7:34	7:36	7:43	7:59	8:01	8:06	8:20	8:22	8:37	9:00	9:05	9:11	9:25
	7:30	7:45	8:00	8:05	8:15	8:34	8:36	8:43	8:59	9:01	9:06	9:20	9:22	9:37	10:00	10:05	10:11	10:25
	8:30	8:45	9:00	9:05	9:15	9:34	9:36	9:43	9:59	10:01	10:06	10:20	10:22	10:37	11:00	11:05	11:11	11:25
	9:30	9:45	10:00	10:05	10:15	10:34	10:36	10:43	10:59	11:01	11:06	11:20	11:22	11:37	12:00	12:05	12:11	12:25
	10:30	10:45	11:00	11:05	11:15	11:34	11:36	11:43	11:59	12:01	12:06	12:20	12:22	12:37	1:00	1:05	1:11	1:25
	11:30	11:45	12:00	12:05	12:15	12:34	12:36	12:43	12:59	1:01	1:06	1:20	1:22	1:37	2:00	2:05	2:11	2:25
P.M.	12:30	12:45	1:00	1:05	1:15	1:34	1:36	1:43	1:59	2:01	2:06	2:20	2:22	2:37	3:00	3:05	3:11	3:25
	1:30	1:45	2:00	2:05	2:15	2:34	2:36	2:43	2:59	3:01	3:06	3:20	3:22	3:37	4:00	4:05	4:11	4:25
	2:30	2:45	3:00	3:05	3:15	3:34	3:36	3:43	3:59	4:01	4:06	4:20	4:22	4:37	5:00	5:05	5:11	5:25
	3:30	3:45	4:00	4:05	4:15	4:34	4:36	4:43	4:59	5:01	5:06	5:20	5:22	5:37	6:00	6:05	6:11	6:25
	4:30	4:45	5:00	5:05	5:15	5:34	5:36	5:43	5:59	6:01	6:06	6:20	6:22	6:37	7:00	7:05	7:11	7:25
	5:30	5:45	6:00	6:05	6:15	6:34	6:36	6:43	6:59	7:01	7:06	7:20	7:22	7:37	8:00	8:15	8:21	8:35
	6:30	6:45	7:00	7:05	7:15	7:34	7:36	7:43	7:59	To Gard	ige							
	7:30	7:45	8:00	8:05	8:15	8:34	8:36	8:43	8:59	To Gard	ige							
				1			S	ATURD	AY S	CHE	DULE	1	1					
A.M.										7:31	7:39	7:59	8:04	8:14	8:30	8:35	8:41	8:55
	7:00	7:15	7:30	7:35	7:47	8:08	8:12	8:20	8:29	8:31	8:39	8:59	9:04	9:14	9:30	9:35	9:41	9:55
	8:00	8:15	8:30	8:35	8:47	9:08	9:12	9:20	9:29	9:31	9:39	9:59	10:04	10:14	10:30	10:35	10:41	10:55
	9:00	9:15	9:30	9:35	9:47	10:08	10:12	10:20	10:29	10:31	10:39	10:59	11:04	11:14	11:30	11:35	11:41	11:55
	10:00	10:15	10:30	10:35	10:47	11:08	11:12	11:20	11:29	11:31	11:39	11:59	12:04	12:14	12:30	12:35	12:41	12:55
	11:00	11:15	11:30	11:35	11:47	12:08	12:12	12:20	12:29	12:31	12:39	12:59	1:04	1:14	1:30	1:35	1:41	1:55
P.M.	12:00	12:15	12:30	12:35	12:47	1:08	1:12	1:20	1:29	1:31	1:39	1:59	2:04	2:14	2:30	2:35	2:41	2:55
	1:00	1:15	1:30	1:35	1:47	2:08	2:12	2:20	2:29	2:31	2:39	2:59	3:04	3:14	3:30	3:35	3:41	3:55
	2:00	2:15	2:30	2:35	2:47	3:08	3:12	3:20	3:29	3:31	3:39	3:59	4:04	4:14	4:30	4:35	4:41	4:55
	3:00	3:15	3:30	3:35	3:47	4:08	4:12	4:20	4:29	4:31	4:39	4:59	5:04	5:14	5:30	5:35	5:41	5:55
	4:00	4:15	4:30	4:35	4:47	5:08	5:12	5:20	5:29	5:31	5:39	5:59	6:04	6:14	6:30	6:35	6:41	6:55
	5:00	5:15	5:30	5:35	5:47	6:08	6:12	6:20	6:29	6:31	6:39	6:59	7:04	7:14	7:30	7:45	7:51	8:05
	6:00	6:15	6:30	6:35	6:47	7:08	7:12	7:20	7:29	7:31	7:39	7:59	8:04	8:14	8:30	8:45	8:51	9:05
	7:00	7:15	7:30	7:35	7:47	8:08	8:12	8:20	8:29	To Garage								

Need help reading this schedule?

Need other general information on how to ride?

Click here to Download the General Schedule Information pdf available from katbus.com

APPENDIX E

LOBETTI ROAD ZONING MAP



APPENDIX F

MANUAL TRAFFIC COUNT DATA

TRAFFIC COUNT DATA

Major Street: Ball Road (WB - EB) Minor Street: Lobetti Road (NB - SB) Traffic Control: Stop Control on Minor Street 3/9/2017 (Thursday) Sunny/Mild Conducted by: Ajax Engineering

	Lobetti Road SOUTHBOUND			Ball Road		I.	obetti Roa	ıd		Ball Road				
TIME	SO	UTHBOU	ND	W	ESTBOUI	ND	NO	RTHBOU	ND	E	ASTBOUN	JD	VEHICLE	PEAK
BEGIN	LT	THRU	RT	LT	THRU	RT	LT	THRU	RT	LT	THRU	RT	TOTAL	HOUR
7:00 AM	0	1	0	1	109	0	0	0	0	0	54	0	165	
7:15 AM	2	0	0	2	125	1	0	0	2	0	66	0	198	7:15 AM - 8:15 AM
7:30 AM	1	0	0	8	147	2	0	0	4	0	66	0	228	
7:45 AM	0	2	1	19	175	0	0	0	1	0	64	0	262	
8:00 AM	1	0	2	6	174	0	0	0	1	1	63	0	248	
8:15 AM	1	0	2	2	139	0	0	0	0	1	41	0	186	
8:30 AM	2	0	0	1	105	1	0	0	2	0	43	0	154	
8:45 AM	1	0	0	0	90	0	0	0	0	0	50	0	141	
TOTAL	8	3	5	39	1064	4	0	0	10	2	447	0	1582	
2:00 PM	2	0	0	1	39	1	0	1	0	0	56	0	100	
2:15 PM	2	0	0	0	46	0	0	0	0	0	66	0	114	
2:30 PM	0	0	1	0	53	0	0	1	0	0	78	0	133	
2:45 PM	3	0	0	2	54	1	0	0	3	0	87	1	151	
3:00 PM	2	0	2	2	82	6	1	0	1	0	78	0	174	
3:15 PM	1	0	2	2	78	0	0	0	2	0	91	0	176	
3:30 PM	0	0	0	0	88	2	0	0	0	1	90	0	181	
3:45 PM	0	0	1	1	65	3	0	0	1	3	105	0	179	
4:00 PM	1	0	1	0	92	2	1	0	1	4	105	0	207	
4:15 PM	0	0	1	2	63	1	0	0	1	0	105	0	173	
4:30 PM	1	0	1	2	80	0	0	1	2	1	105	0	193	
4:45 PM	3	0	1	0	75	2	0	0	1	0	130	0	212	
5:00 PM	1	0	0	1	81	2	0	0	1	2	187	1	276	5:00 PM - 6:00 PM
5:15 PM	0	0	2	1	85	4	0	0	3	1	174	0	270	
5:30 PM	0	0	1	0	97	4	0	0	1	0	138	0	241	
5:45 PM	3	0	0	2	79	2	0	0	3	2	137	0	228	
TOTAL	19	0	13	16	1157	30	2	3	20	14	1732	2	3008	

2017 AM Peak Hour 7:15 AM - 8:15 AM

	L	obetti Roa	tti Road Ball Road				L	obetti Roa	ıd	Ball Road			
TIME	SO	UTHBOU	ND	WESTBOUND			NO	RTHBOU	ND	EA	STBOUN	JD	
BEGIN	LT	THRU	RT	LT	THRU	RT	LT	THRU	RT	LT	THRU	RT	
7:15 AM	2	0	0	2	125	1	0	0	2	0	66	0	
7:30 AM	1	0	0	8	147	2	0	0	4	0	66	0	
7:45 AM	0	2	1	19	175	0	0	0	1	0	64	0	
8:00 AM	1	0	2	6	174	0	0	0	1	1	63	0	
TOTAL	4	2	3	35	621	3	0	0	8	1	259	0	
PHF	0.50	0.25	0.38	0.46	0.89	0.38	-	-	0.50	0.25	0.98	-	

2017 PM Peak Hour 5:00 PM - 6:00 PM

	L	obetti Roa	ıd	Ball Road			L	obetti Roa	d	Ball Road		
TIME	SO	UTHBOU	ND	W	ESTBOUN	ND	NO	RTHBOU	ND	EA	ASTBOUN	JD
BEGIN	LT	THRU	RT	LT	THRU	RT	LT	THRU	RT	LT	THRU	RT
5:00 PM	1	0	0	1	81	2	0	0	1	2	187	1
5:15 PM	0	0	2	1	85	4	0	0	3	1	174	0
5:30 PM	0	0	1	0	97	4	0	0	1	0	138	0
5:45 PM	3	0	0	2	79	2	0	0	3	2	137	0
TOTAL	4	0	3	4	342	12	0	0	8	5	636	1
PHF	0.33 - 0.38 0.50 0.88 0.75			0.75	-	-	0.67	0.63	0.85	0.25		

TRAFFIC COUNT DATA

Major Street: Ball Camp Pike (WB - EB) Minor Street: Lobetti Road (SB) Traffic Control: Stop Control on Lobetti Road 3/9/2017 (Thursday) Sunny/Mild Conducted by: Ajax Engineering

	Lobett	ti Road	Ball Car	mp Pike	Ball Camp Pike			
TIME	SOUTH	BOUND	WESTE	BOUND	EASTB	OUND	VEHICLE	PEAK
BEGIN	LT	RT	THRU	RT	LT	THRU	TOTAL	HOUR
7:00 AM	2	1	63	0	0	60	126	
7:15 AM	1	2	90	1	0	57	151	
7:30 AM	2	9	132	3	1	54	201	7:30 AM - 8:30 AM
7:45 AM	6	14	121	1	0	69	211	
8:00 AM	0	7	150	0	1	68	226	
8:15 AM	1	1	102	0	0	65	169	
8:30 AM	0	1	114	1	0	58	174	
8:45 AM	0	1	106	0	0	53	160	
TOTAL	12	36	878	6	2	484	1418	
2:00 PM	1	0	40	1	1	65	108	
2:15 PM	0	2	58	0	0	55	115	
2:30 PM	0	0	36	1	1	65	103	
2:45 PM	1	1	42	3	0	62	109	
3:00 PM	3	4	53	0	2	61	123	
3:15 PM	1	1	61	1	1	74	139	
3:30 PM	0	0	62	0	1	75	138	
3:45 PM	3	0	57	0	3	91	154	
4:00 PM	0	1	71	0	2	104	178	
4:15 PM	1	1	64	1	2	100	169	
4:30 PM	0	1	73	2	1	93	170	
4:45 PM	0	1	69	0	2	125	197	
5:00 PM	1	1	91	1	2	127	223	5:00 PM - 6:00 PM
5:15 PM	0	1	78	1	2	143	225	
5:30 PM	0	0	79	1	0	140	220	
5:45 PM	1	1	78	1	2	142	225	
TOTAL	12	15	1012	13	22	1522	2596	

2017 AM Peak Hour 7:30 AM - 8:30 AM

		Lobett	i Road	Ball Car	mp Pike	Ball Camp Pike		
ſ	TIME	SOUTH	BOUND	WESTE	SOUND	EASTB	OUND	
L	BEGIN	LT	RT	THRU	RT	LT	THRU	
E	7:30 AM	2	9	132	3	1	54	
	7:45 AM	6	14	121	1	0	69	
	8:00 AM	0 7		150	0	1	68	
Γ	8:15 AM	1 1		102	0	0	65	
Г	TOTAL	9 31		505 4		2	256	
ſ	PHF	0.38 0.55		0.84	0.33	0.50	0.93	

2017 PM Peak Hour 5:00 PM - 6:00 PM

	Lobett	i Road	Ball Car	mp Pike	Ball Camp Pike		
TIME	SOUTH	BOUND	WESTE	BOUND	EASTB	OUND	
BEGIN	LT	RT	THRU	RT	LT	THRU	
5:00 PM	1	1	91	1	2	127	
5:15 PM	0	1	78	1	2	143	
5:30 PM	0	0	79	1	0	140	
5:45 PM	1 1		78	1	2	142	
TOTAL	2 3		326	326 4		552	
PHF	0.50	0.75	0.90	1.00	0.75	0.97	

APPENDIX G

CSX RAILROAD RESPONSE & USDOT INVENTORY FORM

From: Sent: To: Subject:

Attachments:

TellCSX Service Center (imailagent) [TellCSXWebServiceIQ@csx.com] Thursday, March 16, 2017 4:16 PM ajaxengineering@gmail.com HUD Request/Mr. Robert Jacks _PE/Case #896273/DOT #347556D (Intranet Quorum IMA00142002) IQFormatFile.txt



1-877-TellCSX TellCSX@csx.com

www.csx.com/ContactUs

Dear Mr. Jacks:

In response to your inquiries about CSXT train traffic in the vicinity of Lobetti Road, we have provided the following information:

- An average of 9 trains per day pass through the area on the CSXT line in Knoxville. Train count is subject to change depending on customer demand.
- Trains operate 24 hours a day, seven days a week, 365 days a year.
- About half operate during day light hours and about half operate after 10:00 p.m.
- The trains have diesel locomotive engines with approximately 2 locomotives per train.
- Car count per train can vary widely; generally trains have between 40 and 100 cars.
- The track is welded.
- The maximum track speed is approximately 45 MPH for freight trains.
- According to the Federal Railroad Administration's Train Horn Rule, enacted June 24, 2005, all crossings require four whistles, 2 long, 1 short, and 1 long. Train horns must be between 96 and 110 decibels as prescribed by the FRA. Please visit the FRA's web site for more rules on train horns at <u>www.fra.dot.gov</u> and click on the "Train Horn Rule" link.

Thank you for contacting CSX.

Sincerely,

TellCSX Team

NJ

Ref: 896273

When responding to this email, please do not change the subject line.

U. S. DOT CROSSING INVENTORY FORM

DEPARTMENT OF TRANSPORTATION

FEDERAL RAILROAD ADMINISTRATION

A. Revision Date (MM/DDYYYY) 07_10_2014 B. Reporting Agency (MA/DDYYYY) 15 tate C. Reason for Update (Select only one) (B Change in New Cosed Re-Open Date Crossing Re-Open Date Change on Primary Admin. Correction D. DOT Crossing (Revision Date (Construction) 1. Primary Operating Rallroad CSX Transportation (CSX) 2. State (DOT Part I: Location and Classification Information) 347556D 1. Primary Operating Rallroad CSX Transportation (CSX) 5. Street/Road Name & Block Number (DOETTI ROAD) 3. County (ENNESSEE 3. County (NOX) 4. City / Municipality (If Yes, Specify RR 5. Street/Road Name & Block Number (DOETTI ROAD) 6. Highway Type & No. (If Yes, Specify RR 6. Highway Type & No. (If Yes, Specify RR 9. Railroad Division or Region (If Yes, Specify RR 10. Railroad Subdivision or District (MA/A) 11. Branch or Line Name (I CQ255.72) 12. RR Milepost (DOE) 13. Line Segment (If Yes, Specify RR 14. Nearest RR Timetable Station * MEADOWBROOK 15. Parent RR (I (<i>paplicable</i>)) 16. Crossing Owner (I <i>qaplicable</i>) 14. Nearest RR Timetable Station, Peed. 19. Crossing Porsising Position (I Private Crossing) 20. Public Access (I Private Crossing) 17. Reight (I paplicable) 16. Crossing Owner (I <i>qaplicable</i>) 23. Type of Land Use (B Open Space 19. Crossing Position (I Private Crossing) 20. Public Access (I Private Crossing) 21. Type of Train (I Private Crossing) 17. Crossing Correctional (I Private Crossin	Instructions for the initial Form. For private highway pedestrian station grade c Parts I and II, and the Subm I, and the Submission Info updated data fields. Note:	reporting of the for y-rail grade crossin crossings), complet nission Information prmation section. F For private crossin	ollowing types on ngs, complete the the Header, P n section. For gra For changes to ngs only, Part I to	of new or present of he Header, Parts I and ade-separa existing da em 20 and	previously un , Parts I and II, and the S ated highway ata, complete Part III Item	nrepo II, ai Submi v-rail o e the 2.K. a	orted cro nd the S ission Inf or pathw Header, are requi	ssings: For public hig ubmission Informatic ormation section. Fo ay crossings (includin Part I Items 1-3, an red unless otherwise	ghway-rail grade on section. For or Private pathw og pedestrian sta od the Submission noted.	e crossings, com public pathway vay grade crossin ation crossings), on Information An asterisk *	plete the entire inventory grade crossings (including ngs, complete the Header, complete the Header, Part section, in addition to the denotes an optional field.			
IMM/DD/WYI 07_/10_/2014 If Rainad Transit If Change in Closed No Train Quiet Inventory Number 01 State Other Data Crossing Crossing RR Correction 347556D Part I: Location and Classification Information 1. Primary Operating Railroad CSX Transportation (CSX) 2. State 3. County KNOX 4. City / Municipality 5. Street/Road Name & Block Number 6. Highway Type & No. KNOX I' Yes, Specify RR (Street/Road Name & Block Number) 6. Highway Type & No. If Yes, Specify RR 9. Railroad Subdivision or District 10. Railroad Subdivision or District 11. Branch or Line Name 12. RR Milepost None APPALACHIAN None None None (prefix) (nnnn.nnn) 13. Line Segment 14. Nacrest RR Timetable 15. Parent RR (f applicable) 16. Crossing Owner (f applicable) 17. Crossing Type 18. Crossing Position 19. Crossing Position 20. Public Access 21. Type of Train Prephate 19. Viotic Part I: Acrossing Position 19. Crossing Position 19. Crossing Position 10. Raitorial Crossing) 19. Viotic 19. Private Sta	A. Revision Date	B. Reporting Ag	gency	C. Reaso	on for Update	e (Sel	lect only	one)			D. DOT Crossing			
U	(MM/DD/YYYY)	🛾 Railroad	🗆 Transit	🗷 Chang	ge in 🛛 🗆 N	lew		Closed	🗆 No Train	🗆 Quiet	Inventory Number			
Change Unity Operating RM Contention Part I: Location and Classification Information 1. Primary Operating Railroad GSX Transportation [CSX] 2. State TENNESSEE 3. County KNOX 4. City / Municipality In In 5. Street/Road Name & Block Number (Street/Road Name & Block Number) 6. Highway Type & No. In None KNOXVILLE 5. Street/Road Name & Block Number) 6. Highway Type & No. I' Yes, Specify RR 10. Railroad Subdivision or District 11. Branch or Line Name 12. RR Milepost None APPALACHIAN None KD None 10. Railroad Subdivision or District 11. Branch or Line Name 12. RR Milepost None APPALACHIAN None KD None Innunn) (suffix) 13. Line Segment 14. Nearest RR Timetable Station * MEADOWBROOK 15. Parent RR (<i>f applicable</i>) 16. Crossing Owner (<i>f applicable</i>) 17. crossing Type 18. crossing Porpose 19. Crossing Position 20. Public Access (<i>f Private Crossing</i>) 19. N/A N/A 10. None Pr Da I' Private 18. transing Purpose 19. Crossing Position (<i>f Private Crossing</i>) 20. Public Access (21. Type of Train) 11. Bransit 11. Bransit 11. Bransit 11. Bransit 12. Arerage Passenger	07 / 10 / 2014	□ State	□ Other	Data Re-Op	Cros pen 🗆 D	ssing Date	[Dahu (Change in Primary	Traffic Admin.	Zone Update	347556D			
1. Primary Operating Railroad CSX Transportation [CSX] 2. State TENNESSEE 3. County KNOX 4. City / Municipality 5. Street/Road Name & Biock Number LOBETTI ROAD 6. Highway Type & No. 1 Near KNOXVILLE 6. Highway Type & No. 7. Do Other Railroads Operate a Separate Track at Crossing? Yes 8. Do Other Railroads Operate Over Your Track at Crossing? Yes 9. Railroad Division or Region 10. Railroad Subdivision or District 11. Branch or Line Name 12. RR Milepost (prefix) 12. RR Milepost (prefix) 13. Line Segment 14. Nearest RR Timetable Station * MEADOWBROOK 15. Parent RR (f applicable) 16. Crossing During (f applicable) 7. Torossing Type 18. Crossing Purpose 19. Crossing Position 20. Public Access (f Private Crossing) N/A N/A 17. Crossing Type 18. Crossing Purpose 10. Crossing Position 20. Public Access (f Private Crossing) 11. Intercity Passenger N/A 23. Type of Land Use Boo If Yes, Provide Crossing Number 25. Quiet Zone (FRA provided) Number Per Day 24. Is there an Adjacent Crossing Number 27. Latitude in decimal degrees 28. Longitude in decimal degrees 29. Lat/Long Source 26. HSR Corridor ID 27. Latitude in decimal degrees 28. Longitude in decimal degree			Par	t l· Loca	ation and	Cla	ssificat	tion Informatio	n					
CSX Transportation [CSX] TENNESSEE KNOX" 4. City / Municipality 5. Street/Road Name & Block Number 6. Highway Type & No. In LOBETTI ROAD [* (Block Number] Wear KNOX/ILLE 6. Highway Type & No. If Yes, Specify RR 10. Railroad Subdivision or District 1* (Block Number) 9. Railroad Division or Region 10. Railroad Subdivision or District 11. Branch or Line Name 12. RR Milepost None APPALACHIAN None KD None (prefix) (nnn.nnn) (suffix) 13. Line Segment 14. Nearest RR Timetable 15. Parent RR (f applicable) 16. Crossing Owner (f applicable) Train (our Per Day) * 00C MALDOWBROOK N/A N/A N/A 17. Crossing Type 18. Crossing Porse 19. Crossing Position (<i>f Private Crossing</i>) Freight Transit * Highway # At Grade (<i>f Private Crossing</i>) Freight Transit * Intercity Passenger Shared Use Transit Number Per Day 0 22. Average Passenger * OCC Station, Ped. RR Over No Commuter Shared Use Transit <td>1. Primary Operating Railr</td> <td>road</td> <td>1 01</td> <td></td> <td>2. State</td> <td>Cia</td> <td>SSIIICa</td> <td></td> <td>3. County</td> <td></td> <td></td>	1. Primary Operating Railr	road	1 01		2. State	Cia	SSIIICa		3. County					
A. City / Municipality 5. Street/Road Name & Block Number 6. Highway Type & No. □ In LOBETTI ROAD	CSX Transportation [CS	SX]			TENNE	SSE	E		KNOX					
Image: KNOXVILLE (Street/Road Name) [* (Block Number) 7. Do Other Railroads Operate a Separate Track at Crossing? Yes None S. Do Other Railroads Operate Over Your Track at Crossing? Yes Yes None 9. Railroad Division or Region 10. Railroad Subdivision or District 11. Branch or Line Name 12. RR Milepost 10265.72 1 13. Line Segment 14. Nearest RR Timetable 15. Parent RR (if applicable) 16. Crossing Owner (if applicable) 16. Crossing Owner (if applicable) 16. Crossing Owner (if applicable) 17. Crossing Type 18. Crossing Purpose 19. Crossing Position 20. Public Access 21. Type of Train Train Count Per Day Image: Private 18. Crossing Purpose 19. Crossing Position 20. Public Access 21. Type of Train Train Count Per Day Image: Private 18. Grade (if Private Crossing) Freight Train Count Per Day Number Per Day 23. Type of Land Use RR Under Yes Industrial Institutional Recreational RR Yard 24. Is there an Adjacent Crossing Number 25. Quiet Zone (FRA provided) 29. Lat/Long Source 29. Lat/Long Source Yes Nn/A (WGS84 std: nn.nnnnn)	4. City / Municipality In		5. Street/Ro LOBETTI	ad Name a ROAD	& Block Num	nber	I.		6. Highway Ty	/pe & No.				
7. Do Other Railroads Operate a Separate Track at Crossing? Yes If Yes, Specify RR If Yes, Specify RR If Yes, Specify RR If Yes, Specify RR 9. Railroad Division or Region 10. Railroad Subdivision or District If Sec. Specify RR Image: Specify RR Image: Specify RR Image: Specify RR 9. Railroad Division or Region 10. Railroad Subdivision or District Image: Specify RR 13. Line Segment 14. Nearest RR Timetable Image: Specify RR 13. Line Segment 14. Nearest RR Timetable Image: Specify RR 14. Nearest RR Timetable Station * None OC MEADOWBROOK N/A 17. Crossing Type 18. Crossing Purpose 19. Crossing Position If Private Istanon, Ped. Image: RR Under Private Station, Ped. RR Under Yes Industrial Institutional Recreational If Open Space Farm Residential Commercial Industrial Institutional RR Yard 24. Is there an Adjacent Crossing Number Z7. Latitude in decimal degrees 28. Longitude in decimal degrees 29. Lat/Long Source N/A (WGS84 std: nn.nnnnnn) </td <td>Near KNOXVILLE</td> <td></td> <td>(Street/Roc</td> <td>ad Name)</td> <td></td> <td></td> <td>* (Bloc</td> <td>k Number)</td> <td></td> <td></td> <td></td>	Near KNOXVILLE		(Street/Roc	ad Name)			* (Bloc	k Number)						
9. Railroad Division or Region 10. Railroad Subdivision or District 11. Branch or Line Name 12. RR Milepost None APPALACHIAN None KD None 10. Railroad Subdivision or District 13. Line Segment 14. Nearest RR Timetable 15. Parent RR (if applicable) 16. Crossing Owner (if applicable) 17. Crossing Type 18. Crossing Purpose 19. Crossing Position 20. Public Access 17. Freight Transit 12. Type of Land Use Pathway, Ped. RR Under Yes Yes Station, Ped. RR Ower No 23. Type of Land Use If Yes, Provide Crossing Number 25. Quiet Zone (FRA provided) RR Yard 24. Is there an Adjacent Crossing Number 27. Latitude in decimal degrees 28. Longitude in decimal degrees 29. Lat/Long Source 10. N/A (WGS84 std: nn.nnnnnn) 35.9698000 (WGS84 std: -nnn.nnnnnn) 84.0756000 Exactual Estimated 30.8. Railroad Use * 31.8. State Use * 31.8. State Use * 31.8. State Use * 31.8. State Use *	7. Do Other Railroads Ope If Yes, Specify RR	erate a Separate Tra	ack at Crossing?	? 🗆 Yes	🗷 No	8. C If	Do Other FYes, Spe	Railroads Operate O ccify RR	ver Your Track	at Crossing? 🗆	Yes 🗷 No			
None APPALACHIAN None KD None (prefix) (nnnn.nnn) (suffix) 13. Line Segment 14. Nearest RR Timetable 15. Parent RR (if applicable) 16. Crossing Owner (if applicable) * 00C MEADOWBROOK N/A N/A 17. Crossing Type 18. Crossing Purpose 19. Crossing Position 20. Public Access (if Private Crossing) Freight Transit Z2. Average Passenger Train Count Per Day At Grade (if Private Crossing) Freight Transit Less Than One Per Day B Public Pathway, Ped. RR Under Yes Intercity Passenger Shared Use Transit Less Than One Per Day 23. Type of Land Use E Open Space Farm Residential Commercial Industrial Institutional Recreational RR Yard 24. Is there an Adjacent Crossing with a Separate Number? Z5. Quiet Zone Z6. Mprovided) Z7. Latitude in decimal degrees 28. Longitude in decimal degrees 29. Lat/Long Source 0/A (WGS84 std: nn.nnnnnn) 35.9698000 (WGS84 std: -nnn.nnnnnn) - 64.0756000 X Actual Estimated 30.B. Railroad Use * 31.B. State Use * 31.B. State	9. Railroad Division or Reg	gion	10. Railroad Sub	odivision o	or District		11. Bra	nch or Line Name		12. RR Milepo	st 5.72			
13. Line Segment 14. Nearest RR Timetable Station * MEADOWBROOK 15. Parent RR (if applicable) 16. Crossing Owner (if applicable) 00C MEADOWBROOK N/A N/A N/A 17. Crossing Type 18. Crossing Purpose Bi Highway 19. Crossing Position Bi Highway, Ped. 20. Public Access 21. Type of Train Implicable 18. Crossing Vipue 18. Crossing Portocal 19. Crossing Position Bi Highway, Ped. Implicable Implicable 22. Average Passenger Implicable 19. Public Pathway, Ped. RR Under Yes Intercity Passenger Shared Use Transit Less Than One Per Day 23. Type of Land Use Station, Ped. RR Over Industrial Institutional Recreational RR Yard 24. Is there an Adjacent Crossing with a Separate Number? 25. Quiet Zone (FRA provided) 28. Longitude in decimal degrees 29. Lat/Long Source 26. HSR Corridor ID 27. Latitude in decimal degrees 28. Longitude in decimal degrees 29. Lat/Long Source 30.A. Railroad Use * 31.B. State Use * 31.B. State Use * 31.B. State Use *	□ None _APPALACH	IAN	□ None KD)			🗆 Non	e		(prefix) (nnr	nn.nnn) (suffix)			
Station Station Station Station N/A N/A 00C MEADOWBROOK N/A N/A N/A 22. Average Passenger 17. Crossing Type 18. Crossing Purpose 19. Crossing Position 20. Public Access 21. Type of Train 22. Average Passenger Image: Public Pathway, Ped. R Under Yes Intercity Passenger Train Count Per Day Private Station, Ped. R R Over No Commuter Shared Use Transit Less Than One Per Day 23. Type of Land Use Residential Commercial Industrial Institutional Recreational R Yard 24. Is there an Adjacent Crossing with a Separate Number? 25. Quiet Zone (FRA provided) Version Date Established 26. HSR Corridor ID 27. Latitude in decimal degrees 28. Longitude in decimal degrees 29. Lat/Long Source 30.A. Railroad Use * 31.A. State Use * 31.B. State Use * 31.B. State Use *	13. Line Segment	14. Neare	est RR Timetabl	e	15. Parent F	RR (ij	f applicat	ole)	16. Crossin	n <mark>g Owner</mark> (if app	licable)			
17. Crossing Type 18. Crossing Purpose 19. Crossing Position 20. Public Access 21. Type of Train 22. Average Passenger 18. Highway At Grade (if Private Crossing) Freight Transit Train Count Per Day 19. Public Pathway, Ped. RR Under Yes Intercity Passenger Shared Use Transit Less Than One Per Day 23. Type of Land Use RR Over No Industrial Institutional Recreational RR Yard 24. Is there an Adjacent Crossing Number Crossing Number? Zo. Quiet Zone (FRA provided) 29. Lat/Long Source 26. HSR Corridor ID 27. Latitude in decimal degrees 28. Longitude in decimal degrees 29. Lat/Long Source 30.A. Railroad Use * 30.B. Railroad Use * 31.B. State Use * 31.B. State Use *	00C	MEADO	WBROOK		□ N/A				□ N/A					
Image: Highway Image: At Grade (if Private Crossing) □ Freight □ Transit Train Count Per Day Image: Public □ Pathway, Ped. □ RR Under □ Yes □ Intercity Passenger □ Shared Use Transit □ Less Than One Per Day Image: Private □ Station, Ped. □ RR Over □ No □ Commuter □ Tourist/Other □ Less Than One Per Day Image: Private □ Station, Ped. □ RR Over □ No □ Intercity Passenger □ Tourist/Other □ Less Than One Per Day Image: Private □ Station, Ped. □ RR Over □ Industrial □ Institutional □ Recreational □ RR Yard Image: Private □ Station, Ped. □ Residential □ Commercial □ Industrial □ Institutional □ Recreational □ RR Yard Image: Private Image: Private Image: Private Image: Private Image: Private Image: Private □ Private Image: Private Image: Private Image: Private Image: Private Image: Private Image: Private Image: Private Image: Private Image: Private Image: Private Image: Private Image: Private Image: Private Image: Private Image: Private Image: Private Image: Private Image: Private Image: Private Image: Private Image: Private Image: Private Image: Private Image: Private Image: Private Image: Private Image: Private Image: Private Image: Private Image: Private Image: Private Image: Pr	17. Crossing Type 18. Crossing Purpose 19. Crossing Position 20. Public Access 21. Type of Train 22. Average Passenger Image: Im													
Image: Second secon	Image: Public Image: Pathway, Ped. Image:													
23. Type of Land Use 23. Type of Land Use 23. Type of Land Use 24. Is there an Adjacent Crossing with a Separate Number? 25. Quiet Zone (FRA provided) 26. HSR Corridor ID 27. Latitude in decimal degrees 28. Longitude in decimal degrees 28. Longitude in decimal degrees 29. Lat/Long Source 0.N/A (WGS84 std: nn.nnnnnn) 35.9698000 (WGS84 std: -nnn.nnnnnn) 36.9698000 (WGS84 std: -nnn.nnnnnn) 36.8. Railroad Use * 31.8. State Use *	Public □ P	Image: Private Image: Private Pathway, Ped. Image: RR Order Pes Image: Image: Image: RR Order Image: Imag												
Image: Space □ Farm □ Residential □ Commercial □ Industrial □ Institutional □ Recreational □ RR Yard 24. Is there an Adjacent Crossing with a Separate Number? 25. Quiet Zone (FRA provided) □ Yes Image: No If Yes, Provide Crossing Number Image: No 24 Hr □ Partial □ Chicago Excused Date Established 26. HSR Corridor ID 27. Latitude in decimal degrees 28. Longitude in decimal degrees 29. Lat/Long Source	Private Station, Ped. RR Over No Commuter Tourist/Other Number Per Day 0 23. Type of Land Use													
24. Is there an Adjacent Crossing with a Separate Number? 25. Quiet Zone (FRA provided) Yes No Yes No If Yes, Provide Crossing Number Image: No 26. HSR Corridor ID 27. Latitude in decimal degrees N/A (WGS84 std: nn.nnnnnn) 35.9698000 (WGS84 std: -nnn.nnnnn) 30.A. Railroad Use * 31.A. State Use *	🗷 Open Space 🛛 Fa	arm 🗌 Resid	dential 🛛	Commerci	ial 🗆 I	ndus	trial	Institutional	□ Recreatio	onal 🗌 RI	R Yard			
Yes No If Yes, Provide Crossing Number No 24 Hr Partial Chicago Excused Date Established 26. HSR Corridor ID 27. Latitude in decimal degrees 28. Longitude in decimal degrees 29. Lat/Long Source N/A (WGS84 std: nn.nnnnnn) 35.9698000 (WGS84 std: -nnn.nnnnnn) 84.0756000 Image: Actual Estimated 30.A. Railroad Use * 31.A. State Use * 31.B. State Use *	24. Is there an Adjacent Cr	rossing with a Sepa	arate Number?		25. Q	uiet 7	Zone (Fl	RA provided)						
26. HSR Corridor ID 27. Latitude in decimal degrees 28. Longitude in decimal degrees 29. Lat/Long Source	Ves 🖬 No If Ves P	Provide Crossing Nu	umber				24 Hr	Partial Chica	go Excused	Date Establis	hed			
N/A (WGS84 std: nn.nnnnnn) 35.9698000 (WGS84 std: -nnn.nnnnnn) -84.0756000 Image: Actual image: Estimated image:	26. HSR Corridor ID	27. Latitu	ude in decimal d	egrees		28.	Longitud	le in decimal degrees	s Excused	29. La	it/Long Source			
	_			35 960	98000			84	0756000					
30.B. Railroad Use * 31.B. State Use *		/A (WGS84 s	std: nn.nnnnnn	n) 00.000		(Wo	GS84 std:	<u>-nnn.nnnnnn) </u>		L X Act	tual 🗆 Estimated			
30.B. Railroad Use * 31.B. State Use *	JU.A. Nambau USE						J1.A	state ose						
	30.B. Railroad Use *						31.B. S	State Use *						
30.C. Railroad Use * 31.C. State Use *	30.C. Railroad Use *						31.C. S	itate Use *						
30.D. Railroad Use * 31.D. State Use *	30.D. Railroad Use *						31.D. S	State Use *						
32.A. Narrative (Railroad Use) * 32.B. Narrative (State Use) *	32.A. Narrative (Railroad	Use) *					32.B. N	Narrative (State Use)	*					
33. Emergency Notification Telephone No. (posted) 34. Railroad Contact (Telephone No.) 35. State Contact (Telephone No.)	33. Emergency Notification	n Telephone No. (µ	posted)	34. Railroa	d Contact (7	elepł	hone No.,)	35. State Cor	ntact (Telephone	e No.)			
800-232-0144 615-741-9558	800-232-0144								615-741-95	58				
Part II: Railroad Information			L_ _	Pa	art II: Rail	roa	d Info	mation	<u> </u>					
1. Estimated Number of Daily Train Movements	1. Estimated Number of Da	aily Train Movemer	nts	-										
1.A. Total Day Thru Trains 1.B. Total Night Thru Trains 1.C. Total Switching Trains 1.D. Total Transit Trains 1.E. Check if Less Than	1.A. Total Day Thru Trains	1.B. To	otal Night Thru Ti	rains 1.	.C. Total Swit	ching	g Trains	1.D. Total Transit	Trains	1.E. Check if L	ess Than			
(6 AM to 6 PM) (6 PM to 6 AM) One Movement Per Day Description 4 6 2 How many trains per week? Description														
2. Year of Train Count Data (YYYY) 3. Speed of Train at Crossing 3.A. Maximum Timetable Speed (mph) 45														
3.B. Typical Speed Range Over Crossing (mph) From 40 to 45														
4. Type and Count of Tracks														
Main 1 Siding Yard Transit Industry	Main 1 Siding													
5. Train Detection (Main Track only)	5. Train Detection (Main Tr	rack only)												
Constant Warning Time Motion Detection AFO PTC DC Other None	Constant Warning T	ime 🗌 Motion D	Detection \Box Al	FO D PTC			ther	None		7 D. Demot	Lloolth Monitories			
V. Is index signateur 7.A. Event Recorder 7.B. Remote Health Monitoring Image: Signateur 7.B. Remote Health Monitoring	• IS TRACK Signaled? I Yes □ No			7.A	A. EVENT RECO	No				7.в. кетоte				

A. Revision Date (A	Revision Date (<i>MM/DD/YYYY</i>) 10/2014 PAGE 2 D. Crossing Inventory Number (7 char.) 347556D Part III: Highway or Pathway Traffic Control Device Information														
			Part II	I: Highwa	y or Pat	thway	Traffic (Control D	evice	Info	rmation				
1. Are there	2. Types of Pa	assive T	raffic Con	trol Devices a	ssociated	with the	Crossing								
Signs or Signals?	2.A. Crossbuc	k .	2.B. ST	OP Signs (R1-2	1) 2.C.	YIELD Sig	gns <i>(R1-2)</i>	2.D. Adva	nce Wa	arning S	igns (Check al	l that appl	y; includ	е соі	int) 🗌 None
🖬 Yes 🛛 No	Assemblies (c 2	ount)	(count) 0		(<i>cou</i> 1	int)		□ W10-1 □ W10-2			□ W10-3 □ W10-4	8 4		V10-: V10-:	l1 l2
2.E. Low Ground Cl (W10-5)	earance Sign	2.F. F	avement	Markings			2.G. Cha Devices/	nnelization Medians			2.H. EXEMP (<i>R15-3</i>)	T Sign	2.I. EN Display	S Sigi ved	n <i>(I-13)</i>
☐ Yes <i>(count</i>)	□ St	op Lines Xing Sym	⊔D bols I∎t	ynamic En	velope	□ All Ap	proaches	🗆 Me	dian ne	☐ Yes		I∎ Yes		
2.J. Other MUTCD S	Signs		Yes 🕱 N	lo <u> </u>			2.K. Priva	ate Crossing	2.L	. LED Er	nhanced Signs	(List types	;)		
Specify Type		Co	unt				Signs (if)	orivate)							
Specify Type Specify Type		Co	unt				□ Yes	□ No							
3. Types of Train A	ctivated Warni	ng Devic	es at the	Grade Crossi	ng (specify	v count o	f each dev	ice for all the	t appl	v)					
3.A. Gate Arms	3.B. Gate Cor	figuratio	on	3.C. Ca	ntilevered	(or Bridg	ged) Flashii	ng Light	3.D). Mast	Mounted Flas	hing Lights	5	3.6	. Total Count of
(count)	_	_		Structu	ires (count	t)	_		(co	unt of r	nasts)_0			Fla	shing Light Pairs
Boadway 0	□ 2 Quad	L Full	(Barrier)	Over T	raffic Lane	0	⊔ In	candescent		Incande Back Lie	escent		lighte	_	
Pedestrian	□ 3 Quad □ 4 Quad		dian Gate	s Not Ov	er Traffic I	Lane 0	D LE	D			ints included		ed	0	
3.F. Installation Dat	e of Current			3.G. Waysio	le Horn					3.H. H	Highway Traffi	c Signals C	Controllin	g	3.I. Bells
Active Warning Dev	vices: (MM/YYY	Y)			o balletan	n /11/11/1	(VVV)	/		Cross	ing				(count)
/	[]	Not Ree	quired	□ No	instance o			/		∐ Ye	sL⊠dNo				0
3.J. Non-Train Activ	e Warning n □Manually (Operated	d Signals	Watchman	n 🗆 Flood	llighting	🗆 None		3.K Cou	. Other unt_0	Flashing Light S	s or Warn pecify type	ing Devic	ces	
4.A. Does nearby Hwy 4.B. Hwy Traffic Signal 4.C. Hwy Traffic Signal Preemption 5. Highway Traffic Pre-Signals 6. Highway Monitoring Devices Interconnection Vec Ne Ne 6. Highway Monitoring Devices															
Interconnection Interconnection Unterconnection Interconnection Interconnectio															
Traffic Signals?	Traffic Signals? □ Not Interconnected □ Yes - Photo/Video Recording □ Soc Taific Signals □ Yes - Photo/Video Recording														
🗆 Yes 🔳 No	□ For V	Varning	Signs		eous			Stop Line Dist	stance	*		□ Tes =	enicie	FIES	ence Detection
		-	-		Part IV	: Physi	cal Cha	racteristi	cs						
1. Traffic Lanes Cro	ssing Railroad	One	-way Traf	fic	2. Is Ro	adway/P	athway	3. Does T	rack Ru	un Dow	n a Street?	4. Is Cro	ossing Illu	imin	ated? (Street
Number of Lanes	1		o-way Tra ided Traff	ic	Paved?	Yes	□ No		🗆 Yes	X	No	lights wi nearest	thin app rail) 🗆 ר	rox. : ′es	50 feet from
5. Crossing Surface	(on Main Track	k, multip	le types a	<i>llowed)</i> Ins	tallation D	ate * <i>(M</i>	M/YYYY) _	/		Wi	dth *		Length '	*	
□ 1 Timber □ □ 8 Unconsolidate	2 Asphalt ∟ ed □ 9 Com	i 3 Aspi iposite	nait and I	Ther (specify,	ASPHA		RUBBEF	and Rubber			er 🗆 / Me	- -			
6. Intersecting Roa	dway within 50	0 feet?					7. Smalle	est Crossing A	ngle			8. Is Co	mmercia	al Pov	wer Available? *
🖬 Yes 🗆 No	If Yes, Approxir	nate Dis	tance <i>(fe</i>	et) <u>75</u>		-	□ 0° – 2	9° 🗆 30°	– 59°	X	60° - 90°		🖿 Ye	S	□ No
				Pa	art V: P	ublic H	lighway	Informat	ion						
1. Highway System			2.	Functional Cl	assificatio	n of Road	d at Crossir	ng	3.	Is Cros	sing on State I	Highway	4.1	High	way Speed Limit
(01) Inters	tato Highway S	ictom		(1) Interstat	L ⊻ (0) Ru o	ral ∐ (1) Urban	Collector	Sy	/stem?	No.		20	Post	MPH
□ (01) Inters	Nat Hwy Syster	n (NHS)		(2) Other Fr	e eeways an	d Expres	sways	Conector	5.	Linear	Referencing S	vstem (LR	S Route I	D) *	
□ (03) Feder	al AID, Not NHS			(3) Other Pr	incipal Art	erial 🗆	(6) Mino	Collector	6	IRS Mi	lenost *	, (-		,	
 Annual Average 	Image: Second state in the second s														
Year 2006 AA	DT 000173		_04		%	🗷 Yes	□ No	Average Nu	umber	per Day	, <u>3</u>	_ D1	/es [J No	
Submi	Submission Information - This information is used for administrative purposes and is not available on the public website.														
Submitted by				Orgar	nization						Phone		[Date	
Public reporting burden for this information collection is estimated to average 30 minutes per response, including the time for reviewing instructions, searching existing data															
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displays a currently	valid OMB con	trol num	ber. The	valid OMB co	ontrol num	ber for i	nformation	collection is	2130-	0017. 5	Send comment	ts regardir	ng this bu	irder	estimate or any
other aspect of this	collection, incl	uding fo	r reducin	g this burden	to: Inform	nation Co	llection Of	ficer, Federa	Railro	ad Adm	ninistration, 12	200 New Je	ersey Ave	e. SE	MS-25
washington, DC 20	390.														

U. S. DOT CROSSING INVENTORY FORM

FORM FRA F 6180.71 (Rev. 3/15)

APPENDIX H

CAPACITY ANALYSES - HCM WORKSHEETS (SYNCHRO 8)

Intersection

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Vol, veh/h	1	259	0	35	621	3	4	2	3	0	0	8
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None									
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	-2	-	-	2	-	-	-2	-	-	2	-
Peak Hour Factor	25	98	90	46	89	38	50	25	38	90	90	50
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	4	264	0	76	698	8	8	8	8	0	0	16

Major/Minor	Major1			Major2			Minor2			Minor1		
Conflicting Flow All	706	0	0	264	0	0	1134	1126	702	1134	1130	264
Stage 1	-	-	-	-	-	-	854	854	-	272	272	-
Stage 2	-	-	-	-	-	-	280	272	-	862	858	-
Critical Hdwy	4.1	-	-	4.1	-	-	6.7	6.1	6	7.5	6.9	6.4
Critical Hdwy Stg 1	-	-	-	-	-	-	5.7	5.1	-	6.5	5.9	-
Critical Hdwy Stg 2	-	-	-	-	-	-	5.7	5.1	-	6.5	5.9	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	902	-	-	1312	-	-	206	234	459	160	181	768
Stage 1	-	-	-	-	-	-	392	416	-	716	668	-
Stage 2	-	-	-	-	-	-	754	709	-	320	342	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	902	-	-	1312	-	-	186	211	459	141	163	768
Mov Cap-2 Maneuver	-	-	-	-	-	-	186	211	-	141	163	-
Stage 1	-	-	-	-	-	-	390	376	-	712	665	-
Stage 2	-	-	-	-	-	-	735	705	-	279	310	-

Approach	EB	WB	SE	NW
HCM Control Delay, s	0.1	0.8	21.4	9.8
HCM LOS			С	А

Minor Lane/Major Mvmt	NWLn1	EBL	EBT	EBR	WBL	WBT	WBR S	SELn1
Capacity (veh/h)	768	902	-	-	1312	-	-	244
HCM Lane V/C Ratio	0.021	0.004	-	-	0.058	-	-	0.098
HCM Control Delay (s)	9.8	9	0	-	7.9	0	-	21.4
HCM Lane LOS	А	А	А	-	А	А	-	С
HCM 95th %tile Q(veh)	0.1	0	-	-	0.2	-	-	0.3

Intersection

Movement	EBL	EBT	WBT	WBR	SEL	SER
Vol, veh/h	2	256	505	4	9	31
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	10	-
Peak Hour Factor	50	93	84	33	38	55
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	4	275	601	12	24	56

Major/Minor	Major1		Major2		Minor2		
Conflicting Flow All	613	0	-	0	890	607	
Stage 1	-	-	-	-	607	-	
Stage 2	-	-	-	-	283	-	
Critical Hdwy	4.1	-	-	-	8.4	7.2	
Critical Hdwy Stg 1	-	-	-	-	7.4	-	
Critical Hdwy Stg 2	-	-	-	-	7.4	-	
Follow-up Hdwy	2.2	-	-	-	3.5	3.3	
Pot Cap-1 Maneuver	976	-	-	-	193	422	
Stage 1	-	-	-	-	391	-	
Stage 2	-	-	-	-	658	-	
Platoon blocked, %		-	-	-			
Mov Cap-1 Maneuver	976	-	-	-	192	422	
Mov Cap-2 Maneuver	-	-	-	-	192	-	
Stage 1	-	-	-	-	391	-	
Stage 2	-	-	-	-	655	-	

Approach	EB	WB	SE	
HCM Control Delay, s	0.1	0	20.5	
HCM LOS			С	

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR SELn1
Capacity (veh/h)	976	-	-	- 312
HCM Lane V/C Ratio	0.004	-	-	- 0.257
HCM Control Delay (s)	8.7	0	-	- 20.5
HCM Lane LOS	А	А	-	- C
HCM 95th %tile Q(veh)	0	-	-	- 1

Intersection

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Vol, veh/h	5	636	1	4	342	12	4	0	3	0	0	8
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None									
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	-2	-	-	2	-	-	-2	-	-	2	-
Peak Hour Factor	63	85	25	50	88	75	33	90	38	90	90	67
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	8	748	4	8	389	16	12	0	8	0	0	12

Major/Minor	Major1			Major2			Minor2			Minor1		
Conflicting Flow All	405	0	0	752	0	0	1185	1181	397	1183	1187	750
Stage 1	-	-	-	-	-	-	413	413	-	766	766	-
Stage 2	-	-	-	-	-	-	772	768	-	417	421	-
Critical Hdwy	4.1	-	-	4.1	-	-	6.7	6.1	6	7.5	6.9	6.4
Critical Hdwy Stg 1	-	-	-	-	-	-	5.7	5.1	-	6.5	5.9	-
Critical Hdwy Stg 2	-	-	-	-	-	-	5.7	5.1	-	6.5	5.9	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1165	-	-	867	-	-	191	218	672	147	167	398
Stage 1	-	-	-	-	-	-	649	625	-	366	381	-
Stage 2	-	-	-	-	-	-	431	451	-	589	565	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1165	-	-	867	-	-	182	213	672	143	163	398
Mov Cap-2 Maneuver	-	-	-	-	-	-	182	213	-	143	163	-
Stage 1	-	-	-	-	-	-	641	618	-	362	376	-
Stage 2	-	-	-	-	-	-	413	446	-	575	558	-

Approach	EB	WB	SE	NW
HCM Control Delay, s	0.1	0.2	20.3	14.3
HCM LOS			С	В

Minor Lane/Major Mvmt	NWLn1	EBL	EBT	EBR	WBL	WBT	WBR S	SELn1
Capacity (veh/h)	398	1165	-	-	867	-	-	255
HCM Lane V/C Ratio	0.03	0.007	-	-	0.009	-	-	0.078
HCM Control Delay (s)	14.3	8.1	0	-	9.2	0	-	20.3
HCM Lane LOS	В	А	А	-	А	А	-	С
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0.3

Intersection

Movement	EBL	EBT	WBT	WBR	SEL	SER	l
Vol, veh/h	6	552	326	4	2	3	
Conflicting Peds, #/hr	0	0	0	0	0	0	
Sign Control	Free	Free	Free	Free	Stop	Stop	
RT Channelized	-	None	-	None	-	None	
Storage Length	-	-	-	-	0	-	
Veh in Median Storage, #	-	0	0	-	0	-	
Grade, %	-	0	0	-	10	-	
Peak Hour Factor	75	97	90	100	50	75	
Heavy Vehicles, %	0	0	0	0	0	0	
Mvmt Flow	8	569	362	4	4	4	

Major/Minor	Major1		Major2		Minor2		
Conflicting Flow All	366	0	-	0	949	364	
Stage 1	-	-	-	-	364	-	
Stage 2	-	-	-	-	585	-	
Critical Hdwy	4.1	-	-	-	8.4	7.2	
Critical Hdwy Stg 1	-	-	-	-	7.4	-	
Critical Hdwy Stg 2	-	-	-	-	7.4	-	
Follow-up Hdwy	2.2	-	-	-	3.5	3.3	
Pot Cap-1 Maneuver	1204	-	-	-	172	620	
Stage 1	-	-	-	-	578	-	
Stage 2	-	-	-	-	405	-	
Platoon blocked, %		-	-	-			
Mov Cap-1 Maneuver	1204	-	-	-	170	620	
Mov Cap-2 Maneuver	-	-	-	-	170	-	
Stage 1	-	-	-	-	578	-	
Stage 2	-	-	-	-	401	-	

Approach	EB	WB	SE	
HCM Control Delay, s	0.1	0	18.9	
HCM LOS			С	

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR S	SELn1
Capacity (veh/h)	1204	-	-	-	267
HCM Lane V/C Ratio	0.007	-	-	-	0.03
HCM Control Delay (s)	8	0	-	-	18.9
HCM Lane LOS	А	А	-	-	С
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Intersection

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Vol, veh/h	1	277	0	37	664	3	4	2	3	0	0	9
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None									
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	-2	-	-	2	-	-	-2	-	-	2	-
Peak Hour Factor	25	98	90	46	89	38	50	25	38	90	90	50
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	4	283	0	80	746	8	8	8	8	0	0	18

Major/Minor	Major1			Major2			Minor2			Minor1		
Conflicting Flow All	754	0	0	283	0	0	1211	1202	750	1210	1206	283
Stage 1	-	-	-	-	-	-	911	911	-	291	291	-
Stage 2	-	-	-	-	-	-	300	291	-	919	915	-
Critical Hdwy	4.1	-	-	4.1	-	-	6.7	6.1	6	7.5	6.9	6.4
Critical Hdwy Stg 1	-	-	-	-	-	-	5.7	5.1	-	6.5	5.9	-
Critical Hdwy Stg 2	-	-	-	-	-	-	5.7	5.1	-	6.5	5.9	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	865	-	-	1291	-	-	184	213	432	141	162	749
Stage 1	-	-	-	-	-	-	366	394	-	698	654	-
Stage 2	-	-	-	-	-	-	737	697	-	296	320	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	865	-	-	1291	-	-	164	189	432	123	144	749
Mov Cap-2 Maneuver	-	-	-	-	-	-	164	189	-	123	144	-
Stage 1	-	-	-	-	-	-	364	352	-	695	651	-
Stage 2	-	-	-	-	-	-	716	694	-	254	286	-

Approach	EB	WB	SE	NW
HCM Control Delay, s	0.1	0.8	23.5	9.9
HCM LOS			С	А

Minor Lane/Major Mvmt	NWLn1	EBL	EBT	EBR	WBL	WBT	WBR S	SELn1
Capacity (veh/h)	749	865	-	-	1291	-	-	218
HCM Lane V/C Ratio	0.024	0.005	-	-	0.062	-	-	0.11
HCM Control Delay (s)	9.9	9.2	0	-	8	0	-	23.5
HCM Lane LOS	А	А	А	-	А	А	-	С
HCM 95th %tile Q(veh)	0.1	0	-	-	0.2	-	-	0.4

Intersection

Movement	EBL	EBT	WBT	WBR	SEL	SER	
Vol, veh/h	2	287	566	4	10	35	
Conflicting Peds, #/hr	0	0	0	0	0	0	
Sign Control	Free	Free	Free	Free	Stop	Stop	
RT Channelized	-	None	-	None	-	None	
Storage Length	-	-	-	-	0	-	
Veh in Median Storage, #	-	0	0	-	0	-	
Grade, %	-	0	0	-	10	-	
Peak Hour Factor	50	93	84	33	38	55	
Heavy Vehicles, %	0	0	0	0	0	0	
Mvmt Flow	4	309	674	12	26	64	

Major/Minor	Major1		Major2		Minor2		
Conflicting Flow All	686	0	-	0	997	680	
Stage 1	-	-	-	-	680	-	
Stage 2	-	-	-	-	317	-	
Critical Hdwy	4.1	-	-	-	8.4	7.2	
Critical Hdwy Stg 1	-	-	-	-	7.4	-	
Critical Hdwy Stg 2	-	-	-	-	7.4	-	
Follow-up Hdwy	2.2	-	-	-	3.5	3.3	
Pot Cap-1 Maneuver	917	-	-	-	157	376	
Stage 1	-	-	-	-	347	-	
Stage 2	-	-	-	-	623	-	
Platoon blocked, %		-	-	-			
Mov Cap-1 Maneuver	917	-	-	-	156	376	
Mov Cap-2 Maneuver	-	-	-	-	156	-	
Stage 1	-	-	-	-	347	-	
Stage 2	-	-	-	-	620	-	

Approach	EB	WB	SE	
HCM Control Delay, s	0.1	0	25.3	
HCM LOS			D	

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR SELn1
Capacity (veh/h)	917	-	-	- 266
HCM Lane V/C Ratio	0.004	-	-	- 0.338
HCM Control Delay (s)	8.9	0	-	- 25.3
HCM Lane LOS	А	А	-	- D
HCM 95th %tile Q(veh)	0	-	-	- 1.4

Intersection

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Vol, veh/h	5	681	1	4	366	13	4	0	3	0	0	9
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None									
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	-2	-	-	2	-	-	-2	-	-	2	-
Peak Hour Factor	63	85	25	50	88	75	33	90	38	90	90	67
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	8	801	4	8	416	17	12	0	8	0	0	13

Major/Minor	Major1			Major2			Minor2			Minor1		
Conflicting Flow All	433	0	0	805	0	0	1267	1262	425	1264	1268	803
Stage 1	-	-	-	-	-	-	441	441	-	819	819	-
Stage 2	-	-	-	-	-	-	826	821	-	445	449	-
Critical Hdwy	4.1	-	-	4.1	-	-	6.7	6.1	6	7.5	6.9	6.4
Critical Hdwy Stg 1	-	-	-	-	-	-	5.7	5.1	-	6.5	5.9	-
Critical Hdwy Stg 2	-	-	-	-	-	-	5.7	5.1	-	6.5	5.9	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1137	-	-	828	-	-	169	197	649	128	148	370
Stage 1	-	-	-	-	-	-	629	610	-	340	358	-
Stage 2	-	-	-	-	-	-	405	429	-	567	548	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1137	-	-	828	-	-	160	192	649	124	144	370
Mov Cap-2 Maneuver	-	-	-	-	-	-	160	192	-	124	144	-
Stage 1	-	-	-	-	-	-	621	602	-	336	353	-
Stage 2	-	-	-	-	-	-	385	423	-	553	541	-

Approach	EB	WB	SE	NW
HCM Control Delay, s	0.1	0.2	22.3	15.1
HCM LOS			С	С

Minor Lane/Major Mvmt	NWLn1	EBL	EBT	EBR	WBL	WBT	WBR S	SELn1
Capacity (veh/h)	370	1137	-	-	828	-	-	228
HCM Lane V/C Ratio	0.036	0.007	-	-	0.01	-	-	0.088
HCM Control Delay (s)	15.1	8.2	0	-	9.4	0	-	22.3
HCM Lane LOS	С	А	А	-	А	А	-	С
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0.3

Intersection

Movement	EBL	EBT	WBT	WBR	SEL	SER	
Vol, veh/h	7	618	365	4	2	3	
Conflicting Peds, #/hr	0	0	0	0	0	0	
Sign Control	Free	Free	Free	Free	Stop	Stop	
RT Channelized	-	None	-	None	-	None	
Storage Length	-	-	-	-	0	-	
Veh in Median Storage, #	-	0	0	-	0	-	
Grade, %	-	0	0	-	10	-	
Peak Hour Factor	75	97	90	100	50	75	
Heavy Vehicles, %	0	0	0	0	0	0	
Mvmt Flow	9	637	406	4	4	4	

Major/Minor	Major1		Major2		Minor2		
Conflicting Flow All	410	0	-	0	1064	408	
Stage 1	-	-	-	-	408	-	
Stage 2	-	-	-	-	656	-	
Critical Hdwy	4.1	-	-	-	8.4	7.2	
Critical Hdwy Stg 1	-	-	-	-	7.4	-	
Critical Hdwy Stg 2	-	-	-	-	7.4	-	
Follow-up Hdwy	2.2	-	-	-	3.5	3.3	
Pot Cap-1 Maneuver	1160	-	-	-	138	578	
Stage 1	-	-	-	-	539	-	
Stage 2	-	-	-	-	361	-	
Platoon blocked, %		-	-	-			
Mov Cap-1 Maneuver	1160	-	-	-	136	578	
Mov Cap-2 Maneuver	-	-	-	-	136	-	
Stage 1	-	-	-	-	539	-	
Stage 2	-	-	-	-	357	-	

Approach	EB	WB	SE	
HCM Control Delay, s	0.1	0	22	
HCM LOS			С	

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR SELn1
Capacity (veh/h)	1160	-	-	- 220
HCM Lane V/C Ratio	0.008	-	-	- 0.036
HCM Control Delay (s)	8.1	0	-	- 22
HCM Lane LOS	А	А	-	- C
HCM 95th %tile Q(veh)	0	-	-	- 0.1

Intersection

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Vol, veh/h	1	277	1	40	664	3	4	2	3	14	0	17
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None									
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	-2	-	-	2	-	-	-2	-	-	2	-
Peak Hour Factor	25	98	90	46	89	38	50	25	38	90	90	50
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	4	283	1	87	746	8	8	8	8	16	0	34

Major/Minor	Major1			Major2			Minor2			Minor1		
Conflicting Flow All	754	0	0	284	0	0	1232	1216	750	1223	1219	283
Stage 1	-	-	-	-	-	-	924	924	-	291	291	-
Stage 2	-	-	-	-	-	-	308	292	-	932	928	-
Critical Hdwy	4.1	-	-	4.1	-	-	6.7	6.1	6	7.5	6.9	6.4
Critical Hdwy Stg 1	-	-	-	-	-	-	5.7	5.1	-	6.5	5.9	-
Critical Hdwy Stg 2	-	-	-	-	-	-	5.7	5.1	-	6.5	5.9	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	865	-	-	1290	-	-	178	209	432	138	159	749
Stage 1	-	-	-	-	-	-	361	389	-	698	654	-
Stage 2	-	-	-	-	-	-	731	697	-	291	315	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	865	-	-	1290	-	-	154	184	432	119	140	749
Mov Cap-2 Maneuver	-	-	-	-	-	-	154	184	-	119	140	-
Stage 1	-	-	-	-	-	-	359	344	-	695	651	-
Stage 2	-	-	-	-	-	-	694	694	-	247	278	-

Approach	EB	WB	SE	NW
HCM Control Delay, s	0.1	0.8	24.3	20.5
HCM LOS			С	С

Minor Lane/Major Mvmt	NWLn1	EBL	EBT	EBR	WBL	WBT	WBR S	SELn1
Capacity (veh/h)	281	865	-	-	1290	-	-	210
HCM Lane V/C Ratio	0.176	0.005	-	-	0.067	-	-	0.114
HCM Control Delay (s)	20.5	9.2	0	-	8	0	-	24.3
HCM Lane LOS	С	А	А	-	А	А	-	С
HCM 95th %tile Q(veh)	0.6	0	-	-	0.2	-	-	0.4

Intersection

Movement	EBL	EBT	WBT	WBR	SEL	SER
Vol, veh/h	4	287	566	4	12	43
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	10	-
Peak Hour Factor	50	93	84	33	38	55
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	8	309	674	12	32	78

Major/Minor	Major1		Major2		Minor2		
Conflicting Flow All	686	0	-	0	1005	680	
Stage 1	-	-	-	-	680	-	
Stage 2	-	-	-	-	325	-	
Critical Hdwy	4.1	-	-	-	8.4	7.2	
Critical Hdwy Stg 1	-	-	-	-	7.4	-	
Critical Hdwy Stg 2	-	-	-	-	7.4	-	
Follow-up Hdwy	2.2	-	-	-	3.5	3.3	
Pot Cap-1 Maneuver	917	-	-	-	154	376	
Stage 1	-	-	-	-	347	-	
Stage 2	-	-	-	-	615	-	
Platoon blocked, %		-	-	-			
Mov Cap-1 Maneuver	917	-	-	-	152	376	
Mov Cap-2 Maneuver	-	-	-	-	152	-	
Stage 1	-	-	-	-	347	-	
Stage 2	-	-	-	-	608	-	

Approach	EB	WB	SE	
HCM Control Delay, s	0.2	0	28	
HCM LOS			D	

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR SELn1
Capacity (veh/h)	917	-	-	- 264
HCM Lane V/C Ratio	0.009	-	-	- 0.416
HCM Control Delay (s)	9	0	-	- 28
HCM Lane LOS	А	А	-	- D
HCM 95th %tile Q(veh)	0	-	-	- 1.9

Intersection

Movement	EBL	EBR	SET	SER	NWL	NWT
Vol, veh/h	22	10	39	4	2	9
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	4	-	-	-4
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	24	11	43	4	2	10

Major/Minor	Minor1		Major1		Major2		
Conflicting Flow All	60	46	0	0	48	0	
Stage 1	46	-	-	-	-	-	
Stage 2	14	-	-	-	-	-	
Critical Hdwy	6.4	6.2	-	-	4.1	-	
Critical Hdwy Stg 1	5.4	-	-	-	-	-	
Critical Hdwy Stg 2	5.4	-	-	-	-	-	
Follow-up Hdwy	3.5	3.3	-	-	2.2	-	
Pot Cap-1 Maneuver	952	1029	-	-	1572	-	
Stage 1	982	-	-	-	-	-	
Stage 2	1014	-	-	-	-	-	
Platoon blocked, %			-	-		-	
Mov Cap-1 Maneuver	951	1029	-	-	1572	-	
Mov Cap-2 Maneuver	951	-	-	-	-	-	
Stage 1	982	-	-	-	-	-	
Stage 2	1013	-	-	-	-	-	

Approach	EB	SE	NW	
HCM Control Delay, s	8.8	0	1.3	
HCM LOS	А			

Minor Lane/Major Mvmt	NWL	NWT EB	Ln1	SET	SER	
Capacity (veh/h)	1572	-	974	-	-	
HCM Lane V/C Ratio	0.001	- 0.	037	-	-	
HCM Control Delay (s)	7.3	0	8.8	-	-	
HCM Lane LOS	А	А	А	-	-	
HCM 95th %tile Q(veh)	0	-	0.1	-	-	

Intersection

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Vol, veh/h	5	681	8	17	366	13	4	0	3	4	0	15
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None									
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	-2	-	-	2	-	-	-2	-	-	2	-
Peak Hour Factor	63	85	25	50	88	75	33	90	38	90	90	67
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	8	801	32	34	416	17	12	0	8	4	0	22

Major/Minor	Major1			Major2			Minor2			Minor1		
Conflicting Flow All	433	0	0	833	0	0	1337	1342	425	1330	1334	817
Stage 1	-	-	-	-	-	-	493	493	-	833	833	-
Stage 2	-	-	-	-	-	-	844	849	-	497	501	-
Critical Hdwy	4.1	-	-	4.1	-	-	6.7	6.1	6	7.5	6.9	6.4
Critical Hdwy Stg 1	-	-	-	-	-	-	5.7	5.1	-	6.5	5.9	-
Critical Hdwy Stg 2	-	-	-	-	-	-	5.7	5.1	-	6.5	5.9	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1137	-	-	809	-	-	153	178	649	115	134	363
Stage 1	-	-	-	-	-	-	593	581	-	334	352	-
Stage 2	-	-	-	-	-	-	396	418	-	529	516	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1137	-	-	809	-	-	136	166	649	108	125	363
Mov Cap-2 Maneuver	-	-	-	-	-	-	136	166	-	108	125	-
Stage 1	-	-	-	-	-	-	585	549	-	330	347	-
Stage 2	-	-	-	-	-	-	367	413	-	494	488	-

Approach	EB	WB	SE	NW
HCM Control Delay, s	0.1	0.7	25.2	20.4
HCM LOS			D	С

Minor Lane/Major Mvmt	NWLn1	EBL	EBT	EBR	WBL	WBT	WBR S	SELn1
Capacity (veh/h)	261	1137	-	-	809	-	-	198
HCM Lane V/C Ratio	0.103	0.007	-	-	0.042	-	-	0.101
HCM Control Delay (s)	20.4	8.2	0	-	9.6	0	-	25.2
HCM Lane LOS	С	А	А	-	А	А	-	D
HCM 95th %tile Q(veh)	0.3	0	-	-	0.1	-	-	0.3

Intersection

Movement	EBL	EBT	WBT	WBR	SEL	SER	
Vol, veh/h	15	618	365	5	2	7	
Conflicting Peds, #/hr	0	0	0	0	0	0	
Sign Control	Free	Free	Free	Free	Stop	Stop	
RT Channelized	-	None	-	None	-	None	
Storage Length	-	-	-	-	0	-	
Veh in Median Storage, #	-	0	0	-	0	-	
Grade, %	-	0	0	-	10	-	
Peak Hour Factor	75	97	90	100	50	75	
Heavy Vehicles, %	0	0	0	0	0	0	
Mvmt Flow	20	637	406	5	4	9	

Major/Minor	Major1		Major2		Minor2		
Conflicting Flow All	411	0	-	0	1085	408	
Stage 1	-	-	-	-	408	-	
Stage 2	-	-	-	-	677	-	
Critical Hdwy	4.1	-	-	-	8.4	7.2	
Critical Hdwy Stg 1	-	-	-	-	7.4	-	
Critical Hdwy Stg 2	-	-	-	-	7.4	-	
Follow-up Hdwy	2.2	-	-	-	3.5	3.3	
Pot Cap-1 Maneuver	1159	-	-	-	132	578	
Stage 1	-	-	-	-	539	-	
Stage 2	-	-	-	-	349	-	
Platoon blocked, %		-	-	-			
Mov Cap-1 Maneuver	1159	-	-	-	128	578	
Mov Cap-2 Maneuver	-	-	-	-	128	-	
Stage 1	-	-	-	-	539	-	
Stage 2	-	-	-	-	340	-	

Approach	EB	WB	SE	
HCM Control Delay, s	0.2	0	18.4	
HCM LOS			С	

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR SELn1
Capacity (veh/h)	1159	-	-	- 281
HCM Lane V/C Ratio	0.017	-	-	- 0.047
HCM Control Delay (s)	8.2	0	-	- 18.4
HCM Lane LOS	А	А	-	- C
HCM 95th %tile Q(veh)	0.1	-	-	- 0.1

Intersection

Movement	EBL	EBR	SET	SER	NWL	NWT
Vol, veh/h	10	4	5	20	9	9
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	4	-	-	-4
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	11	4	6	22	10	10

Major/Minor	Minor1		Major1		Major2		
Conflicting Flow All	47	17	0	0	28	0	
Stage 1	17	-	-	-	-	-	
Stage 2	30	-	-	-	-	-	
Critical Hdwy	6.4	6.2	-	-	4.1	-	
Critical Hdwy Stg 1	5.4	-	-	-	-	-	
Critical Hdwy Stg 2	5.4	-	-	-	-	-	
Follow-up Hdwy	3.5	3.3	-	-	2.2	-	
Pot Cap-1 Maneuver	968	1068	-	-	1599	-	
Stage 1	1011	-	-	-	-	-	
Stage 2	998	-	-	-	-	-	
Platoon blocked, %			-	-		-	
Mov Cap-1 Maneuver	962	1068	-	-	1599	-	
Mov Cap-2 Maneuver	962	-	-	-	-	-	
Stage 1	1011	-	-	-	-	-	
Stage 2	992	-	-	-	-	-	

Approach	EB	SE	NW	
HCM Control Delay, s	8.7	0	3.6	
HCM LOS	А			

Minor Lane/Major Mvmt	NWL	NWT	EBLn1	SET	SER	
Capacity (veh/h)	1599	-	990	-	-	
HCM Lane V/C Ratio	0.006	-	0.016	-	-	
HCM Control Delay (s)	7.3	0	8.7	-	-	
HCM Lane LOS	А	А	А	-	-	
HCM 95th %tile Q(veh)	0	-	0	-	-	

Intersection

Movement	EBL	EBR	SET	SER	NWL	NWT
Vol, veh/h	3	29	45	1	5	15
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	4	-	-	-4
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	3	32	50	1	6	17

Major/Minor	Minor1		Major1		Major2		
Conflicting Flow All	79	51	0	0	51	0	
Stage 1	51	-	-	-	-	-	
Stage 2	28	-	-	-	-	-	
Critical Hdwy	6.4	6.2	-	-	4.1	-	
Critical Hdwy Stg 1	5.4	-	-	-	-	-	
Critical Hdwy Stg 2	5.4	-	-	-	-	-	
Follow-up Hdwy	3.5	3.3	-	-	2.2	-	
Pot Cap-1 Maneuver	929	1023	-	-	1568	-	
Stage 1	977	-	-	-	-	-	
Stage 2	1000	-	-	-	-	-	
Platoon blocked, %			-	-		-	
Mov Cap-1 Maneuver	925	1023	-	-	1568	-	
Mov Cap-2 Maneuver	925	-	-	-	-	-	
Stage 1	977	-	-	-	-	-	
Stage 2	996	-	-	-	-	-	

Approach	EB	SE	NW	
HCM Control Delay, s	8.7	0	1.8	
HCM LOS	А			

Minor Lane/Major Mvmt	NWL	NWT EBLn1	SET	SER	
Capacity (veh/h)	1568	- 1013	-	-	
HCM Lane V/C Ratio	0.004	- 0.035	-	-	
HCM Control Delay (s)	7.3	0 8.7	-	-	
HCM Lane LOS	А	A A	-	-	
HCM 95th %tile Q(veh)	0	- 0.1	-	-	

Intersection

Movement	SET	SER	NWL	NWT	NEL	NER	
Vol, veh/h	53	11	6	10	39	18	
Conflicting Peds, #/hr	0	0	0	0	0	0	
Sign Control	Free	Free	Free	Free	Stop	Stop	
RT Channelized	-	None	-	None	-	None	
Storage Length	-	-	-	-	0	-	
Veh in Median Storage, #	0	-	-	0	0	-	
Grade, %	4	-	-	-4	0	-	
Peak Hour Factor	90	90	90	90	90	90	
Heavy Vehicles, %	0	0	0	0	0	0	
Mvmt Flow	59	12	7	11	43	20	

Major/Minor	Major1		Major2		Minor1		
Conflicting Flow All	0	0	71	0	89	65	
Stage 1	-	-	-	-	65	-	
Stage 2	-	-	-	-	24	-	
Critical Hdwy	-	-	4.1	-	6.4	6.2	
Critical Hdwy Stg 1	-	-	-	-	5.4	-	
Critical Hdwy Stg 2	-	-	-	-	5.4	-	
Follow-up Hdwy	-	-	2.2	-	3.5	3.3	
Pot Cap-1 Maneuver	-	-	1542	-	917	1005	
Stage 1	-	-	-	-	963	-	
Stage 2	-	-	-	-	1004	-	
Platoon blocked, %	-	-		-			
Mov Cap-1 Maneuver	-	-	1542	-	912	1005	
Mov Cap-2 Maneuver	-	-	-	-	912	-	
Stage 1	-	-	-	-	963	-	
Stage 2	-	-	-	-	999	-	

Approach	SE	NW	NE	
HCM Control Delay, s	0	2.8	9.1	
HCM LOS			А	

Minor Lane/Major Mvmt	NELn1	NWL	NWT	SET	SER	
Capacity (veh/h)	939	1542	-	-	-	
HCM Lane V/C Ratio	0.067	0.004	-	-	-	
HCM Control Delay (s)	9.1	7.3	0	-	-	
HCM Lane LOS	А	А	А	-	-	
HCM 95th %tile Q(veh)	0.2	0	-	-	-	
Intersection

Movement	EBT	EBR	WBL	WBT	NWL	NWR	
Vol, veh/h	531	7	0	1022	0	14	
Conflicting Peds, #/hr	0	0	0	0	0	0	
Sign Control	Free	Free	Free	Free	Stop	Stop	
RT Channelized	-	None	-	None	-	None	
Storage Length	-	-	-	-	-	0	
Veh in Median Storage, #	0	-	-	0	0	-	
Grade, %	2	-	-	-2	0	-	
Peak Hour Factor	92	92	92	92	92	92	
Heavy Vehicles, %	2	2	2	2	0	0	
Mvmt Flow	577	8	0	1111	0	15	

Major/Minor	Major1		Major2		Minor1		
Conflicting Flow All	0	0	585	0	1136	292	
Stage 1	-	-	-	-	581	-	
Stage 2	-	-	-	-	555	-	
Critical Hdwy	-	-	4.14	-	6.8	6.9	
Critical Hdwy Stg 1	-	-	-	-	5.8	-	
Critical Hdwy Stg 2	-	-	-	-	5.8	-	
Follow-up Hdwy	-	-	2.22	-	3.5	3.3	
Pot Cap-1 Maneuver	-	-	986	-	199	710	
Stage 1	-	-	-	-	528	-	
Stage 2	-	-	-	-	544	-	
Platoon blocked, %	-	-		-			
Mov Cap-1 Maneuver	-	-	986	-	199	710	
Mov Cap-2 Maneuver	-	-	-	-	199	-	
Stage 1	-	-	-	-	528	-	
Stage 2	-	-	-	-	544	-	

Approach	EB	WB	NW	
HCM Control Delay, s	0	0	10.2	
HCM LOS			В	

Minor Lane/Major Mvmt	NWLn1	EBT	EBR	WBL	WBT	
Capacity (veh/h)	710	-	-	986	-	
HCM Lane V/C Ratio	0.021	-	-	-	-	
HCM Control Delay (s)	10.2	-	-	0	-	
HCM Lane LOS	В	-	-	А	-	
HCM 95th %tile Q(veh)	0.1	-	-	0	-	

HCM Unsignalized Intersection Capacity Analysis 12: Lobetti Road & Schaad Road

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations	ľ	∱ î,		ľ	↑ ĵ≽			\$			÷	
Volume (veh/h)	7	534	4	5	976	1	6	55	14	32	12	5
Sign Control		Free			Free			Stop			Stop	
Grade		2%			-2%			10%			2%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	8	593	4	6	1084	1	7	61	16	36	13	6
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	1086			598			1421	1709	543	1211	1708	299
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1086			598			1421	1709	543	1211	1708	299
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			99			92	32	97	41	85	99
cM capacity (veh/h)	650			989			85	89	489	60	90	703
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	SE 1	NW 1				
Volume Total	8	396	202	6	723	363	83	54				
Volume Left	8	0	0	6	0	0	7	36				
Volume Right	0	0	4	0	0	1	16	6				
cSH	650	1700	1700	989	1700	1700	105	73				
Volume to Capacity	0.01	0.23	0.12	0.01	0.43	0.21	0.79	0.75				
Queue Length 95th (ft)	1	0	0	0	0	0	110	88				
Control Delay (s)	10.6	0.0	0.0	8.7	0.0	0.0	113.2	138.5				
Lane LOS	В			А			F	F				
Approach Delay (s)	0.1			0.0			113.2	138.5				
Approach LOS							F	F				
Intersection Summary												
Average Delay			9.3									
Intersection Capacity Utilizatio	n		43.1%	IC	CU Level	of Service			А			
Analysis Period (min)			15									

10/29/2017

Intersection

Movement	EBL	EBR	SET	SER	NWL	NWT
Vol, veh/h	1	13	13	3	26	18
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	4	-	-	-4
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	1	14	14	3	29	20

Major/Minor	Minor1		Major1		Major2		
Conflicting Flow All	94	16	0	0	18	0	
Stage 1	16	-	-	-	-	-	
Stage 2	78	-	-	-	-	-	
Critical Hdwy	6.4	6.2	-	-	4.1	-	
Critical Hdwy Stg 1	5.4	-	-	-	-	-	
Critical Hdwy Stg 2	5.4	-	-	-	-	-	
Follow-up Hdwy	3.5	3.3	-	-	2.2	-	
Pot Cap-1 Maneuver	911	1069	-	-	1612	-	
Stage 1	1012	-	-	-	-	-	
Stage 2	950	-	-	-	-	-	
Platoon blocked, %			-	-		-	
Mov Cap-1 Maneuver	895	1069	-	-	1612	-	
Mov Cap-2 Maneuver	895	-	-	-	-	-	
Stage 1	1012	-	-	-	-	-	
Stage 2	933	-	-	-	-	-	

Approach	EB	SE	NW	
HCM Control Delay, s	8.5	0	4.3	
HCM LOS	А			

Minor Lane/Major Mvmt	NWL	NWT E	BLn1	SET	SER
Capacity (veh/h)	1612	-	1054	-	-
HCM Lane V/C Ratio	0.018	- (0.015	-	-
HCM Control Delay (s)	7.3	0	8.5	-	-
HCM Lane LOS	А	А	А	-	-
HCM 95th %tile Q(veh)	0.1	-	0	-	-

Intersection

Movement	SET	SER	NWL	NWT	NEL	NER
Vol, veh/h	16	36	20	20	26	12
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	4	-	-	-4	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	18	40	22	22	29	13

Major/Minor	Major1		Major2		Minor1		
Conflicting Flow All	0	0	58	0	105	38	
Stage 1	-	-	-	-	38	-	
Stage 2	-	-	-	-	67	-	
Critical Hdwy	-	-	4.1	-	6.4	6.2	
Critical Hdwy Stg 1	-	-	-	-	5.4	-	
Critical Hdwy Stg 2	-	-	-	-	5.4	-	
Follow-up Hdwy	-	-	2.2	-	3.5	3.3	
Pot Cap-1 Maneuver	-	-	1559	-	898	1040	
Stage 1	-	-	-	-	990	-	
Stage 2	-	-	-	-	961	-	
Platoon blocked, %	-	-		-			
Mov Cap-1 Maneuver	-	-	1559	-	885	1040	
Mov Cap-2 Maneuver	-	-	-	-	885	-	
Stage 1	-	-	-	-	990	-	
Stage 2	-	-	-	-	948	-	

Approach	SE	NW	NE	
HCM Control Delay, s	0	3.7	9.1	
HCM LOS			А	

Minor Lane/Major Mvmt	NELn1	NWL	NWT	SET	SER	
Capacity (veh/h)	929	1559	-	-	-	
HCM Lane V/C Ratio	0.045	0.014	-	-	-	
HCM Control Delay (s)	9.1	7.3	0	-	-	
HCM Lane LOS	А	А	А	-	-	
HCM 95th %tile Q(veh)	0.1	0	-	-	-	

Intersection

Movement	EBT	EBR	WBL	WBT	NWL	NWR
Vol, veh/h	994	23	0	599	0	9
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	2	-	-	-2	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	0	0
Mvmt Flow	1080	25	0	651	0	10

Major/Minor	Major1		Major2		Minor1		
Conflicting Flow All	0	0	1105	0	1419	553	
Stage 1	-	-	-	-	1093	-	
Stage 2	-	-	-	-	326	-	
Critical Hdwy	-	-	4.14	-	6.8	6.9	
Critical Hdwy Stg 1	-	-	-	-	5.8	-	
Critical Hdwy Stg 2	-	-	-	-	5.8	-	
Follow-up Hdwy	-	-	2.22	-	3.5	3.3	
Pot Cap-1 Maneuver	-	-	628	-	130	482	
Stage 1	-	-	-	-	287	-	
Stage 2	-	-	-	-	710	-	
Platoon blocked, %	-	-		-			
Mov Cap-1 Maneuver	-	-	628	-	130	482	
Mov Cap-2 Maneuver	-	-	-	-	130	-	
Stage 1	-	-	-	-	287	-	
Stage 2	-	-	-	-	710	-	

Approach	EB	WB	NW	
HCM Control Delay, s	0	0	12.6	
HCM LOS			В	

Minor Lane/Major Mvmt	NWLn1	EBT	EBR	WBL	WBT	
Capacity (veh/h)	482	-	-	628	-	
HCM Lane V/C Ratio	0.02	-	-	-	-	
HCM Control Delay (s)	12.6	-	-	0	-	
HCM Lane LOS	В	-	-	А	-	
HCM 95th %tile Q(veh)	0.1	-	-	0	-	

HCM Unsignalized Intersection Capacity Analysis 12: Lobetti Road & Schaad Road

	٢	-	-*	۲	←	*	\$	\mathbf{x}	4	*	×	4
Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations	٦.	≜ î≽		٦	∱ î≽			4			4	
Volume (veh/h)	9	982	12	16	575	13	6	24	3	21	22	3
Sign Control		Free			Free			Stop			Stop	
Grade		2%			-2%			10%			2%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	10	1091	13	18	639	14	7	27	3	23	24	3
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	653			1104			1263	1806	327	1489	1807	552
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	653			1104			1263	1806	327	1489	1807	552
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			97			93	65	100	62	68	99
cM capacity (veh/h)	943			640			93	76	674	62	77	482
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	SE 1	NW 1				
Volume Total	10	727	377	18	426	227	37	51				
Volume Left	10	0	0	18	0	0	7	23				
Volume Right	0	0	13	0	0	14	3	3				
cSH	943	1700	1700	640	1700	1700	86	73				
Volume to Capacity	0.01	0.43	0.22	0.03	0.25	0.13	0.43	0.70				
Queue Length 95th (ft)	1	0	0	2	0	0	44	81				
Control Delay (s)	8.9	0.0	0.0	10.8	0.0	0.0	75.0	130.1				
Lane LOS	А			В			F	F				
Approach Delay (s)	0.1			0.3			75.0	130.1				
Approach LOS							F	F				
Intersection Summary												
Average Delay			5.2									
Intersection Capacity Utilization	۱		39.5%	IC	CU Level	of Service			А			
Analysis Period (min)			15									
			10									

APPENDIX I

KRTPO MODEL OUTPUTS







APPENDIX J

ITE TRIP GENERATION RATES

Land Use: 210 Single-Family Detached Housing

Description

Single-family detached housing includes all single-family detached homes on individual lots. A typical site surveyed is a suburban subdivision.

Additional Data

The number of vehicles and residents had a high correlation with average weekday vehicle trip ends. The use of these variables was limited, however, because the number of vehicles and residents was often difficult to obtain or predict. The number of dwelling units was generally used as the independent variable of choice because it was usually readily available, easy to project and had a high correlation with average weekday vehicle trip ends.

This land use included data from a wide variety of units with different sizes, price ranges, locations and ages. Consequently, there was a wide variation in trips generated within this category. Other factors, such as geographic location and type of adjacent and nearby development, may also have had an effect on the site trip generation.

Single-family detached units had the highest trip generation rate per dwelling unit of all residential uses because they were the largest units in size and had more residents and more vehicles per unit than other residential land uses; they were generally located farther away from shopping centers, employment areas and other trip attractors than other residential land uses; and they generally had fewer alternative modes of transportation available because they were typically not as concentrated as other residential land uses.

The peak hour of the generator typically coincided with the peak hour of the adjacent street traffic.

The sites were surveyed between the late 1960s and the 2000s throughout the United States and Canada.

Source Numbers

1, 4, 5, 6, 7, 8, 11, 12, 13, 14, 16, 19, 20, 21, 26, 34, 35, 36, 38, 40, 71, 72, 84, 91, 98, 100, 105, 108, 110, 114, 117, 119, 157, 167, 177, 187, 192, 207, 211, 246, 275, 283, 293, 300, 319, 320, 357, 384, 435, 550, 552, 579, 598, 601, 603, 611, 614, 637, 711, 735

Single-Family Detached Housing (210)

Average Vehicle Trip Ends vs: Dwelling Units On a: Weekday

Number of Studies:	355
Avg. Number of Dwelling Units:	198
Directional Distribution:	50% entering, 50% exiting

Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
9.52	4.31 - 21.85	3.70



Single-Family Detached Housing (210)				
Average Vehicle Trip Ends vs: On a:	Dwelling Units Weekday, Peak Hour of Adjacent Street Traffic, One Hour Between 7 and 9 a.m.			
Number of Studies: Avg. Number of Dwelling Units: Directional Distribution:	292 194 25% entering, 75% exiting			

Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.75	0.33 - 2.27	0.90



Single-Family Detached Housing (210)					
Average Vehicle Trip Ends vs: On a:	Dwelling Units Weekday, Peak Hour of Adjacent Street Traffic, One Hour Between 4 and 6 p.m.				
Number of Studies:	321				
Avg. Number of Dwelling Units:	207				
Directional Distribution:	63% entering, 37% exiting				

Average Rate Range of Rates Standard Deviation 1.00 0.42 - 2.98 1.05



Land Use: 230 Residential Condominium/Townhouse

Description

Residential condominiums/townhouses are defined as <u>ownership</u> units that have at least one other owned unit within the <u>same building structure</u>. **Both condominiums and townhouses are included in this land use.** The studies in this land use did not identify whether the condominiums/townhouses were low-rise or high-rise. Low-rise residential condominium/townhouse (Land Use 231), high-rise residential condominium/townhouse (Land Use 232) and luxury condominium/townhouse (Land Use 233) are related uses.

Additional Data

The number of vehicles and the number of residents had a high correlation with average weekday vehicle trip ends. The use of these variables was limited, however, because the number of vehicles and residents was often difficult to obtain or predict. The number of dwelling units was generally used as the independent variable of choice because it is usually readily available, easy to project and had a high correlation with average weekday vehicle trip ends.

The peak hour of the generator typically coincided with the peak hour of the adjacent street traffic.

The sites were surveyed between the mid-1970s and the 2000s throughout the United States and Canada.

Source Numbers

4, 92, 94, 95, 97, 100, 105, 106, 114, 168, 186, 204, 237, 253, 293, 319, 320, 321, 390, 412, 418, 561, 562, 583, 638

Residential Condominium/Townhouse (230)

Average Vehicle Trip Ends vs: Dwelling Units On a: Weekday

Number of Studies:	56
Avg. Number of Dwelling Units:	179
Directional Distribution:	50% entering, 50% exiting

Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
5.81	1.53 - 11.79	3.11



Residential Condominium/Townhouse (230)

Average Vehicle Trip Ends vs:Dwelling UnitsOn a:Weekday,Peak Hour of Adjacent Street Traffic,One Hour Between 7 and 9 a.m.

Number of Studies:	59
Avg. Number of Dwelling Units:	213
Directional Distribution:	17% entering, 83% exiting

Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.44	0.15 - 1.61	0.69



Residential Condominium/Townhouse (230)				
Average Vehicle Trip Ends vs: On a:	Dwelling Units Weekday, Peak Hour of Adjacent Street Traffic, One Hour Between 4 and 6 p.m.			
Number of Studies:	62			
Avg. Number of Dwelling Units:	205			
Directional Distribution:	67% entering, 33% exiting			

Average Rate	Range of Rates	Standard Deviation
0.52	0.18 - 1.24	0.75



TRIP GENERATION FOR CASCADE FALLS PHASE 1

66 Dwelling Units = X

Weekday:

Fitted Curve Equation: Ln(T) = 0.87 Ln(X)+2.46 Ln(T) = 0.87 * 4.19 + 2.46 Ln(T) = 6.10<u>T = 449 trips</u>

Peak Hour of Adjacent Traffic between 7 and 9 am:

Fitted Curve Equation:	Ln(T)	$= 0.80 \mathrm{Ln}($	X)+0.2	26	
	Ln(T) =	0.80 *	4.19	+	0.26
	Ln(T) =	3.61			
	T =	38 trip	s		

Peak Hour of Adjacent Traffic between 4 and 6 pm:

Fitted Curve Equation:	Ln(T) = 0.82 Ln(X) + 0.32				
	Ln(T) =	0.82 *	4.19	+	0.32
	Ln(T) =	3.76			
	T =	43 trip	S		

TRIP GENERATION FOR CASCADE FALLS PHASE 2

121 Residential Units = X

Weekday:

Fitted Curve Equation: Ln(T) = 0.92 Ln(X)+2.72 Ln(T) = 0.92 * 4.80 + 2.72 Ln(T) = 7.13<u>T = 1,252 trips</u>

Peak Hour of Adjacent Traffic between 7 and 9 am:

	T =	95 trips		
	Т=	0.70 * 121	+	9.74
Fitted Curve Equation:	T = 0.	70(X)+9.74		

Peak Hour of Adjacent Traffic between 4 and 6 pm:

	T =	125 trips	
	Ln(T) =	4.83	
	Ln(T) =	0.90 * 4.80	+ 0.51
Fitted Curve Equation:	Ln(T)	$= 0.90 \operatorname{Ln}(X) + 0.51$	

APPENDIX K

TRIP DISTRIBUTION SPREADSHEET RESULTS

AM 2022										
In Out 45 45 20 20	% West Sc % East Sch	haad Rd haad Rd	ional bution			<u>Development Areas</u> Phase 1		66 lots		
10 10 25 25	% Ball Roa % West Ba	id East Ill Camp Pike	Direct Distril							
Road "A" at Lobetti	Road				% TOTAL		10	0		
EB Left EB Right NB Left	0 25 25	0 45 45	0 20 20	10 0	10 90		Ļ	Ĵ		age
NB Thru SB Thru	0	0	0	0	0			1		ercent
SB Right	0	0	0	10	10		90	0		-
Road "A" at Schaad	Road Exter	nsion			0/ TOTAT					
EB Left	0	0	0	0	% 101AL					
EB Thru	0	45	0	0	45					
EB Right	0	0	0	0	0					
WB Left	0	0	0	0	0			ge		
WB Thru	0	45	0	0	45			enta		 .=
WB Right	0	0	0	0	0	45		erce		45
NB Left	0	0	0	0	0			P		
NB Ihru	0	0	0	0	0					
NB Kight	0	0	0	0	0	•				
SB Left	0	0	0	0	0					
SB Thru SB Right	0	0	0	0	0				0	
5D Right	0	0	0	0	0				0	
Road "C" at Lobetti	Road				% TOTAL		0	25		
EB Left	0	0	0	0	0					
EB Right	0	0	0	0	0	0	\boldsymbol{i}	•		e
NB Left	0	0	0	0	0	0				nta
NB Thru	25	0	0	0	25	4				rce
SB Thru	25	0	0	0	25					Pe
SB Right	0	0	0	0	0		0	25		
Lobetti Road at Sch	aad Road E	xtension			% TOTAL		45	25	20	
EB Left	0	45	0	0	45					
EB Thru	0	0	0	0	0		$ \rightarrow $		\hookrightarrow	
EB Right	0	0	0	0	0	1				1
WB Left	0	0	0	0	0	45		ŝ		2 0
WB Thru	0	0	0	0	0			nta§		
WB Right	0	0	20	0	20	0		rcei		0
NB Left	0	0	0	0	0			\mathbf{Pe}		
NB Thru	25	0	0	0	25	0				0
NB Right	0	0	0	0	0					
SB Left	0	0	20	0	20			1		
SB Thru	25	0	0	0	25					
SB Right	0	45	0	0	45		0	25	0	

% Entering Development	100 %
% Exiting Development	100 %

AM 2022	

In Out 45 45 20 20 10 10 25 25	% West Sc % East Sch % Ball Roa % West Ba	haad Rd naad Rd nd East Ill Camp Pike	Directional Distribution			Development Areas% of Phase 265935100	west side 76 lots east side <u>45 lots</u> 121 lots	
Road "A" at Lobetti	Road				N TOTAL		0 10	
EB Left EB Right NB Left NB Thru SB Thru SB Right	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	$\begin{array}{c} 0 \\ 0 \\ 0 \\ 10 \\ 10 \\ 0 \end{array}$	0 0 0 10 10 0			Percentage
Road "A" at Schaad	Road Exter	nsion			% TOTAL			
EB Left EB Thru EB Right WB Left WB Thru WB Right NB Left NB Thru NB Right SB Left SB Thru SB Right	0 0 0 0 0 0 0 0 0 0 0 0 0 0	$\begin{array}{c} 0\\ 15.75\\ 29.25\\ 0\\ 15.75\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\$	0 0 0 0 0 0 0 13 0 0 0 0	$\begin{array}{c} 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 6.5 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ \end{array}$	$\begin{array}{c} 0\\ 0\\ 15.75\\ 29.25\\ 0\\ 15.75\\ 0\\ 0\\ 0\\ 19.5\\ 0\\ 0\\ 0\\ 0\\ 0\\ \end{array}$	15.75	Percentage	15.75 19.5
Road "C" at Lobetti	Road				N TOTAL		15 75	
EB Left EB Right NB Left NB Thru SB Thru SB Right	0 25 25 0 0 0	45 0 0 0 0 15.75	7 0 0 0 0 20	3.5 0 0 0 0 10	% 101AL 55.5 25 25 0 0 45.75		$ \begin{array}{c} \mathbf{J} \\ \mathbf$	Percentage
Lobetti Road at Sch	aad Road E	xtension						
EB Left EB Thru EB Right WB Left WB Thru WB Right NB Left NB Thru NB Right SB Left SB Thru SB Right	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	$egin{array}{c} 0 \\ 0 \\ 15.75 \\ 0 \\ 0 \\ 0 \\ 45 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ $	$egin{array}{c} 0 \\ 13 \\ 0 \\ 20 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 7 \\ 0 \\ 0 \\ 0 \\ $		% TOTAL 6.5 13 15.75 20 0 0 45 3.5 7 0 10 0 0		0 10 J J → D D D D D D D D D D D D D	

% Entering Development	100 %
% Exiting Development	100 %

AM 2022										
In Out 20 20 45 45 10 10 25 25	% West Sch % East Sch % Ball Roa % West Ba	haad Rd haad Rd d East ll Camp Pike	Directional Distribution			<u>Development Areas</u> Phase 1		66 lots		
Road "A" at Lobetti	Road						10	0		
EB Left EB Right NB Left NB Thru SB Thru SB Right	0 25 25 0 0 0	$\begin{array}{c} 0\\ 20\\ 20\\ 0\\ 0\\ 0\\ 0\end{array}$	0 45 45 0 0 0	10 0 0 0 0 10	10 90 90 0 0 10					Percentage
Road "A" at Schaad	Road Exter	nsion								
EB Left EB Thru EB Right WB Left WB Thru WB Right NB Left NB Thru NB Right SB Left SB Thru SB Right	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	$egin{array}{c} 0 \\ 20 \\ 0 \\ 0 \\ 20 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0$	0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0	% 101AL 0 20 0 20 0 20 0 0 0 0 0 0 0 0 0 0 0 0			Percentage	0	20
Road "C" at Lobetti	Road				% TOTAL		0	25		
EB Left EB Right NB Left NB Thru SB Thru SB Right	0 0 25 25 0	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0	$ \begin{array}{c} 0 \\ 0 \\ 0 \\ 25 \\ 25 \\ 0 \end{array} $			1 25		Percentage
Lobetti Road at Sch	aad Road E:	xtension			% TOTAL		20	25	45	
EB Left EB Thru EB Right WB Left WB Thru WB Right NB Left NB Thru NB Right SB Left SB Thru SB Right	$ \begin{array}{c} 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 25\\ 0\\ 25\\ 0\\ 0\\ 25\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\$	20 0 0 0 0 0 0 0	$egin{array}{c} 0 \\ 0 \\ 0 \\ 0 \\ 45 \\ 0 \\ 0 \\ 0 \\ 45 \\ 0 \\ 0 \\ 0 \end{array}$	0 0 0 0 0 0 0 0 0 0 0 0 0 0	20 0 0 0 0 45 0 25 0 45 25 20			Jo Loccentage 25		€ 45 ← 0 € 0

% Entering Development	100 %
% Exiting Development	100 %

AM 2022	

SortOTAL SortOTAL Bi Right 0 <th 0<="" colspan="4" th=""><th>In Out 20 45 45 10 10 25 25</th><th>% West Sch % East Sch % Ball Road % West Bal</th><th>naad Rd aad Rd d East l Camp Pike</th><th>Directional Distribution</th><th></th><th></th><th>Development Areas% of Phase 26565935100</th><th>t side 76 lots side <u>45 lots</u> <u>121 lots</u></th><th>-</th></th>	<th>In Out 20 45 45 10 10 25 25</th> <th>% West Sch % East Sch % Ball Road % West Bal</th> <th>naad Rd aad Rd d East l Camp Pike</th> <th>Directional Distribution</th> <th></th> <th></th> <th>Development Areas% of Phase 26565935100</th> <th>t side 76 lots side <u>45 lots</u> <u>121 lots</u></th> <th>-</th>				In Out 20 45 45 10 10 25 25	% West Sch % East Sch % Ball Road % West Bal	naad Rd aad Rd d East l Camp Pike	Directional Distribution			Development Areas% of Phase 26565935100	t side 76 lots side <u>45 lots</u> <u>121 lots</u>	-
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	Road "A" at Lobetti	Road				% TOTAL	0	10					
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	EB Left	0	0	0	0	0		JL I					
NB Left 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	EB Right		0	0	0	0			386				
NB Trinu 0	ND Leit	0	0	0	10	10			ent				
SB Right 0	SB Thru	0	0	0	10	10	· · · · · · · · · · · · · · · · · · ·	T	Derc				
Road Road Extension % TOTAL B Left 0 <th cols<="" td=""><td>SB Right</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>10</td><td>Π</td></th>	<td>SB Right</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>10</td> <td>Π</td>	SB Right	0	0	0	0	0	0	10	Π			
Note of the second systems of the second sys	<u> </u>	D 12				• •							
LB Left 0<	Road "A" at Schaad	Road Exten	<u>sion</u>			% TOTAL							
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	EB Left	0	0	0	0	0							
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	EB Thru	0	7	0	0	7							
WB Lcfr. 0	EB Right	0	13	0	0	13							
WB Thru 0 7 0 0 7 WB Right 0 0 0 0 7 7 99 NB Right 0 0 0 0 0 0 0 0 NB Right 0 0 0 0 0 0 0 0 NB Right 0 0 0 0 0 0 0 0 0 NB Right 0 0 0 0 0 0 0 0 0 0 SB Right 0 0 0 0 0 0 0 0 0 0 B Ihra 0 0 0 0 0 25 0 0 25 0 0 25 0 0 25 0 <td>WB Left</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td></td> <td>oc Oc</td> <td></td>	WB Left	0	0	0	0	0		oc Oc					
WB Right 0	WB Thru	0	7	0	0	7	\	inta	4				
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	WB Right	0	0	0	0	0	7	erce	7				
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	NB Left	0	0	0	0	0		$\mathbf{P}_{\mathbf{c}}$					
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	NB Thru		0	0	0	0							
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	NB Kight	0	0	29.25	6.5	35.75	•						
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	SB Left SB They	0	0	0	0	0							
So Right 2 0	SB Right	0	0	0	0	0			35.75				
Nord "C" at Loberti Road 62 0			Ť	Ť	Ť	Ÿ							
EB Left 0 20 15.75 3.5 3.5 19.25 25 EB Right 25 0 0 0 25 0	Road "C" at Lobetti	Road				% TOTAL	62	0					
EB Right 25 0 0 0 25 NB Left 25 0 0 0 25 NB Left 25 0 0 0 25 NB Thru 0 0 0 0 0 SB Right 0 7 45 10 62 Set Right 0 0 0 0 0 0 Set Right 0 0 0 65 25 0 <t< td=""><td>EB Left</td><td>0</td><td>20</td><td>15.75</td><td>3.5</td><td>39.25</td><td></td><td></td><td></td></t<>	EB Left	0	20	15.75	3.5	39.25							
NB Left 25 0 0 0 25 0 <td>EB Right</td> <td>25</td> <td>0</td> <td>0</td> <td>0</td> <td>25</td> <td>39.25</td> <td></td> <td>e.</td>	EB Right	25	0	0	0	25	39.25		e.				
NB Thru 0<	NB Left	25	0	0	0	25	25		Jtag				
SB Thru 0<	NB Thru	0	0	0	0	0			tcet				
SB Right 0 7 45 10 62 25 0 Lobetti Road at Schaad Road Extension $^{\circ}$ TOTAL $^{\circ}$ $^{$	SB Thru	0	0	0	0	0			Pe				
Lobetti Road at Schaad Road ExtensionEB Left006.56.5EB Thru0029.25029.25EB Right07007WB Left00000000000WB Right000000000WB Right000000000NB Right0015.750SB Left00000000SB Thru00 </td <td>SB Right</td> <td>0</td> <td>7</td> <td>45</td> <td>10</td> <td>62</td> <td>25</td> <td>0</td> <td></td>	SB Right	0	7	45	10	62	25	0					
EB Left0006.56.5EB Thru0029.25029.25EB Right07007WB Left00000WB Right00000WB Right00000NB Right0015.75015.75SB Left00000SB Right000000000SB Right000000000100001000010001000100011001215.751315.751410150 <td>Lobetti Road at Sch</td> <td>aad Road Ex</td> <td>tension</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>	Lobetti Road at Sch	aad Road Ex	tension										
Left000000.50.50.5EB Right07007 45 565 565 EB Right07007 6.5 565 565 WB Left00000 6.5 6.5 565 WB Right00000 29.25 565 565 565 WB Right00000 29.25 565 565 565 565 NB Right0003.53.5 756 756 565 756 SB Left0001010 106 200 3.5 15.75 756 756 7566 SB Right00000 006 006 $0066666666666666666666666666666666666$	ED L-A	0	0	0	(E	% TOTAL	0	10	0				
Lib Intu 0 0 $25,25$ 0 $29,25$ EB Right 0 7 0 0 7 WB Left 0 0 0 0 0 0 0 0 0 0 0 WB Right 0 0 0 0 0 0 0 0 0 0 0 NB Right 0 0 0 0 20 NB Right 0 0 0 $15,75$ 0 $15,75$ SB Left 0 0 0 0 0 0 SB Right 0 0 0 0 0 0 SB Right 0 0 0 0 0 0	EB Left	0	0	20.25	6.5	0.5 20.25							
In bight000000WB Left00000WB Thru00000WB Right00000NB Left000029.25 $\begin{array}{c} & & & & \\ & & & & \\ & & & & \\ & & & & $	ED Inru EB Right	0	7	29.25	0	29.25 7	•	•	~				
WB Thru 0 </td <td>WB Left</td> <td>0</td> <td>0</td> <td>45</td> <td>0</td> <td>45</td> <td>6.5</td> <td>6</td> <td></td>	WB Left	0	0	45	0	45	6.5	6					
NB Right 0<	WB Thru	0	0	0	0	0	0.5—	tage 0	— 0				
NB Left 0 20 0 0 20 NB Thru 0 0 0.5.5 3.5 7 45 NB Right 0 0 15.75 0 15.75 0 15.75 SB Left 0 0 0 0 0 0 0 0 SB Thru 0 0 0 10 10 10 20 3.5 15.75 SB Right 0 0 0 0 0 0 0 0 0 10	WB Right	0	0	0	0	ŏ	29.25	cen	0				
NB Thru 0 0 0 3.5 3.5 NB Right 0 0 15.75 0 15.75 SB Left 0 0 0 0 0 0 0 SB Thru 0 0 0 10 10 10 20 3.5 15.75	NB Left	0	20	0	0	20	· · · · · · · · · · · · · · · · · · ·	Per					
NB Right 0 0 15.75 0 15.75 SB Left 0 0 0 0 0 0 SB Thru 0 0 0 10 10 10 SB Right 0 0 0 0 0 0 10	NB Thru	0	0	0	3.5	3.5	7 🛌		7 45				
SB Left 0 0 0 0 0 SB Thru 0 0 0 10 10 10 SB Right 0 0 0 0 0 10 10	NB Right	0	0	15.75	0	15.75	•	•					
SB Thru 0 0 10 10 SB Right 0 0 0 0 0 20 3.5 15.75	SB Left	0	0	0	0	0	~	1	R				
SB Right 0 0 0 0 0 20 3.5 15.75	SB Thru	0	0	0	10	10							
	SB Right	0	0	0	0	0	20	3.5	15.75				

% Entering Development	100 %
% Exiting Development	100 %

AM 2022												
In Ou	t					Dev	velopment Areas				Generated Trips	
45 45	% West Sc	haad Rd	ion							AM	In	6
20 20	% East Scl	haad Rd	tior				Phase 1		66 lots		Out	32
10 10	% Ball Roa	id East	irec									
25 25	% West Ba	ill Camp Pi										
Road "A" at Lobet	ti Road							1	0			
Road II at Lober	<u>a Road</u>				% TOTAL			10	0			
EB Left	0	0	0	10	10			Л				
EB Right	25	45	20	0	90	3	10	\sim	•		Trips	
NB Left	25	45	20	0	90	29	90					
NB Thru	0	0	0	0	0		•					
SB Thru	0	0	0	0	0							
SB Right	0	0	0	10	10			90	0	-		
Road "A" at Schaa	d Road Exte	nsion						5	0			
					% TOTAL							
EB Left	0	0	0	0	0							
EB Thru	0	45	0	0	45							
EB Right	0	0	0	0	0							
WB Left	0	0	0	0	0					-		
WB Thru	0	45	0	0	45				Trips			
WB Right	0	0	0	0	0	3	45				45	14
NB Left	0	0	0	0	0							
NB Thru	0	0	0	0	0	0	0					
NB Right	0	0	0	0	0							
SB Left	0	0	0	0	0						•	
SB Thru	0	0	0	0	0							
SB Right	0	0	0	0	0					θ		
Road "C" at Lobet	ti Road							0	8	0		
riolita O at 15000	<u>a nona</u>				% TOTAL			0	25	_1		
EB Left	0	0	0	0	0		•	Π				
EB Right	0	0	0	0	0	0	0	P	•			
NB Left	0	0	0	0	0	0	0				Trips	
NB Thru	25	0	0	0	25							
SB Thru	25	0	0	0	25		•					
SB Right	0	0	0	0	0			0	25	_		
Lobotti Road at Se	haad Road E	stongion						0	2	6		
1.00ctu Moau at SU	maa noau E	<u>ARCH31011</u>			% TOTAL			45	25	20		
EB Left	0	45	0	0	45							
EB Thru	0	0	0	0	0				•	9	•	
EB Right	0	0	0	0	0						^	
WB Left	0	0	0	0	0	3	45				5 20	1
WB Thru	0	0	0	0	0	<u> </u>					20	
WB Right	0 —	0	20	0	20	0	0				6	0
NBLeft	ů –	0	0	0	0							v
NB Then	25	0	0	0	25	0	0				— 0	0
NB Right	25	0	0	0	25	U						0
TAD RUBIIT	0	0	20	0	20		~				*	
CDIAF	0	0	20	0	20						•	
SB Left	25	0	0	0	114							
SB Left SB Thru	25	0	0	0	25				25	•		

Entering Development6 tripsExiting Development32 trips

AM 2022												
In C 45 4 20 2 10 1 25 2	Out5% West Sci0% East Sci0% Ball Rog5% West Ball	haad Rd naad Rd ad East ill Camp Pil	Directional Distribution			De	evelopment Areas Phase 2		121 lots	G AM	enerated Trips In Out	<mark>24</mark> 71
Road "A" at Lob EB Left EB Right NB Left NB Thru SB Thru SB Right	0 0 0 0 0 0 0 0	0 0 0 0 0	0 0 0 0 0	$\begin{array}{c} 0 \\ 0 \\ 0 \\ 10 \\ 10 \\ 0 \end{array}$	% TOTAL 0 0 10 10 10 0	0			2 10 10 10 10 7]	Trips	
Road "A" at Sch EB Left EB Thru EB Right WB Left WB Thru WB Right NB Left NB Thru NB Right SB Left SB Thru SB Right	aad Road Exte 0 0 0 0 0 0 0 0 0 0 0 0 0	nsion 0 15.75 29.25 0 15.75 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 13 0 0 0	$egin{array}{ccc} 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 6.5 \\ 0 \\ 0 \\ 0 \\ 0 \end{array}$	% TOTAL 0 15.75 29.25 0 15.75 0 0 0 19.5 0 0 0 0 0 0	4	15.75		Trips	19.5 14	15.75	11
EB Left EB Right NB Left NB Thru SB Thru SB Right	0 25 25 0 0 0	45 0 0 0 0 15.75	7 0 0 0 0 20	$3.5 \\ 0 \\ 0 \\ 0 \\ 0 \\ 10$	% TOTAL 55.5 25 25 0 0 45.75	<u>39</u> 18	55.5 1 25	45.75 4 5.75 2 5 6]	Trips	
Lobetti Road at 3 EB Left EB Thru EB Right WB Left WB Thru WB Right NB Left NB Thru NB Right SB Left SB Thru SB Right	Schaad Road E 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 15.75 0 0 0 45 0 0 0 0 0 0 0 0	0 13 0 20 0 0 0 0 7 0 0 0 0	$ \begin{array}{c} 6.5 \\ 0 \\ 0 \\ 0 \\ 0 \\ 3.5 \\ 0 \\ 10 \\ 0 \end{array} $	% TOTAL 6.5 13 15.75 20 0 45 3.5 7 0 10 0	5 9 4	6.5 13 15.75	0 0 2 45 32	2 10 3.5 2			0

 Entering Development
 24 trips

 Exiting Development
 71 trips

AM 2022 In Out % West Schaad Rd % East Schaad Rd % Ball Road East % West Ball Camp Pil						Ge AM	nerated Trips In Out	30 103
Road "A" at Lobetti Road EB Left EB Right NB Left NB Thru SB Thru SB Right	% TOTAL	3 29	1	1 , , , , , , , ,	2 1 1 7][Trips	
Road "A" at Schaad Road Extension EB Left EB Right EB Right EB Right WB Left EB Right WB Right EB Right NB Left EB Right SB Right EB Right	% TOTAL	6		[Trips		ŧ	26
Road "C" at Lobetti Road EB Left EB Right NB Left NB Thru SB Thru SB Right	% TOTAL	39 18	1		8 1 2]	Trips	
Lobetti Road at Schaad Road Extension EB Left EB Thru EB Right WB Left WB Thru WB Right NB Left NB Left SB Right SB Left SB Right SUM CHECK	% TOTAL	7 9 4				6 L	r 1 1	1 0 5

Entering Development30 tripsExiting Development103 trips

AM 2022												
In Ou 20 45 45 10 10 25 25	t % West So % East So % Ball Ro % West Ba	chaad Rd haad Rd ad East all Camp Pi	Directional Distribution			De	velopment Areas Phase 1		66 lots	AM	Generated Trips In Out	29 14
Road "A" at Lober	tti Road							3	0			
EB Left	0	0	0	10	% TOTAL 10			10	0			
EB Right	25	20	45	0	90	1	10	J.	1		Trips	
NB Left	25	20	45	0	90	13	90					
NB Thru	0	0	0	0	0							
B Thru	0	0	0	0	0		•					
B Right	0	0	0	10	10			90	0	-		
Road "A" at Schaa	d Road Exte	nsion						26	0			
					% TOTAL							
EB Left	0	0	0	0	0							
EB Thru	0	20	0	0	20							
EB Right	0	0	0	0	0							
VB Left	0	0	0	0	0					_		
VB Thru	0	20	0	0	20				Trips]		
VB Right	0	0	0	0	0	6	20				20	3
NB Left	0	0	0	0	0							
IB Thru	0	0	0	0	0	0						
NB Right	0	0	0	0	0							
B Left	0	0	0	0	0		Ť			R	•	
B Thru	0	0	0	0	0							
B Right	0	0	0	0	0					0		
Road "C" at Lobet	ti Road							0	4	0		
					% TOTAL			0	25			
EB Left	0	0	0	0	0							
EB Right	0	0	0	0	0	0	0					
NB Left	0	0	0	0	0	0					Trips	
JB Thru	25	0	0	0	25		•					
B Thru	25	0	0	0	25							
B Right	0	0	0	0	0			0	25	٦		
obetti Road at Sc	haad Road E	extension						3	4	6		
BLoft	0	20	0	0	% TOTAL			20	25	45		
D Lett	0	20	0	0	20			لے			•	
D Infu D Dicht	0	0	0	0	0				•	_		
D Kignt	0	0	0	0	0						Ľ.	1.2
VD LEIU	0	0	0	0	0	0	20				45	13
v D I hru	0	0	0	0	0	0						~
V B Kight	0	0	45	0	45	0						0
IB Left	0	0	0	0	0		. –				— -	
(11) (11)	25	0	0	0	25	0						0
B Inru		0	0	0	0					_	\checkmark	
IB Thru IB Right	0											
IB Thru IB Right B Left	0	0	45	0	45				1		•	
IB Thru IB Right B Left B Thru	0 25	0 0	45 0	0 0	45 25				1	r		

Entering Development29 tripsExiting Development14 trips

AM 2022										
	In Out 20 20 % West Schaad Rd 45 45 % East Schaad Rd 10 0 % Ball Road East 25 % West Ball Camp Pil	Directional Distribution		De	evelopment Areas Phase 2		121 lots	Ge AM	enerated Trips In Out	<mark>79</mark> 46
Road "A" at	Lobetti Road		% TOTAL			0	8 10			
EB Left EB Right NB Left NB Thru SB Thru SB Right	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	$\begin{array}{ccc} 0 & 0 \\ 0 & 0 \\ 0 & 0 \\ 0 & 10 \\ 0 & 10 \\ 0 & 0 \end{array}$	0 0 10 10 0	0		,	10 5	1	Trips	
Road "A" at	Schaad Road Extension					<u> </u>	5			
EB Left EB Thru EB Right WB Left WB Thru WB Right NB Thru NB Right SB Left SB Thru SB Right Road "C" at EB Left EB Right NB Left	0 0 0 15.75 0 29.25 0 0 0 15.75 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 20 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 13 6.5 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	% TOTAL 0 15.75 29.25 0 15.75 0 0 19.5 0 0 0 19.5 0 0 50 0 0 25.5 25 25 25	12 23 26 12	15.75 •••	.36 45.75	0 0	19.5 9	(15.75) Trips	7
NB Thru SB Thru		0 0 0	0		•		1			
SB Right	0 15.75	20 10	45.75			25 20	0 0 8			
EB Left EB Thru EB Right WB Left WB Thru WB Right	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	$\begin{array}{cccc} 0 & 6.5 \\ 13 & 0 \\ 0 & 0 \\ 20 & 0 \\ 0 & 0 \\ 0 & 0 \\ 0 & 0 \\ \end{array}$	% TOTAL 6.5 13 15.75 20 0 0 45	<u> </u>	6.5			ů L	۰ د ا	0
NB Lett NB Thru NB Right SB Left SB Thru SB Right	$\begin{array}{cccc} 0 & 45 \\ 0 & 0 \\ 0 & 0 \\ 0 & 0 \\ 0 & 0 \\ 0 & 0 \\ 0 & 0 \end{array}$	$\begin{array}{cccc} 0 & 0 \\ 0 & 3.5 \\ 7 & 0 \\ 0 & 0 \\ 0 & 10 \\ 0 & 0 \end{array}$	45 3.5 7 0 10 0	12	15.75	45 21	1 3.5 2	7 3	2 0	16

 Entering Development
 79 trips

 Exiting Development
 46 trips

AM 2022 In Out % West Schaad Rd % East Schaad Rd % Ball Road East % West Ball Camp Pi						Ge: AM	nerated Trips In Out	108 60
Road "A" at Lobetti Road EB Left EB Right NB Left NB Thru SB Thru SB Right	% TOTAL	1 13	1	3 2 6	8 1 5] [Trips	
Road "A" at Schaad Road Extension EB Left EB Thru EB Right WB Left WB Right NB Left WB Right SB Left SB Right SB Right	% TOTAL	18	ר ר	[Trips			10
Road "C" at Lobetti Road EB Left EB Right NB Left SB Thru SB Thru SB Right	% TOTAL	26 12		36 J 20	4]	Trips	
Lobetti Road at Schaad Road Extension EB Left EB Thru EB Right WB Left WB Thru WB Right NB Left NB Thru NB Right SB Left SB Thru SB Right SUM CHECK	% TOTAL	9 6 12			11 1 9			13 0 16

 Entering Development
 108 trips

 Exiting Development
 60 trips

APPENDIX L

SPOT SPEED STUDY DATA

SPOT SPEED STUDY

Location:	Ball Road (near Lobetti Road intersection)
Posted Speed Limit:	40 mph
Equipment:	Bushnell Speedster III Radar Speed Gun
Direction:	Westbound

Vehicle #	Speed
	(mph)
1	45
2	42
3	47
4	37
5	41
6	43
7	44
8	43
9	43
10	45
11	43
12	51
13	42
14	44
15	44
16	46
17	44
18	55
19	41
20	45
21	44
22	46
23	40
24	48
25	45

Vehicle #	Speed
	(mph)
26	42
27	54
28	45
29	54
30	45
31	46
32	46
33	42
34	46
35	40
36	32
37	44
38	35
39	40
40	42
41	48
42	46
43	45
44	36
45	44
46	45
47	42
48	55
49	44
50	46

Date: 3/8/17 Weather: Mild/Sunny Time: 2:15 PM





Average speed = 50th percentile speed = 85th percentile speed = 44.2 mph44.0 mph46.7 mph

SPOT SPEED STUDY

Location:	Ball Road (near Lobetti Road intersection)
Posted Speed Limit:	40 mph
Equipment:	Bushnell Speedster III Radar Speed Gun
Direction:	Eastbound

Vehicle #	Speed
	(mph)
1	40
2	49
3	42
4	40
5	46
6	48
7	46
8	38
9	46
10	40
11	44
12	45
13	46
14	50
15	47
16	46
17	48
18	47
19	40
20	45
21	40
22	42
23	41
24	41
25	49

Vehicle #	Speed
	(mph)
26	48
27	46
28	54
29	50
30	50
31	48
32	43
33	43
34	49
35	48
36	40
37	50
38	49
39	47
40	45
41	42
42	51
43	39
44	41
45	40
46	45
47	40
48	47
49	48
50	46

Date: 3/8/17 Weather: Mild/Sunny Time: 2:15 PM





Average speed = 50th percentile speed = 85th percentile speed = 45.1 mph 46.0 mph

49.0 mph

APPENDIX M

KNOX COUNTY TURN LANE VOLUME THRESHOLD WORKSHEET
TABLE 6A

LEFT-TURN LANE VOLUME THRESHOLDS FOR TWO-LANE ROADWAYS WITH A PREVAILING SPEED OF 46 TO 55 MPH

OPPOSING	THROU	GH VOLUME	PLUS RIGH	T-TURN V	'OLUME	*
VOLUME	100 - 149	150 - 199	200 - 249	250 - 299	300 - 349	350 - 399
100 - 149	200	140	100	75	60	50
150 - 199	175	120	85	65	55	45
260 - 249	150	100	75	60	50	40
250 - 299	130	85	65	55	45	35
300 - 349	110	75	60	50	40	30
350 - 399	95	65	55	45	35	25
400 - 449	80	60	50	40	30	25
450 - 4 99	70	55	45	35	25	20
500 - 549	60	50	40	30	25	20
550 - 599	50	45	35	25	20	20
600 - 649	45	40	30	25	20	20
650 - 699	40	35	30	20	20	20
700 - 749	35	35	25	20	20	15
750 or Mare	35	35	25	20	15	15

(If the left-turn volume exceeds the table value a left -turn lane is needed)

OPPOSING	THROU	GH VOLUME	PLUS RIGH	T-TURN V	OLUME	Č*
VOLUME	350 - 399	400 - 449	450 ~ 499	500 - 549	550 - 599	=/ > 600
100 - 149	50	45	40	35	30	25
150 - 199	45	40	35	30	30	25
200 • 249 250 - 299	40 35	35	30 30	25 25	25 25	2.0
300 - 349	30	30	25	25 AM	Left Turns	20
350 - 399	25	25	25	20	= 35 > 20	20
400 - 449	25	25	20	20 T	'urn Lane	15
450 - 499	20	20	20		Currently	15
500 - 549 550 - 599	20 20	20 20	20 20	20 V	Varranted) 15] 15
600 - 549	20	20	15	15	15	15
650 - 699	20	15	15	15	15	15
700 - 749	15	15	15	15	15	15
750 or More	15	15	15	15	15	15

* Or through volume only if a right-turn lane exists.

TABLE 6B

11

RIGHT-TURN LANE VOLUME THRESHOLDS FOR TWO-LANE ROADWAYS WITH A PREVAILING SPEED OF 46 TO 55 MPH

RIGHT-TURN	THRO	UGH VOLUM	E PLUS LEI	T-TURN	VOLUME	*
VOLUME	< 100	100 - 199	200 - 249	250 - 299	300 - 349	350 - 399
Fewer Than 25 25 - 49 50 - 99	•					
100 - 149 150 - 199						Yes
200 - 249 250 - 299				Yes	Yes Yes	Yes Yes
300 - 349 350 - 399			Yes Yes	Yes Yes	Yes Yes	Yes Yes
400 - 449 450 - 499		Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
500 - 549 550 - 599	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
600 or More	Yes	Yes	Yes	Yes	Yes	Yes

RIGHT-TURN	THRO	UGH VOLUM	E PLUS LEI	T-TURN	VOLUMI	<u>;</u> *
VOLUME	350 - 399	400 - 449	450 - 499	500 - 549	550 - 600	+ / > 600
Fewer Than 25 25 - 49 50 - 99			Yes	PM Right	t Turns	Yes Yes
100 - 149 150 - 199	Yes	Yes Yes	Yes Yes	Turn I	Lane	Yes Yes
200 - 249 250 - 299	Yes Yes	Yes Yes	Yes Yes	NO Curre Warra	T T ntly } nted	Yes Yes
300 - 349 350 - 399	Yes Yes	Yes	Yes Yes	Yes	Yes	Yes Yes
400 - 449 450 - 499	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
500 - 549 550 - 599	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
600 or More	Yes	Yes	Yes	Yes	Yes	Yes

* Or through volume only if a left-turn lane exists.

APPENDIX N

SIMTRAFFIC QUEUE LENGTH REPORTS

Movement	EB	WB	SE	NW
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	7	69	40	32
Average Queue (ft)	0	9	8	8
95th Queue (ft)	4	42	31	30
Link Distance (ft)	695	690	434	2556
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 2: Ball Camp Pike & Lobetti Road

20	JL
LT	LR
27	56
1	24
16	49
842	2556
	LT 27 1 16 842

Network Summary

Movement	EB	WB	SE	NW
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	31	38	30	32
Average Queue (ft)	3	2	6	6
95th Queue (ft)	19	16	26	27
Link Distance (ft)	695	690	434	2556
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 2: Ball Camp Pike & Lobetti Road

Movement	EB	SE
Directions Served	LT	LR
Maximum Queue (ft)	28	31
Average Queue (ft)	1	4
95th Queue (ft)	12	20
Link Distance (ft)	842	2556
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Movement	EB	WB	SE	NW
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	8	84	30	50
Average Queue (ft)	0	13	8	20
95th Queue (ft)	7	50	29	47
Link Distance (ft)	696	691	434	425
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 2: Ball Camp Pike & Lobetti Road

Movement	EB	SE
Directions Served	LT	LR
Maximum Queue (ft)	40	59
Average Queue (ft)	2	28
95th Queue (ft)	18	55
Link Distance (ft)	842	2074
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 8: Lobetti Road & Road "A"

Movement	EB	NW
Directions Served	LR	LT
Maximum Queue (ft)	32	3
Average Queue (ft)	17	0
95th Queue (ft)	38	3
Link Distance (ft)	246	2074
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Movement	EB	WB	SE	NW
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	35	88	30	39
Average Queue (ft)	2	14	7	13
95th Queue (ft)	16	52	28	38
Link Distance (ft)	696	690	434	380
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 2: Ball Camp Pike & Lobetti Road

Movement	EB	SE
Directions Served	LT	LR
Maximum Queue (ft)	59	32
Average Queue (ft)	5	8
95th Queue (ft)	29	30
Link Distance (ft)	842	2118
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 8: Lobetti Road & Road "A"

Movement	EB	NW
Directions Served	LR	LT
Maximum Queue (ft)	36	9
Average Queue (ft)	10	0
95th Queue (ft)	33	5
Link Distance (ft)	265	2118
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

APPENDIX O

SCHAAD ROAD EXTENSION ROAD PLANS

_____ 11 11 25352 . 94+87.10 (110)NG01>5-JOHN AND DEBORAH D. PACE (112)OSCAR H. AND ELLA M. ROMINES 13/3 RONALD D. AND BRENDA L. GRAVES 230 \Box WALTER W. HOLLAND I -S-FR RES. (114)LEROY AND BARBARA J. BURGIN 115-FR S · > _ / EULA W. HOLLANQ. 0 % A WELL HOUSE RES. (110) \square JOHN AND DEBORAH D. PACE SHED DENTON KENNETH T. AND HATTIE'L. WILLIAM_K. AND TI SHERRIE L. DENTION (5)1/04 ELIMINATED TRACT NO. 113.GGRGC(4)9/03 REVISED ALIGNMENT BEGINNING AT STA.237+28.47 GGRGCNO.DATEDESCRIPTIONBYCKD. (6) 1/04 ELIMINATED TRACT NO. 113. REVISIONS

Thu Jan 08 07:56:40 2004 L: \GENERAL \2000\00025 \BCAMP.pri





Thu Jan 08 08:33:58 2004 L: \GENERAL \2000\00025 \BCAMP.pr

e (118) MARY JO SMITH 240	Re NATCH LINE STA 242+00.00 (SET Sta 241+33.99 51.00' RT N50'58'28'E Sta 241+33.99 51.00' RT N50'58'28'E N50'58'28'E N50'58'28'E N50'58'28'E	NOTE SHEET NO. 16A)	
ROPOSED R.O.W. STA. 230+00 TO 242+00	DESIGNED BY CHECKED BY G.G. R.G.C. DRAWN BY DATE	SCALE SHEET 1"=50' FILE NO. 000055	NO. 15A



Tue Sep 02 12:52:05 2003 L: \GENERAL \2000\00025 \BCAMP.pr

4 9/03 REVISED ALIGNMENT E NO. DATE DE	BEGINNING AT STA.237+28 SCRIPTION	B. 47 GG RGC BY CKD.	G. CAMPBELL & ASS CONSULTING ENGINER	BOC., L.P.	BALL	CAMP PIKE RELOCATION	239+00 240+0 PROP(STA. 230+
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	1040						
						Image: Sector	
	1050						
	1060				30" R.C.P. @-0.540%		R.C.P. + 9 1.15% 0 0 N 1 N 1 N 1 N 1 N 1 N 1 N 1 N 1 N 1 N 1
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	1080			PBR 1000			200.00ft VC K= 156.4 V= 50 MPH +
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		Image: state					
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	G.G.	R.G.C.	1"=50' HORV. 1"=5' VERT.	NO. (15C)
TUU IU 31A. 242+00	G.G.	OCT. 2002	00025	



ì. (CAMPBELL & ASSOC.,	L.P.
CC	DNSULTING ENGINEERS	
	KNOXVILLE. TENNESSEE	

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G. CAMPBELL & ASSOC., L.P.
CONSULTING ENGINEERS
KNOXVILLE, TENNESSEE

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	GG BGC	HUBERT G. CAMPBELL & ASSOC., L.P.	BALL CAMP PIKE BELOCATION	PROPOSED PROFILE	G.G. R.G.C. 1"=5' VERT			
NO DATE	RIPTION	CONSULTING ENGINEERS			DRAWN BY DATE FILE NO. G.G. OCT. 2002 00025 OF SHEFT			

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Tue Sep 02 12:48:51 2003 L: \GENERAL \2000\00025 \BC.

CAMPBELL & ASSOC., L.P. NSULTING ENGINEERS KNOXVILLE, TENNESSEE	BALL CAMP PIKE RELOCATION	PRO FROM ST/

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BALL CAMP PIKE RELOCATION

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APPENDIX P

MUTCD RAILROAD CROSSINGS

warning and control. Pavement markings shall not be required at grade crossings in urban areas if an engineering study indicates that other installed devices provide suitable warning and control. *Guidance:*

Option:

⁰⁶ When justified by engineering judgment, supplemental pavement marking symbol(s) may be placed between the Grade Crossing Advance Warning sign and the grade crossing.

⁰⁵ When pavement markings are used, a portion of the X symbol should be directly opposite the Grade Crossing Advance Warning sign. The X symbol and letters should be elongated to allow for the low angle at which they will be viewed.

Figure 8B-7. Grade Crossing Pavement Markings

Section 8B.28 Stop and Yield Lines

Standard:

On paved roadways at grade crossings that are equipped with active control devices such as flashing-light 01 signals, gates, or traffic control signals, a stop line (see Section 3B.16) shall be installed to indicate the point behind which highway vehicles are or might be required to stop.

Guidance:

- On paved roadway approaches to passive grade crossings where a STOP sign is installed in conjunction 02 with the Crossbuck sign, a stop line should be installed to indicate the point behind which highway vehicles are required to stop or as near to that point as practical.
- If a stop line is used, it should be a transverse line at a right angle to the traveled way and should be placed 03 approximately 8 feet in advance of the gate (if present), but no closer than 15 feet in advance of the nearest rail.

- Signs and plaques larger than those shown in Tables 2C-2 and 2C-3 may be used (see Section 2A.11). *Guidance:*
- ⁰⁷ The minimum size for all diamond-shaped warning signs facing traffic on exit and entrance ramps should be the size identified in Table 2C-2 for the mainline roadway classification (Expressway or Freeway). If a minimum size is not provided in the Freeway Column, the Expressway size should be used. If a minimum size is not provided in the Freeway or the Expressway Column, the Oversized size should be used.

Section 2C.05 Placement of Warning Signs

Support:

For information on placement of warning signs, see Sections 2A.16 to 2A.21.

⁰² The time needed for detection, recognition, decision, and reaction is called the Perception-Response Time (PRT). Table 2C-4 is provided as an aid for determining warning sign location. The distances shown in Table 2C-4 can be adjusted for roadway features, other signing, and to improve visibility. *Guidance:*

Guidance:

⁰³ Warning signs should be placed so that they provide an adequate PRT. The distances contained in Table 2C-4 are for guidance purposes and should be applied with engineering judgment. Warning signs should not be placed too far in advance of the condition, such that drivers might tend to forget the warning because of other driving distractions, especially in urban areas.

				Advance	Placement D	istanaa ¹							
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or 85th- Percentile Speed	Speed reduction		Condition B	: Deceleration	n to the listed	advisory spe	ed (mph) for	r the condition					
	and lane changing in heavy traffic ²	0 ³	104	20 ⁴	30 ⁴	40 ⁴	50 ⁴	60 ⁴	70 ⁴				
20 mph	225 ft	100 ft ⁶	N/A ⁵	_	_	_	_	_	_				
25 mph	325 ft	100 ft ⁶	N/A ⁵	N/A ⁵	—	—	—	—	—				
30 mph	460 ft	100 ft ⁶	N/A ⁵	N/A ⁵	—	—	—	—	—				
35 mph	565 ft	100 ft ⁶	N/A ⁵	N/A ⁵	N/A ⁵	—	—	—	—				
40 mph	670 ft	125 ft	100 ft ⁶	100 ft ⁶	N/A ⁵	—	—	—	—				
45 mph	775 ft	175 ft	125 ft	100 ft ⁶	100 ft ⁶	N/A ⁵	—	—	—				
50 mph	885 ft	250 ft	200 ft	175 ft	125 ft	100 ft ⁶	_	_	_				
55 mph	990 ft	325 ft	275 ft	225 ft	200 ft	125 ft	N/A ⁵	—	—				
60 mph	1,100 ft	400 ft	350 ft	325 ft	275 ft	200 ft	100 ft ⁶	—	—				
65 mph	1,200 ft	475 ft	450 ft	400 ft	350 ft	275 ft	200 ft	100 ft ⁶	_				
70 mph	1,250 ft	550 ft	525 ft	500 ft	450 ft	375 ft	275 ft	150 ft	_				
75 mph	1,350 ft	650 ft	625 ft	600 ft	550 ft	475 ft	375 ft	250 ft	100 ft ⁶				

Table 2C-4. Guidelines for Advance Placement of Warning Signs

¹ The distances are adjusted for a sign legibility distance of 180 feet for Condition A. The distances for Condition B have been adjusted for a sign legibility distance of 250 feet, which is appropriate for an alignment warning symbol sign. For Conditions A and B, warning signs with less than 6-inch legend or more than four words, a minimum of 100 feet should be added to the advance placement distance to provide adequate legibility of the warning sign.

² Typical conditions are locations where the road user must use extra time to adjust speed and change lanes in heavy traffic because of a complex driving situation. Typical signs are Merge and Right Lane Ends. The distances are determined by providing the driver a PRT of 14.0 to 14.5 seconds for vehicle maneuvers (2005 AASHTO Policy, Exhibit 3-3, Decision Sight Distance, Avoidance Maneuver E) minus the legibility distance of 180 feet for the appropriate sign.

³ Typical condition is the warning of a potential stop situation. Typical signs are Stop Ahead, Yield Ahead, Signal Ahead, and Intersection Warning signs. The distances are based on the 2005 AASHTO Policy, Exhibit 3-1, Stopping Sight Distance, providing a PRT of 2.5 seconds, a deceleration rate of 11.2 feet/second², minus the sign legibility distance of 180 feet.

⁴ Typical conditions are locations where the road user must decrease speed to maneuver through the warned condition. Typical signs are Turn, Curve, Reverse Turn, or Reverse Curve. The distance is determined by providing a 2.5 second PRT, a vehicle deceleration rate of 10 feet/second², minus the sign legibility distance of 250 feet.

⁵ No suggested distances are provided for these speeds, as the placement location is dependent on site conditions and other signing. An alignment warning sign may be placed anywhere from the point of curvature up to 100 feet in advance of the curve. However, the alignment warning sign should be installed in advance of the curve and at least 100 feet from any other signs.

⁶ The minimum advance placement distance is listed as 100 feet to provide adequate spacing between signs.

7c) All drainage grates and covers for the residential development need to be pedestrian and bicycle friendly.

8) **Road "C" and Lobetti Road Intersections at the Schaad Road Extension:**

- 8a) According to the Schaad Road Extension plans, the intersection of Road "C" at the Schaad Road Extension will only be allowed to have right turns in and right turns out for the development at this intersection. There will not be a median opening at the Road "C" intersection at the Schaad Road Extension and will not allow for left turns. This intersection configuration will be constructed during the Schaad Road Extension project and prior to Phase 2 being developed.
- 8b) Table 7e gives a summary for the Phase 2 LOS at the two proposed intersections along the Schaad Road Extension. From the assumptions and the capacity calculations, it has been shown that the traffic movements at the proposed intersection of Lobetti Road at the Schaad Road Extension could operate at failure during the peak hours for the northbound and southbound approaches when all phases are completed for the development.

One of the largest reasons for this poor projected operation is due to the projected thru volumes heading northbound and southbound on Lobetti Road at the Schaad Road Extension. These thru volumes are largely due to the existing observed traffic on Lobetti Road during the AM peak hour being brought "forward" into the future. It is speculated that these existing thru volumes are motorists cutting through from Ball Road to Ball Camp Pike for access to Bakertown Road which ultimately leads to Middlebrook Pike. These existing volumes were adjusted upwards according to the projected growth rates, and once calculated in the projected conditions, suffers large delays attempting to cross the new Schaad Road Extension.

TABLE 7e
SUMMARY OF PHASE 2 INTERSECTIONS AT SCHAAD ROAD EXTENSION

	TRAFFIC			AM PEAK		PM PEAK			
INTERSECTION	CONTROL	APPROACH	LOS	DELAY	V/C	LOS	DELAY	V/C	
				(seconds)			(seconds)		
Schaad Road at	р	Northbound Left/Thru/Right	F	138.5	0.750	F	130.1	0.700	
Lobetti Road *	gnalize	Eastbound Left	В	10.6	0.010	А	8.9	0.010	
		Westbound Left	А	8.7	0.010	В	10.8	0.030	
PHASE 2 (2022)	Jusi	Southbound Left/Thru/Right	F	113.2	0.790	F	75.0	0.430	
	1								
Schaad Road at	p	Northbound Right	В	10.2	0.021	В	12.6	0.020	
Road "C"	lize								
	STOP) E								
PHASE 2 (2022)	Jnsi								
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Note: All analyses were calculated in Synchro 8 software and reported with HCM 2010 methodology unless noted otherwise * Schaad Road at Lobetti Road calculated using HCM 2000 methodology (2010 methodology will not compute results due to severe delays)

> It is not known if these thru volumes will continue in the future once the road landscape is changed with the construction of the new Schaad Road Extension. Along with this unknown, this study relies heavily on a variety of assumptions and speculative volumes for the Phase 2 time period. Completing the Schaad Road Extension will greatly impact and alter the traffic movements and volumes in this area. For this study, every effort has been made to provide reasonable analyses for the future conditions. More confidence can be placed in the results provided for Phase 1 of this development since this scenario occurs in the relative near future and is assumed to occur before the Schaad Road Extension is completed.

> Thus, it is the recommendation of this report that Phase 2 of Cascade Falls be developed only under the following conditions:

- i. The Schaad Road Extension is to be completed for all of its phases from Oak Ridge Highway to Middlebrook Pike.
- ii. Allow for some time to pass for vehicular traffic to settle with respect to movements, directions, and patterns.
- iii. Conduct traffic counts on the Schaad Road Extension and on Lobetti Road adjacent to the proposed development.

- iv. Conduct a new Traffic Impact Study to determine the impacts of opening Phase 2 of the development.
- v. Review results of the study and determine how the adjacent roadway system would be able to handle the additional traffic from Phase 2 thru roadway improvements or other means. Potential improvements could include a traffic signal. However, recommendations at this point for traffic signalization would be purely speculative and unwarranted at the present time.