

# TRAFFIC IMPACT STUDY

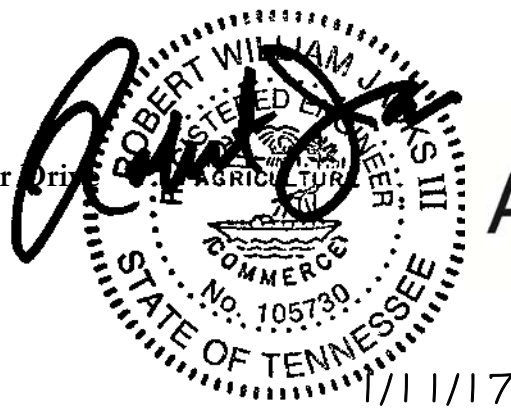
## CHEROKEE LANDING SUBDIVISION

### KNOX COUNTY, TENNESSEE

-Prepared For-

Perry Smith Development LLC  
190 Suite 104 Community Center Drive  
Pigeon Forge, TN 37863

-Prepared By-



Revised January 2017

## TABLE OF CONTENTS

<b>SECTION</b>	<b>PAGE</b>
INTRODUCTION.....	1
PROJECT DESCRIPTION.....	1
EXISTING CONDITIONS IN STUDY AREA .....	5
PHOTO EXHIBITS .....	7
EXISTING TRAFFIC VOLUMES .....	8
BACKGROUND TRAFFIC VOLUMES .....	11
TRIP GENERATION.....	14
TRIP DISTRIBUTION & ASSIGNMENT.....	16
PROJECTED TRAFFIC VOLUMES.....	21
SPOT SPEED STUDY .....	25
EVALUATION OF TURN LANE THRESHOLDS.....	26
CONCLUSIONS AND RECOMMENDATIONS .....	27
APPENDIX A - HISTORICAL TRAFFIC COUNT DATA	
APPENDIX B - MANUAL TRAFFIC COUNT DATA	
APPENDIX C - ITE TRIP GENERATION RATES	
APPENDIX D - MPC REZONING REPORT	
APPENDIX E - CAPACITY ANALYSES – HCM WORKSHEETS (SYNCHRO 8)	
APPENDIX F - SPOT SPEED STUDY DATA	
APPENDIX G - KNOX COUNTY LEFT & RIGHT TURN LANE VOLUME THRESHOLD WORKSHEETS	

## LIST OF FIGURES

<b>FIGURE</b>	<b>PAGE</b>
1. LOCATION MAP .....	2
2. PROPOSED PLAN LAYOUT.....	4
3A. 2016 PM SCHOOL PEAK HOUR TRAFFIC VOLUMES - EXISTING.....	9
3B. 2016 TRADITIONAL PEAK HOUR TRAFFIC VOLUMES - EXISTING.....	10
4A. 2021 PM SCHOOL PEAK HOUR TRAFFIC VOLUMES - BACKGROUND.....	12
4B. 2021 TRADITIONAL PEAK HOUR TRAFFIC VOLUMES - BACKGROUND.....	13
5A. DIRECTIONAL DISTRIBUTION OF GENERATED TRAFFIC TO/FROM SCHOOLS DURING SCHOOL PM PEAK HOUR.....	17
5B. DIRECTIONAL DISTRIBUTION OF GENERATED TRAFFIC DURING TRADITIONAL AM AND PM PEAK HOUR.....	18
6A. TRAFFIC ASSIGNMENT OF GENERATED TRAFFIC TO/FROM SCHOOLS DURING SCHOOL PM PEAK HOUR.....	19
6B. TRAFFIC ASSIGNMENT OF GENERATED TRAFFIC DURING TRADITIONAL AM AND PM PEAK HOUR.....	20
7A. 2021 PM SCHOOL PEAK HOUR TRAFFIC VOLUMES - PROJECTED .....	22
7B. 2021 TRADITIONAL PEAK HOUR TRAFFIC VOLUMES - PROJECTED .....	23
8. TYPICAL BOULEVARD ROAD CROSS SECTION .....	28

## LIST OF TABLES

<b>TABLE</b>	<b>PAGE</b>
1. TRIP GENERATION FOR CHEROKEE LANDING SUBDIVISION.....	14
2. LEVEL OF SERVICE & DELAY FOR UNSIGNALIZED INTERSECTIONS.....	24
3. 2021 PEAK HOUR LEVEL OF SERVICE & DELAY - PROJECTED .....	25

## **INTRODUCTION**

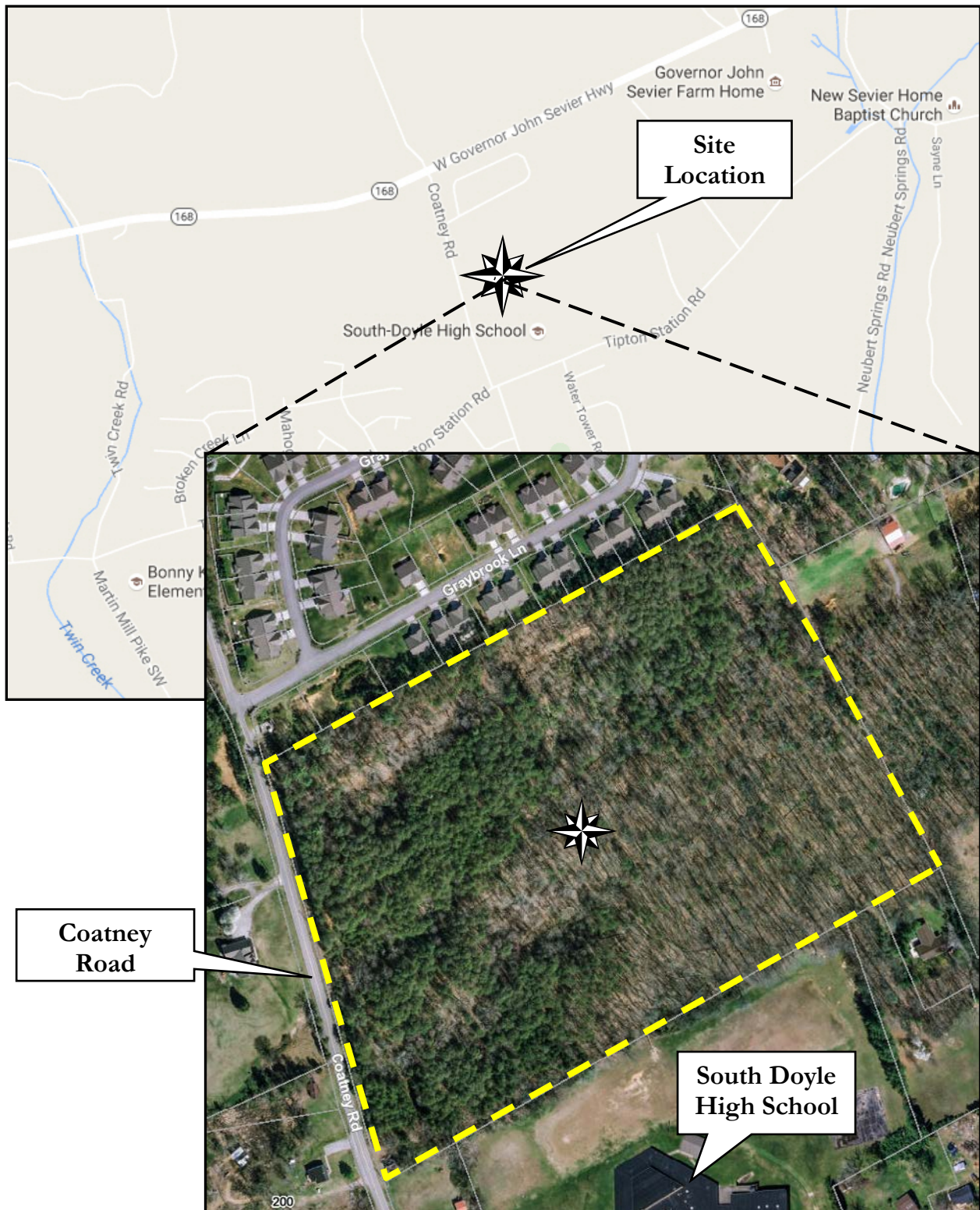
The purpose of this traffic study is to analyze the traffic impacts of a new proposed residential subdivision in Knox County, Tennessee. At this point in the concept stage of design, this development is named Cherokee Landing. This development is being proposed to the south and east of the unsignalized intersection of Coatney Road and West Governor John Sevier Highway in south Knox County. This traffic impact study follows the procedures as outlined for a Level 1 study in accordance with the standards set forth by the Knoxville/Knox County Metropolitan Planning Commission (MPC).

In this study the following analyses/methodologies were conducted:

- A review of the operating characteristics of the existing adjacent roadway system that will provide access to the proposed site
- Determination and application of the trips to the existing adjacent road system that are expected to be generated by the proposed development
- Evaluation of the road system locations to determine the potential traffic impacts of the proposed development
- Identification of recommendations for road improvements to mitigate the expected increase in traffic volume from the projected future traffic volumes

## **PROJECT DESCRIPTION**

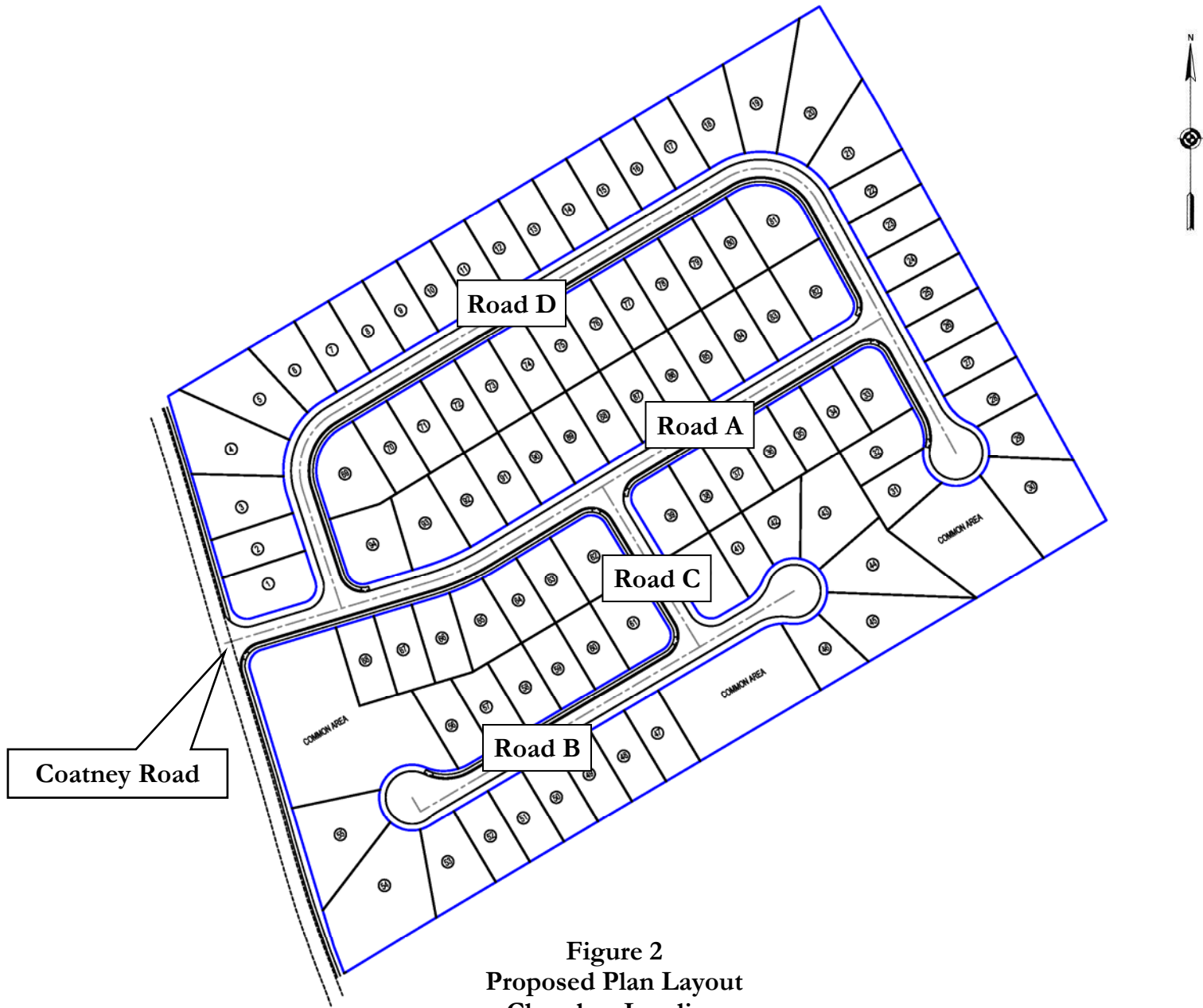
The proposed location of this new development is shown on a map in Figure 1. The development is to be located adjacent to Coatney Road beginning approximately 700 feet to the south and east of the unsignalized intersection of Coatney Road and West Governor John Sevier Highway. In the adjacent vicinity of this study area, there are several other residential subdivisions, individual residences, undeveloped properties, and a public high school. The existing development site consists entirely of forest. The site is bounded by a portion of South Doyle High School to the south. The proposed subdivision is expected to be comprised of a couple new internal paved roads on approximately 26 acres. The latest subdivision site design shows 94 single family residential lots which vary in size with most lots being around ¼ acre. The design shows that the subdivision will tie into Coatney Road approximately 1,150 feet to the south of the intersection with West Governor John Sevier Highway.



**Figure 1**  
**Location Map**

The proposed concept plan layout given by Norvell and Poe Engineers is shown in Figure 2. As can be seen in the figure, one main entrance is proposed to tie into Coatney Road. The one entrance into the development will be located on the west side of the development at Road “A” and Coatney Road. The total length of the new roadways within the development will be approximately 3,675 feet and are labeled as Road “A” thru Road “D” on the concept plan. The proposed typical section for the internal roadways will include a 50 foot right-of-way with 2 – 13 foot travel lanes and extruded concrete curbing. Sidewalks will be included within the development on a single side of the internal roadways. A sidewalk will also be constructed along the east side of Coatney Road within the development property road frontage.

The actual schedule for completion of this new residential development is dependent on economic factors. However, the current residential market in Knox County is experiencing fairly rapid growth. This project is also contingent on permitting, design, and other issues. However, for the purposes of this study, it was assumed that the total construction build-out and full occupation of the development will occur by the year 2021 (in 5 years).

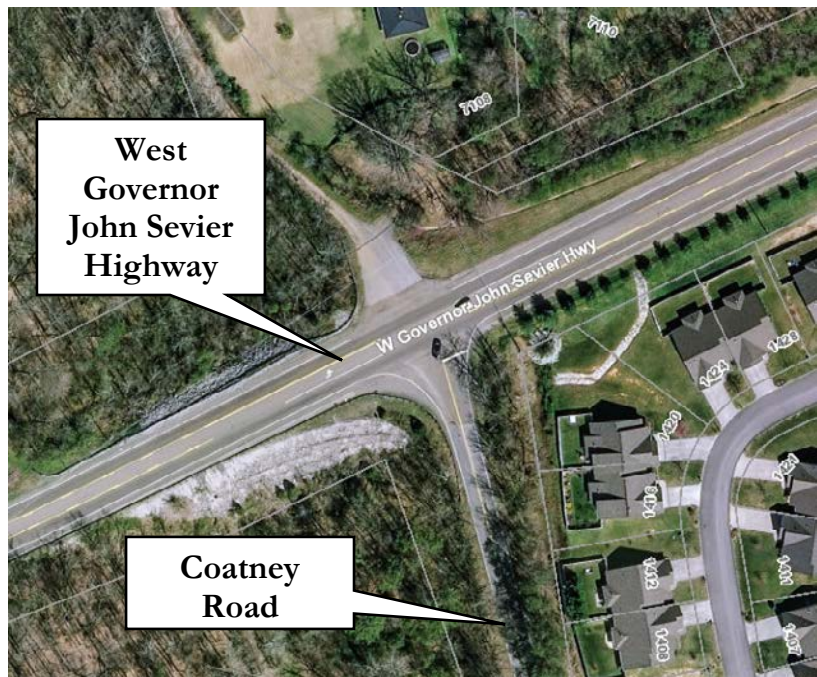


**Figure 2**  
**Proposed Plan Layout**  
**Cherokee Landing**

## EXISTING CONDITIONS IN STUDY AREA

**Coatney Road** is a local street traverses a total length of approximately 2,275 feet in a general north-south direction in between West Governor John Sevier Highway and Tipton Station Road. Coatney Road intersects Tipton Station Road to the south adjacent to South Doyle High School. Coatney Road is posted with a speed limit of 30 mph for the majority of its length. Approximately 375 feet to the north of the intersection of Coatney Road and Tipton Station Road, the posted speed limit on Coatney Road is 20 mph from 7:50 am until 4:10 pm for South Doyle High School. Coatney Road lane width varies between 9.5 feet and 10.5 feet.

**Governor John Sevier Highway (State Route 168)** is a Tennessee State Highway and is classified as a Major Arterial. The highway traverses in a general east-west direction near the proposed site and the highway has a total length of 18.1 miles. West Governor John Sevier Highway intersects Alcoa Highway at its beginning on its west side and terminates at Highway 11E (Asheville Highway) on the eastern side of its route.



**Intersection of Coatney Road and West Governor John Sevier Highway**

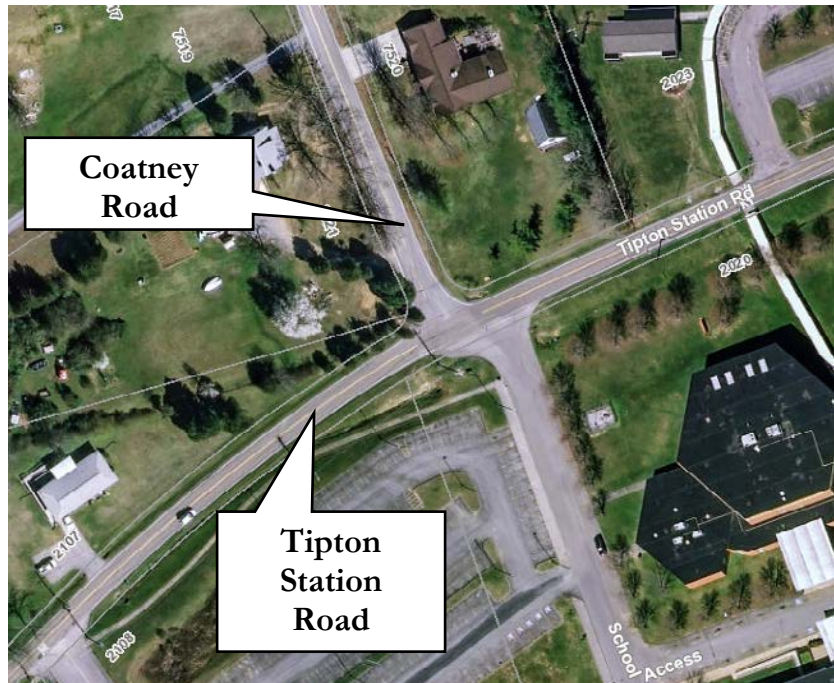
Near the proposed development off of Coatney Road, West Governor John Sevier Highway currently consists of a 3-lane pavement section with a center two way left turn lane and one thru lane in each direction. The highway lanes are 12 feet in width with a 5 foot paved shoulder. The roadway speed limit is posted at 50 mph.

Average Daily Traffic (ADT) on West Governor John Sevier Highway in the vicinity of this proposed development was reported by the Tennessee Department of Transportation (TDOT) at 14,950 vehicles per day in 2015 (Station #000290). This count station on West Governor



John Sevier Highway is approximately 4,300 feet to the west of the intersection of Coatney Road and West Governor John Sevier Highway. Refer to Appendix A for this historical traffic count data.

**Tipton Station Road** is classified as a Major Collector and traverses in a general northeast-southwest direction in south Knox County. The speed limit on Tipton Station Road is posted at 40 mph. Within the school zone the speed limit is reduced to 20 mph. Flashing school beacons are located on Tipton Station Road to the east and west of the campus. The beacon on the west side of the campus on Tipton Station Road is approximately 475 feet to the west of the



**Intersection of Coatney Road and Tipton Station Road**

intersection of Tipton Station Road and Coatney Road. The beacon on the east side of the campus on Tipton Station Road is approximately 1,300 feet to the east of the intersection of Tipton Station Road and Coatney Road. South Doyle High School near the intersection of Tipton Station Road and Coatney Road exists on both the north and south side of Tipton Station Road. Several crosswalks are located on Tipton Station Road for pedestrians crossing in between the north and south campus. The total enrollment of South Doyle High School is in excess of 1,000 students. Normal school hours at South Doyle are from 8:30 am – 3:30 pm.

Average Daily Traffic (ADT) on Tipton Station Road in the vicinity of this proposed development was reported by the Knoxville Transportation Planning Organization at 4,620 vehicles per day in 2015. This count station on Tipton Station Road is approximately 4,800 feet to the west of the intersection of Coatney Road and Tipton Station Road near Twin Creek.

**PHOTO EXHIBITS**

**View of  
Coatney Road  
(Looking South)**



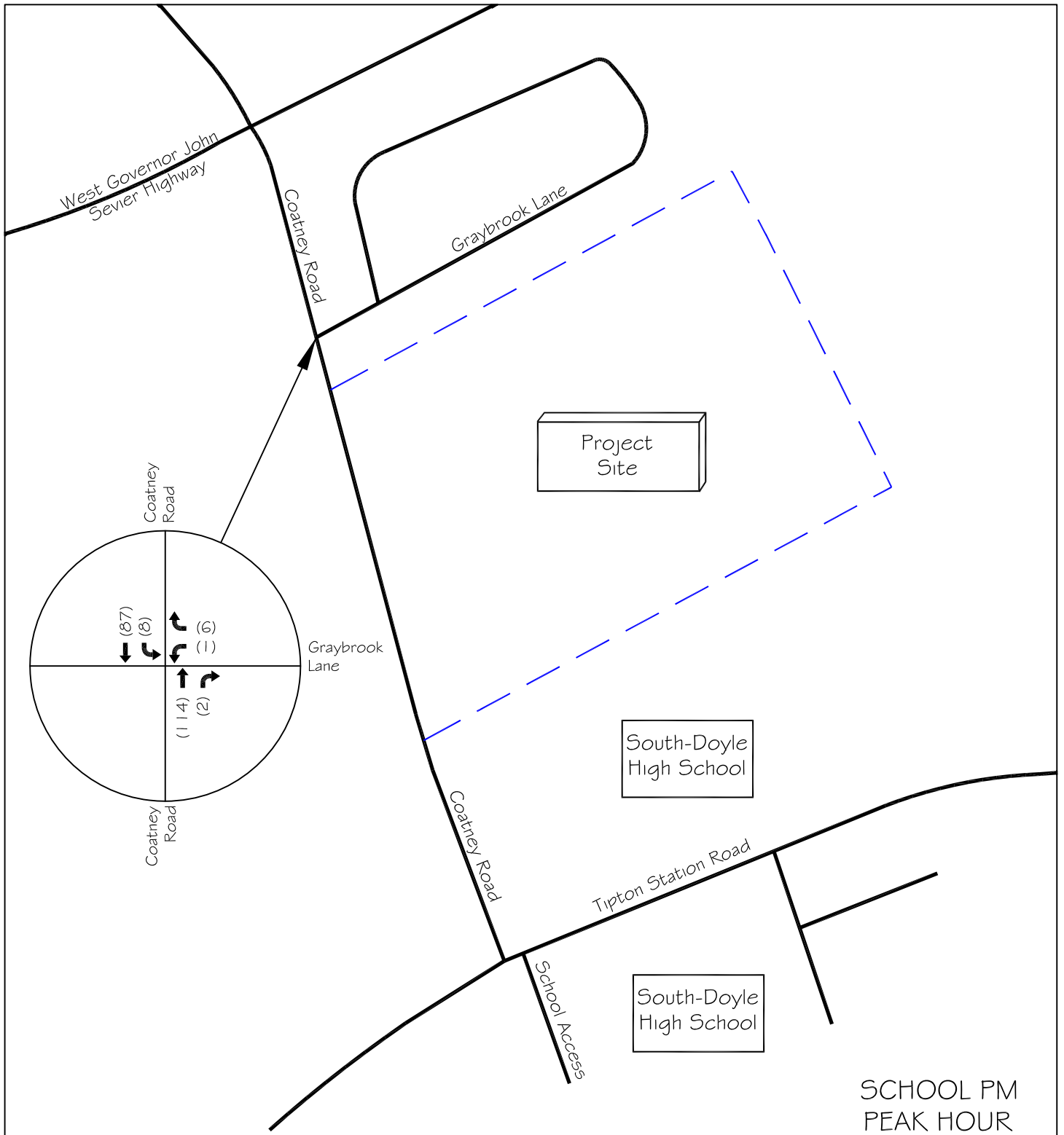
**View of  
Coatney Road  
(Looking North)**

## **EXISTING TRAFFIC VOLUMES**

In order to analyze the traffic impacts associated with the proposed future development, traffic counts were conducted at the nearby existing intersection of Graystone Lane at Coatney Road. The traffic counts were obtained on Wednesday, October 19<sup>th</sup>, 2016 during the morning and afternoon peak periods. South Doyle High School and other local schools were in operation at the time. The AM peak hour was observed at 7:30 - 8:30 and the PM peak hour from 4:30 – 5:30 at the intersection. The manual tabulated traffic counts can be reviewed in Appendix B. This existing intersection was counted to tabulate the thru traffic volumes on Coatney Road and to summarize the traffic movements to and from the existing adjacent subdivision.

Typically, in most instances, the daily morning peak traffic for schools coincides with the adjacent roadway peak hour traffic since the school arrival times correspond with the “traditional” rush hour morning commute periods (South Doyle High School starts at 8:30 am). However, peak school traffic in the afternoon does not usually coincide with the “traditional” afternoon peak hour due to earlier school dismissals in the afternoon (South Doyle High School ends school at 3:30 pm). Thus for this study, due to its proximity to the high school, it would be appropriate to assume that the morning peak hour traffic of the proposed residential subdivision will occur simultaneously with the school arrival morning peak traffic. The peak school traffic in the afternoon will need to be analyzed separately since there will not be a simultaneous occurrence of peak hour adjacent roadway traffic and school dismissal traffic. Typically most traffic impact studies only analyze the AM and PM peak hours of traffic which occur during the traditional rush hours. ITE recommended practices state that traffic impact studies should examine the time period(s) that provide the highest cumulative traffic demands to assess a development’s impact on the adjacent street system. Therefore, the traditional AM and PM peak hour of traffic were studied for the proposed intersection along with the PM school peak hour (3:00 – 4:00 pm) which occurs earlier in the afternoon around the dismissal period at the school.

Figure 3a and Figure 3b show the traffic volumes for the existing intersection based on three different time periods. Figure 3a shows the existing traffic volumes at the unsignalized intersection of Graystone Lane at Coatney Road during the PM peak when the school experiences an earlier peak period at dismissal from 3:00 – 4:00 pm. In Figure 3b, the volumes shown are from the existing traffic counts volumes during the traditional AM and PM peak hours (7:30 – 8:30 am and 4:30 – 5:30 pm). For this study, the AM and PM peak hours during the typical rush hours are labeled and referred as the “traditional” peak hours.



**SCHOOL PM  
PEAK HOUR**

(XXX) PM School Peak  
Hour Volumes  
3:00 - 4:00 PM

Volumes shown here are from traffic counts as described in Existing Traffic Volumes in the report



11812 Black Road  
Knoxville, TN 37932  
Phone: (865) 556-0042  
Email: ajaxengineering@gmail.com

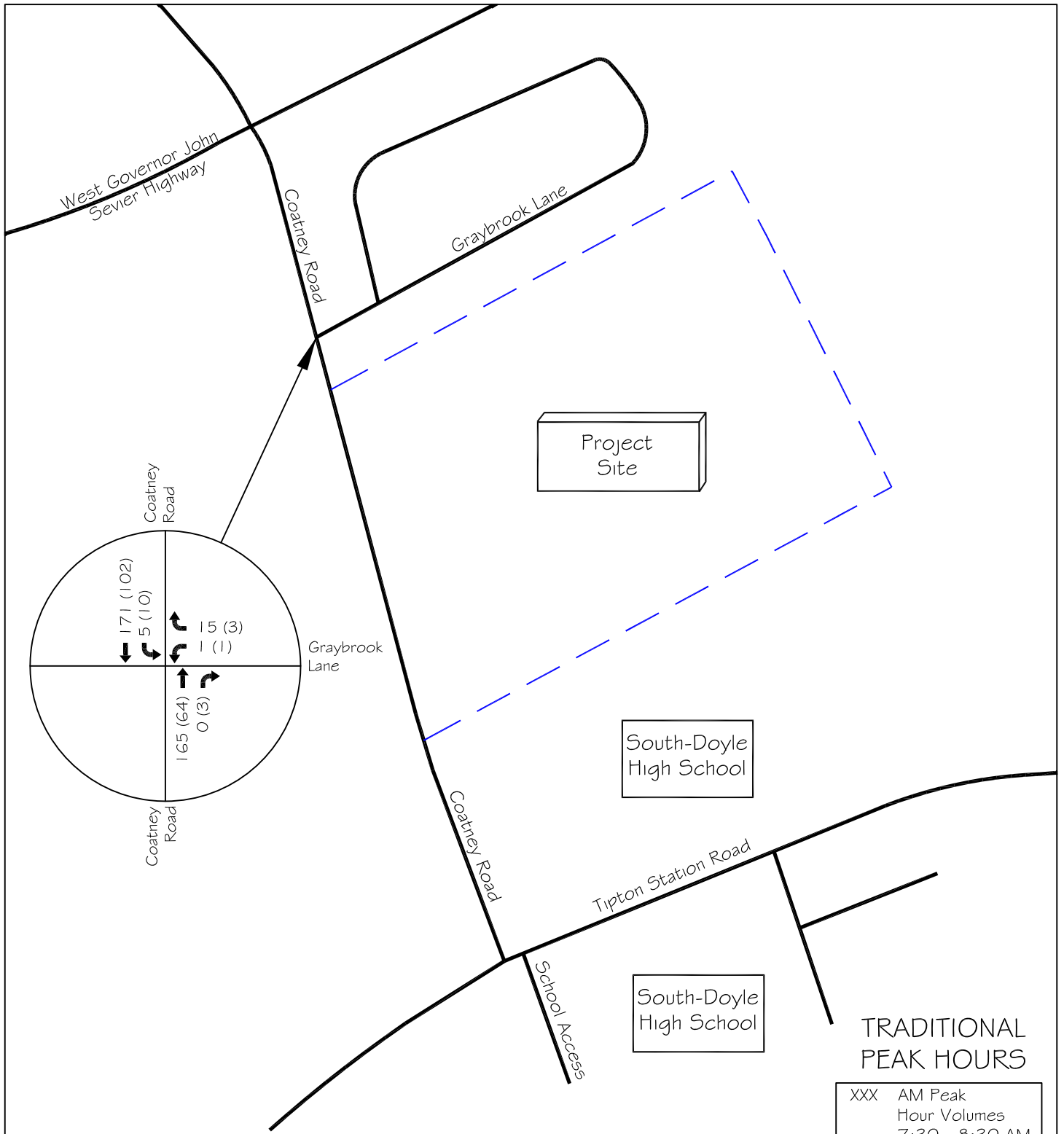
NOT TO SCALE



FIGURE 3a

Cherokee Landing

2016 PM School Peak Hour  
Traffic Volumes - EXISTING



Volumes shown here are from traffic counts as described in Existing Traffic Volumes in the report



11812 Black Road  
 Knoxville, TN 37932  
 Phone: (865) 556-0042  
 Email: ajaxengineering@gmail.com

NOT TO SCALE



FIGURE 3b

Cherokee Landing

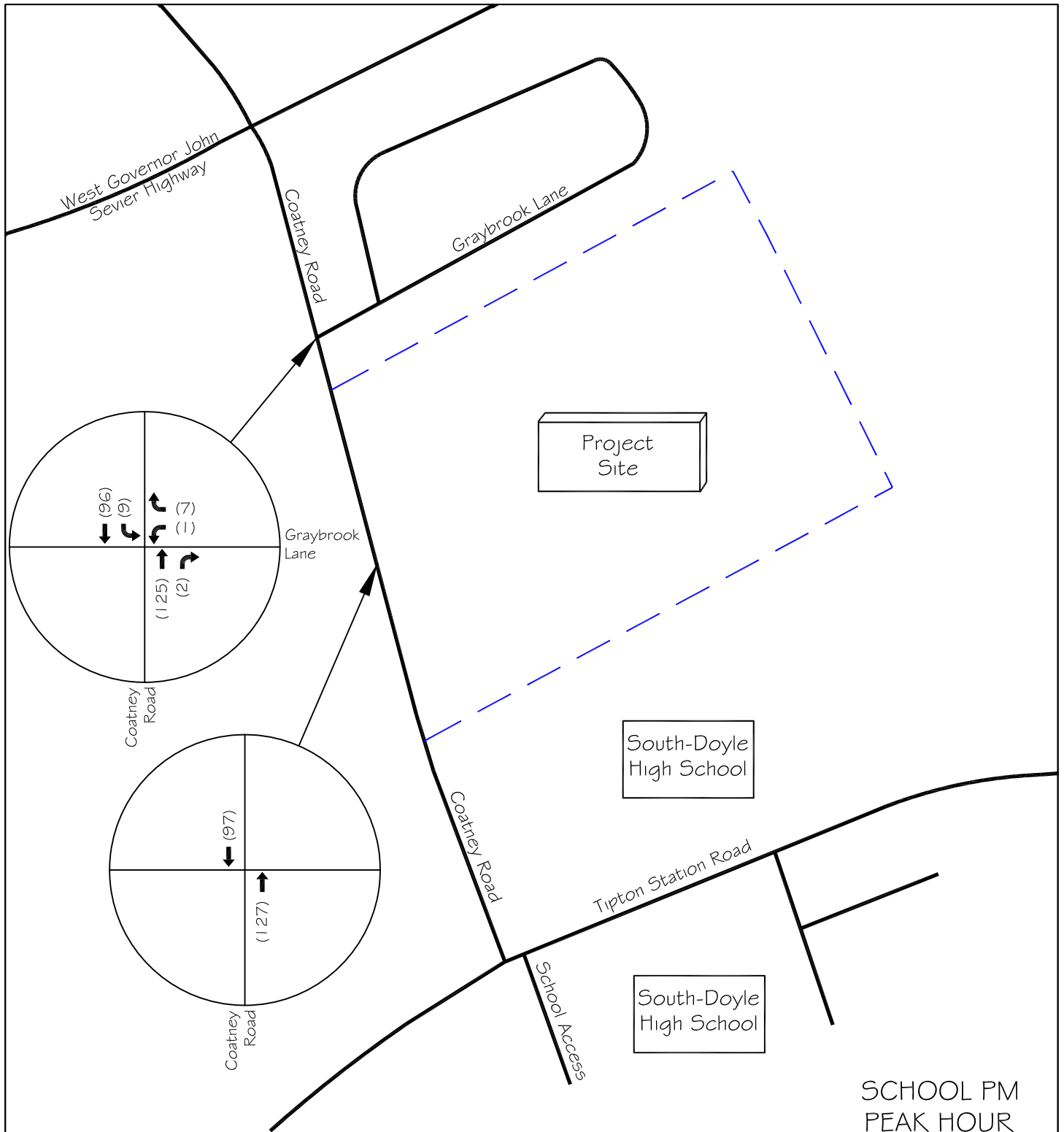
2016 Traditional Peak Hour Traffic Volumes - EXISTING

## **BACKGROUND TRAFFIC VOLUMES**

Background traffic volumes are estimates of non-development related traffic for a particular horizon or design year. Background traffic volume estimates represent the future base condition for which the proposed study area is potentially subject to without the project being developed.

As previously stated, the build-out and full occupancy year for the proposed new residential subdivision was assumed to occur in 2021. Background traffic volumes for this project were calculated by applying an annual growth rate to the existing traffic volumes shown in Figure 3a and 3b. This growth rate was determined by obtaining and analyzing a nearby traffic count in the area located on West Governor John Sevier Highway provided by TDOE. This data is located in Appendix A. The traffic data at this count station indicates that the average daily traffic has fluctuated with positive and negative growth over the past few years. Overall, the traffic count at this count station in the past three years has shown an annual growth of 1.2%. Therefore, a 2% growth was used to take into account any future development in the area and potential rising travel volumes and insure a conservative analysis.

The results of this growth rate application to the existing traffic volumes at the intersection of Coatney Road at Graybrook Lane can be seen in Figure 4a and 4b for the year 2021.



**SCHOOL PM  
PEAK HOUR**

(XXX) PM Peak  
Hour Volumes  
3:00 - 4:00 PM

Volumes shown here are calculated from existing traffic volumes with a growth factor as described in Background Traffic Volumes in the report



11812 Black Road  
Knoxville, TN 37932  
Phone: (865) 556-0042  
Email: ajaxengineering@gmail.com

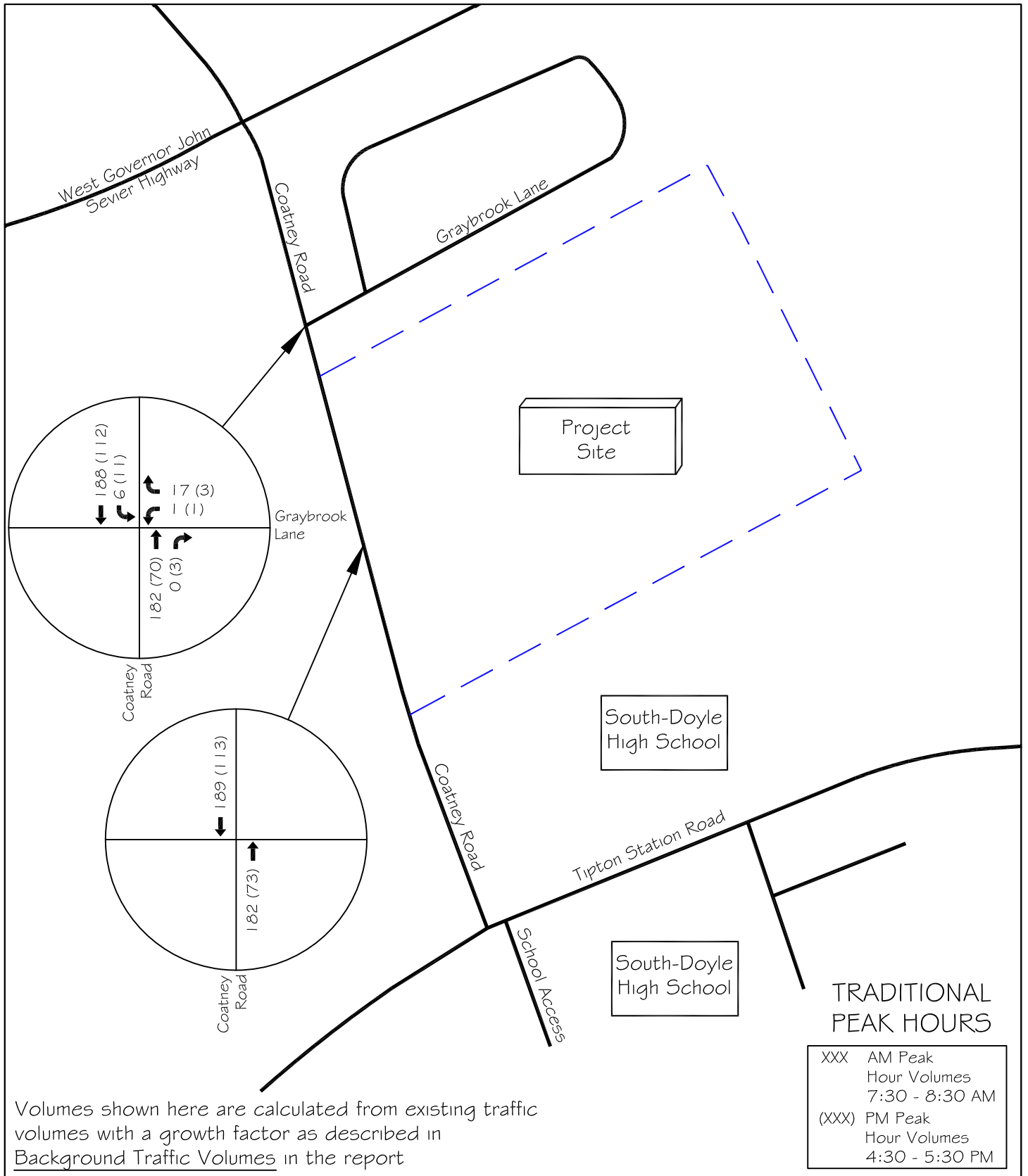
NOT TO SCALE



FIGURE 4a

Cherokee Landing

2021 PM School Peak Hour  
Traffic Volumes - BACKGROUND



**AJAX ENGINEERING**

---

11812 Black Road  
 Knoxville, TN 37932  
 Phone: (865) 556-0042  
 Email: ajaxengineering@gmail.com

NOT TO SCALE

**NORTH**

FIGURE 4b

Cherokee Landing

2021 Traditional Peak Hour Traffic Volumes - BACKGROUND



## TRIP GENERATION

The estimated amount of traffic that will be generated by the proposed residential subdivision during the traditional peak hours was calculated based upon rates and equations for peak hour trips provided by Trip Generation Manual, 9<sup>th</sup> Edition, a publication of the Institute of Transportation Engineers (ITE). A generated trip is a single or one-direction vehicle movement that is either entering or exiting the study site. The Trip Generation Manual is the traditional and most-sourced resource for determining trip generation rates when traffic impact studies are produced. The Manual lists traffic generation data for a variety of land uses. The data from ITE for the land use below is shown in Appendix C. A summary of this information is presented in the following table:

**TABLE 1  
TRIP GENERATION FOR CHEROKEE LANDING SUBDIVISION**

ITE LAND USE CODE	LAND USE DESCRIPTION	UNITS	GENERATED DAILY TRAFFIC	GENERATED TRAFFIC AM PEAK HOUR			GENERATED TRAFFIC PM PEAK HOUR		
				ENTER	EXIT	TOTAL	ENTER	EXIT	TOTAL
				25%	75%		63%	37%	
#210	Single-Family Detached Housing	102 Lots	1,070	20	62	82	67	40	107
Total New Volume Site Trips			1,070	20	62	82	67	40	107

ITE Trip Generation Manual, 9th Edition

The original concept plan included a total of 102 lots. The most recent updated site plan from January 2017 contains a total of only 94 lots. Since the total number of lots can be fluid until construction, it was assumed that the revised calculations for this updated report would still include a total of 102 lots. Using additional lots would also assure a conservative analysis.

Based on these calculations, potentially it can be expected that 20 vehicles will enter the development, 62 will exit, for a total of 82 new generated trips during the AM Peak Hour (7:30 – 8:30 AM) in the year 2021. Similarly, potentially it can be expected that 67 vehicles will enter the development, 40 will exit, for a total of 107 new generated trips during the PM Peak Hour (4:30 – 5:30 PM) in the year 2021. The calculated trips generated for an average day are expected to be approximately 1,070 vehicles for the entire 102 lot development. These volumes are for the “traditional” time periods associated with rush hour traffic in the morning and afternoon.

The ITE Trip Generation Manual does not provide data for the generation of residential traffic during a “School Peak Hour” (i.e. school morning arrival and afternoon dismissal). As stated earlier, typically, peak school traffic in the morning coincides with the roadway morning peak hour since the arrival times at schools correspond with “traditional” rush hour morning commutes. However, school peak traffic in the PM does not coincide with the “traditional” afternoon peak hour due to the earlier dismissal in the afternoon. To determine the residential site traffic generation for the development during the PM school peak hour (3:00 – 4:00 PM), several assumptions were made for the study.

According to the Knoxville/Knox County MPC Rezoning Report dated 5/27/2016 (included in Appendix D), this residential subdivision could potentially yield 49 school children for up to 129 dwelling units. The schools affected by this would include Bonny Kate Elementary School, South Doyle Middle School, and the adjacent South Doyle High School. Bonny Kate Elementary School is located to the south and west of the proposed site off of Tipton Station Road and South Doyle Middle School is located several miles further to the north off of Chapman Highway. Also according to the MPC, this studied property lies within the Parental Responsibility Zone (PRZ) which would mean that bus service would not be provided to the students attending South Doyle High School. 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 and the point where the busses unload at the school.

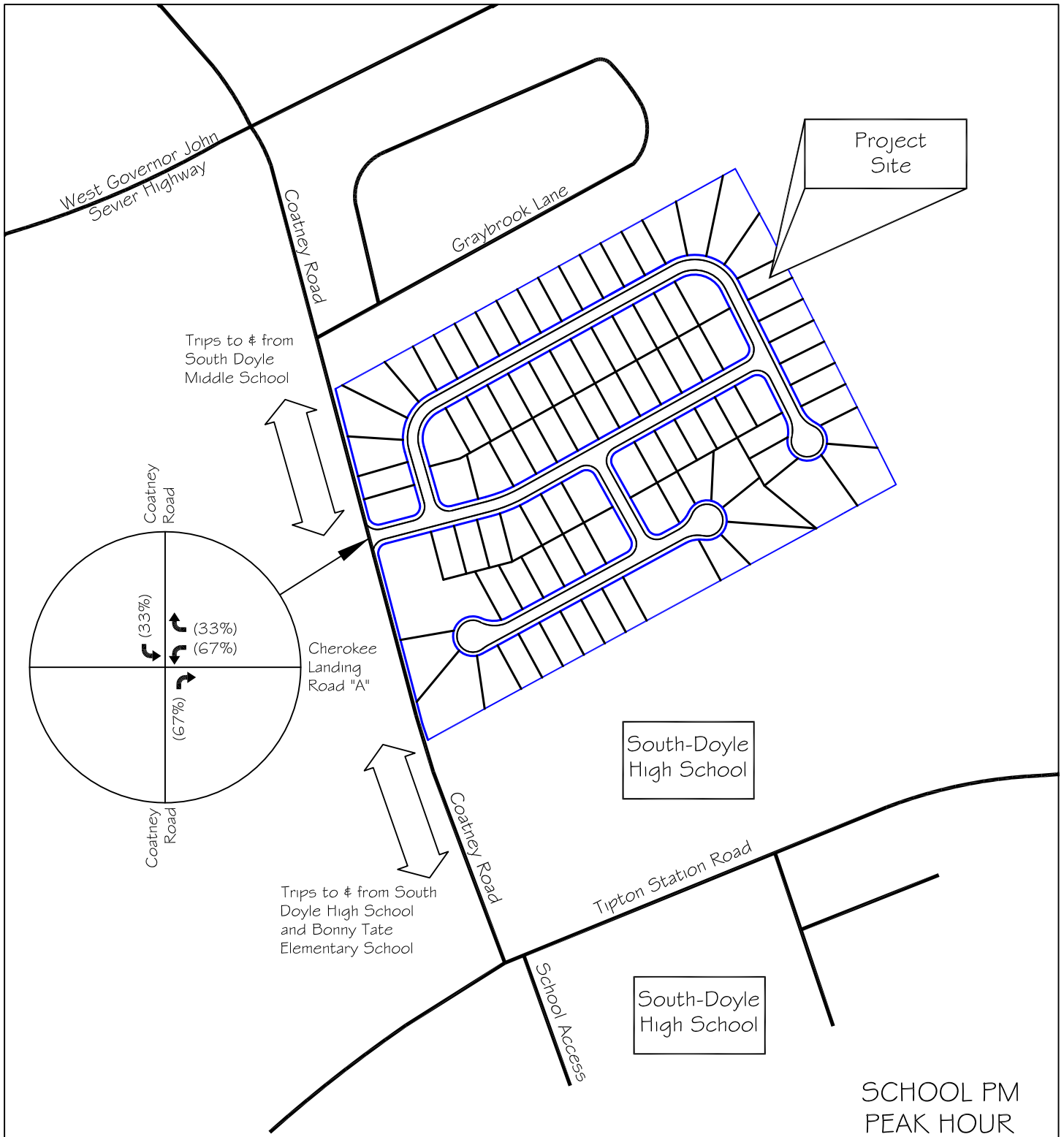
To provide some means of conservatively estimating the traffic impacts at the studied intersection during the “School Peak Hour”, this study assumed that the estimated 49 school children (even though only 94 lots are being proposed instead of the maximum of 129 lots referenced in the MPC document) would be evenly divided among the three schools, all the students would travel by passenger vehicle, fellow students and parents would not carpool, none of the students would walk from school, each student would be in a separate household, the parent would go to the school and return home within the peak hour, and that none of the children would be homeschooled. Based on those assumptions, it can be calculated that each school could generate just over 16 additional trips additional and 16 trips returning to the subdivision during the school peak hour (49 students/3 schools ~ 16.33 trips per direction). This calculation would guarantee an overestimation of trips generated and result in an extremely conservative analysis for the PM school peak hour.

## **TRIP DISTRIBUTION & ASSIGNMENT**

Figure 5a shows the projected distribution for traffic entering/exiting the new residential subdivision during the future PM school peak hour at the proposed new intersection on Coatney Road. The percentages shown only pertain to the new trips generated by the new residential dwellings in the subdivision with respect to school traffic. The projected trip distributions for the future PM school peak hour are based on the location of the three schools serving the proposed subdivision.

Figure 5b shows the projected distribution for traffic entering/exiting the new residential subdivision during the future AM and PM “traditional” peak hours at the proposed intersection. Access to other areas in the Knoxville region outside of Coatney Road will be served by West Governor John Sevier Highway to the north and Tipton Station Road to the south. The projected trip distributions of Figure 5b are based on the existing traffic movements observed at the existing residential subdivision on Graystone Lane and are also surmised from surrounding concentrations of development and population.

Figures 6a and 6b shows the Traffic Assignment of the computed trips that will be generated by the development (Table 1) and applied to the various intersection movements based on the assumed distribution of trips shown in Figures 5a and 5b. Figure 6a shows the trips generated based on the assumed school traffic during the school PM peak as described in the previous section of the report. Figure 6b shows the trips associated with the traditional AM and PM peak hours.



SCHOOL PM  
PEAK HOUR


(XX%) PM Peak Hour

Percentages shown here are assumed as described in  
Trip Distribution & Assignment in the report



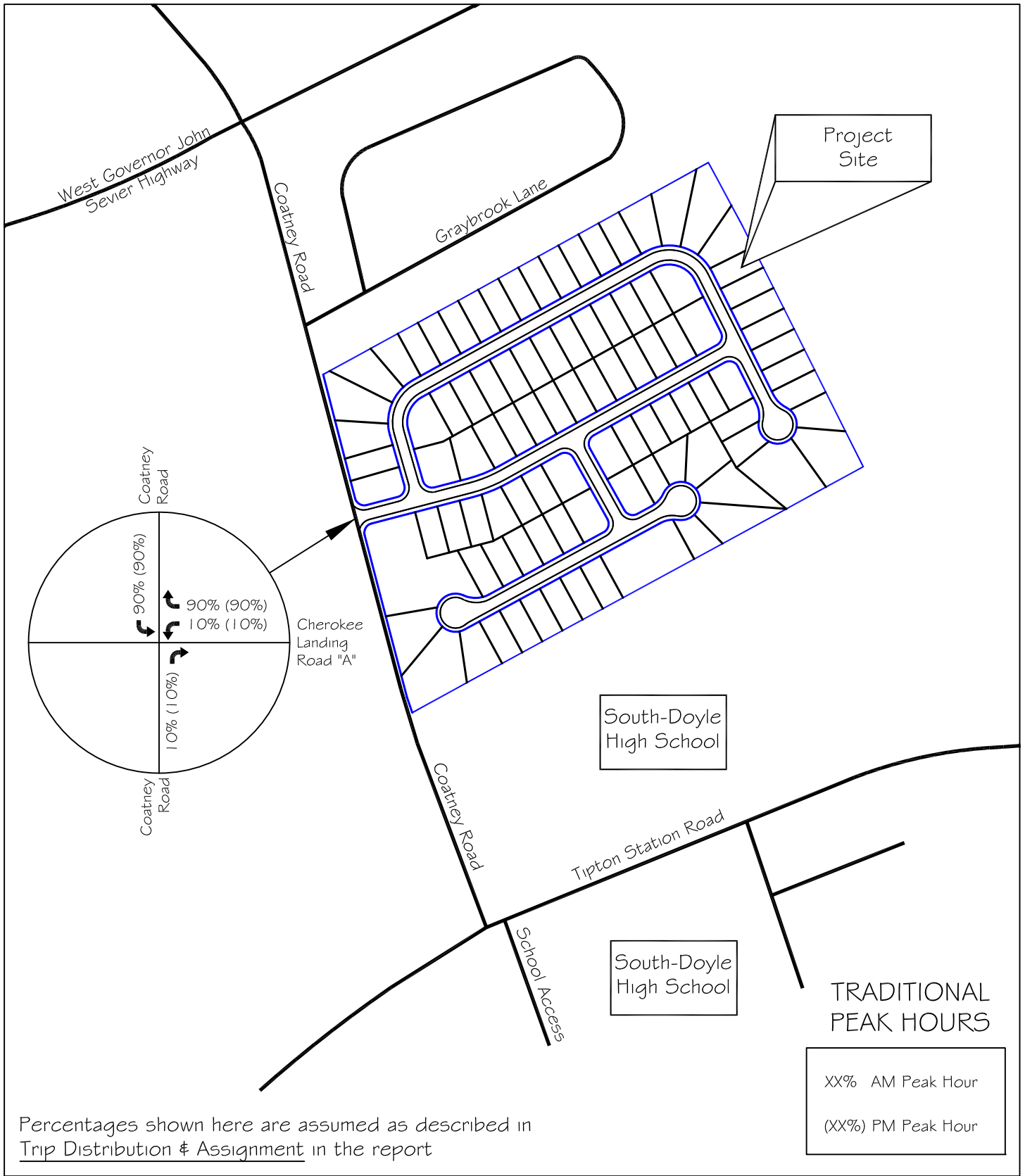
11812 Black Road  
Knoxville, TN 37932  
Phone: (865) 556-0042  
Email: ajaxengineering@gmail.com

NOT TO SCALE



NORTH

FIGURE 5a  
Cherokee Landing  
Directional Distribution of Generated  
Traffic to / from Schools during  
School PM Peak Hour

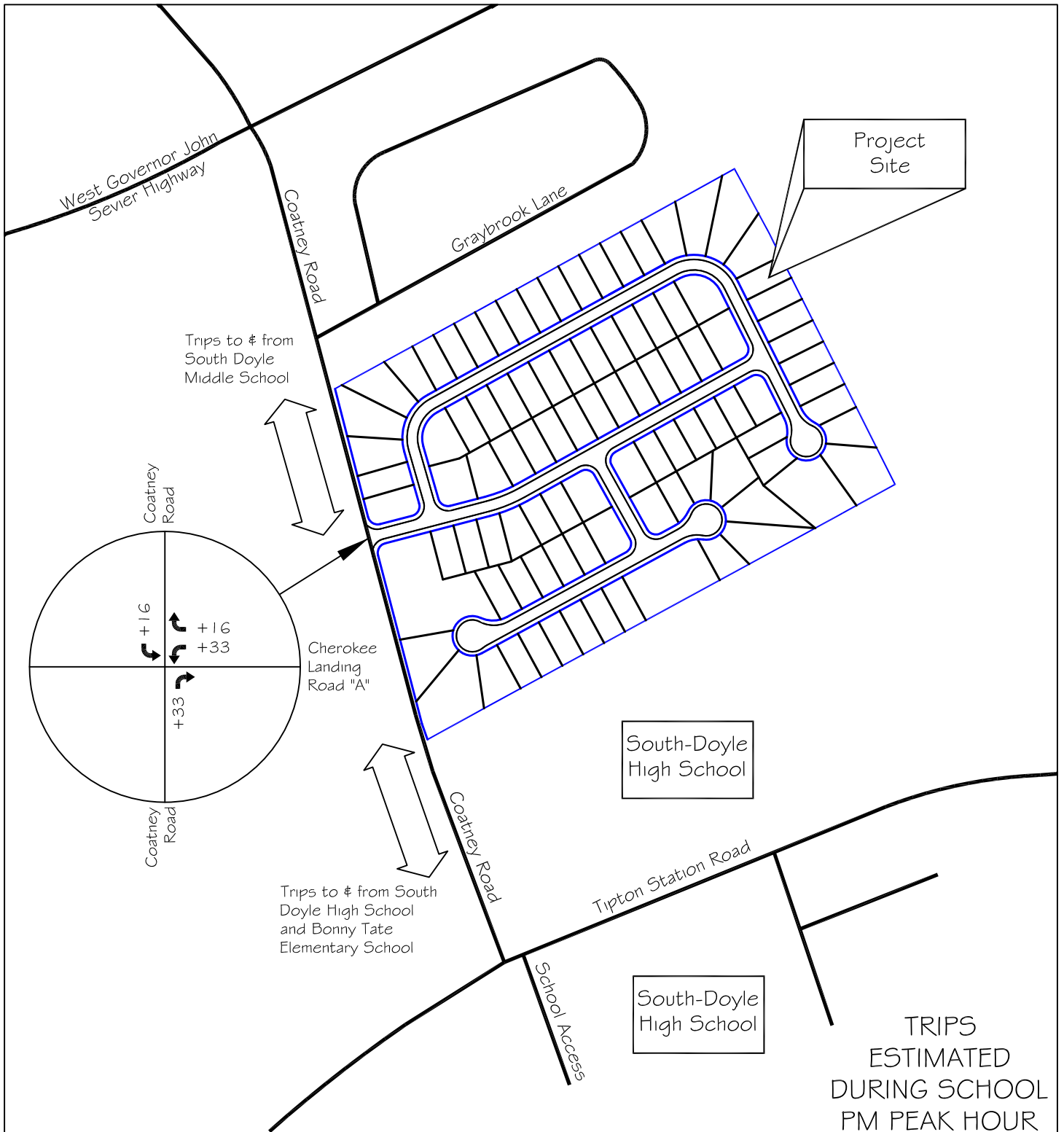


11812 Black Road  
 Knoxville, TN 37932  
 Phone: (865) 556-0042  
 Email: ajaxengineering@gmail.com

NOT TO SCALE

NORTH

FIGURE 5b  
 Cherokee Landing  
 Directional Distribution of  
 Generated Traffic during  
 Traditional AM and PM Peak Hour



Volumes shown here are the calculated trips estimated as described in Trip Generation in the report according to the Directional Distributions from Figure 5a



11812 Black Road  
 Knoxville, TN 37932  
 Phone: (865) 556-0042  
 Email: ajaxengineering@gmail.com

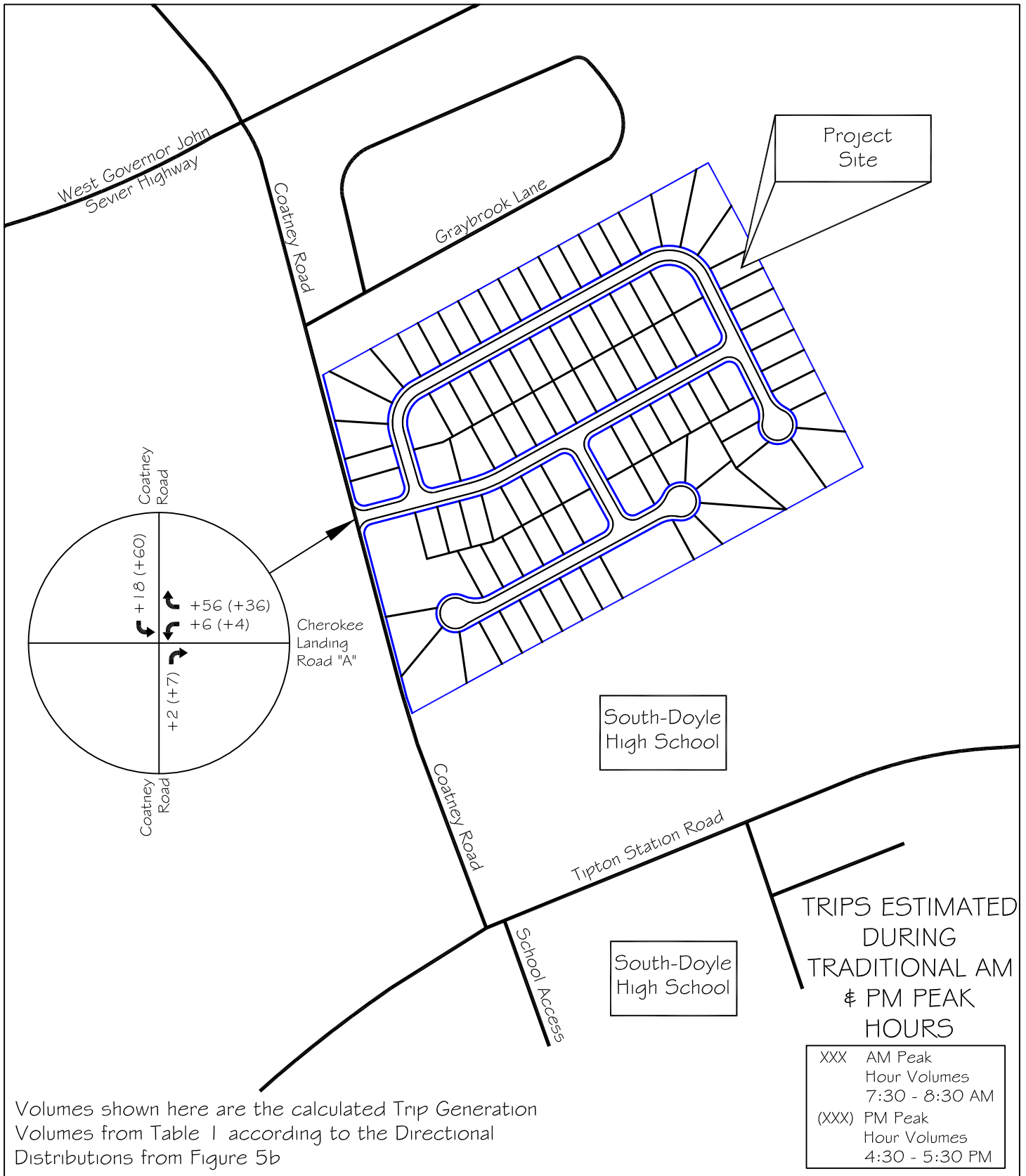
NOT TO SCALE



FIGURE 6a

Cherokee Landing

Traffic Assignment of  
 Generated Traffic to / from Schools  
 during School PM Peak Hour



11812 Black Road  
 Knoxville, TN 37932  
 Phone: (865) 556-0042  
 Email: ajaxengineering@gmail.com

NOT TO SCALE



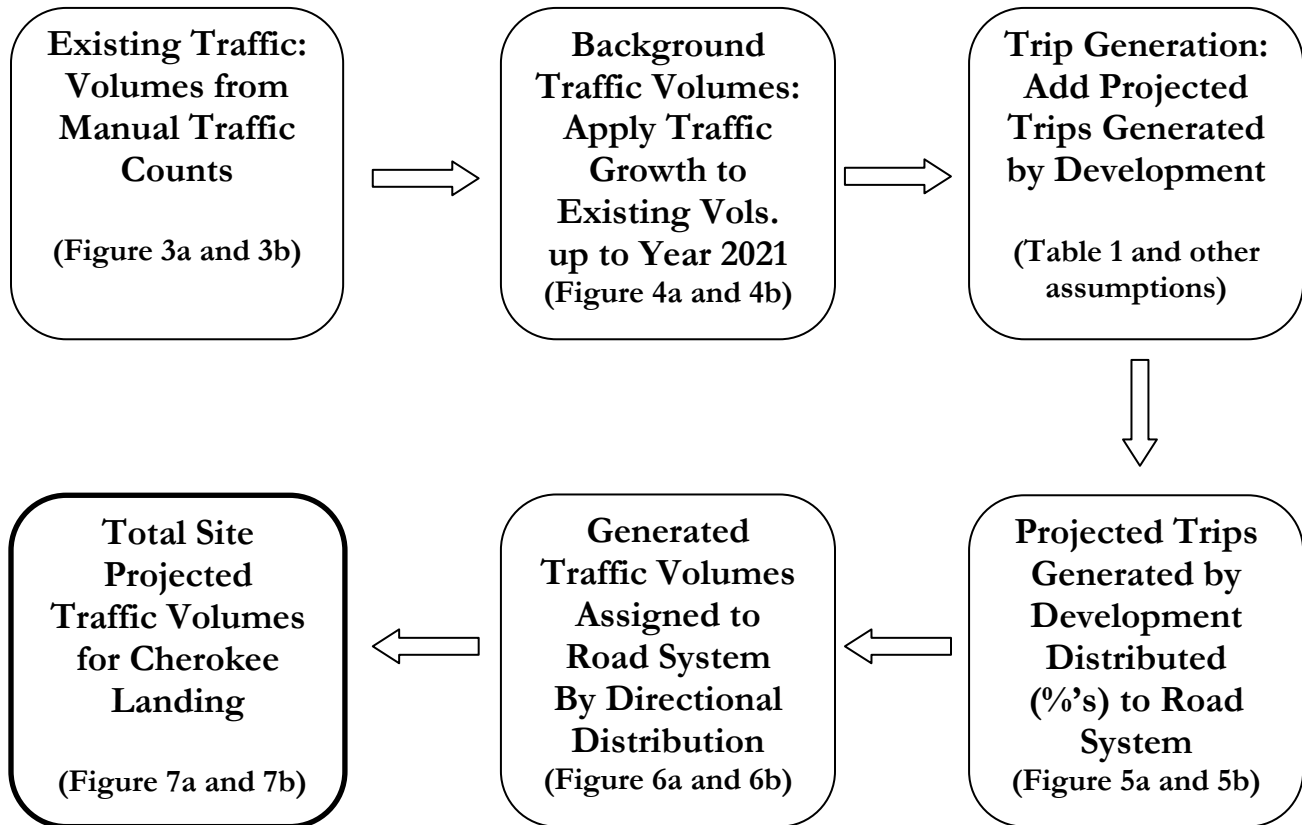
FIGURE 6b

Cherokee Landing

Traffic Assignment of Generated Traffic during Traditional AM and PM Peak Hour

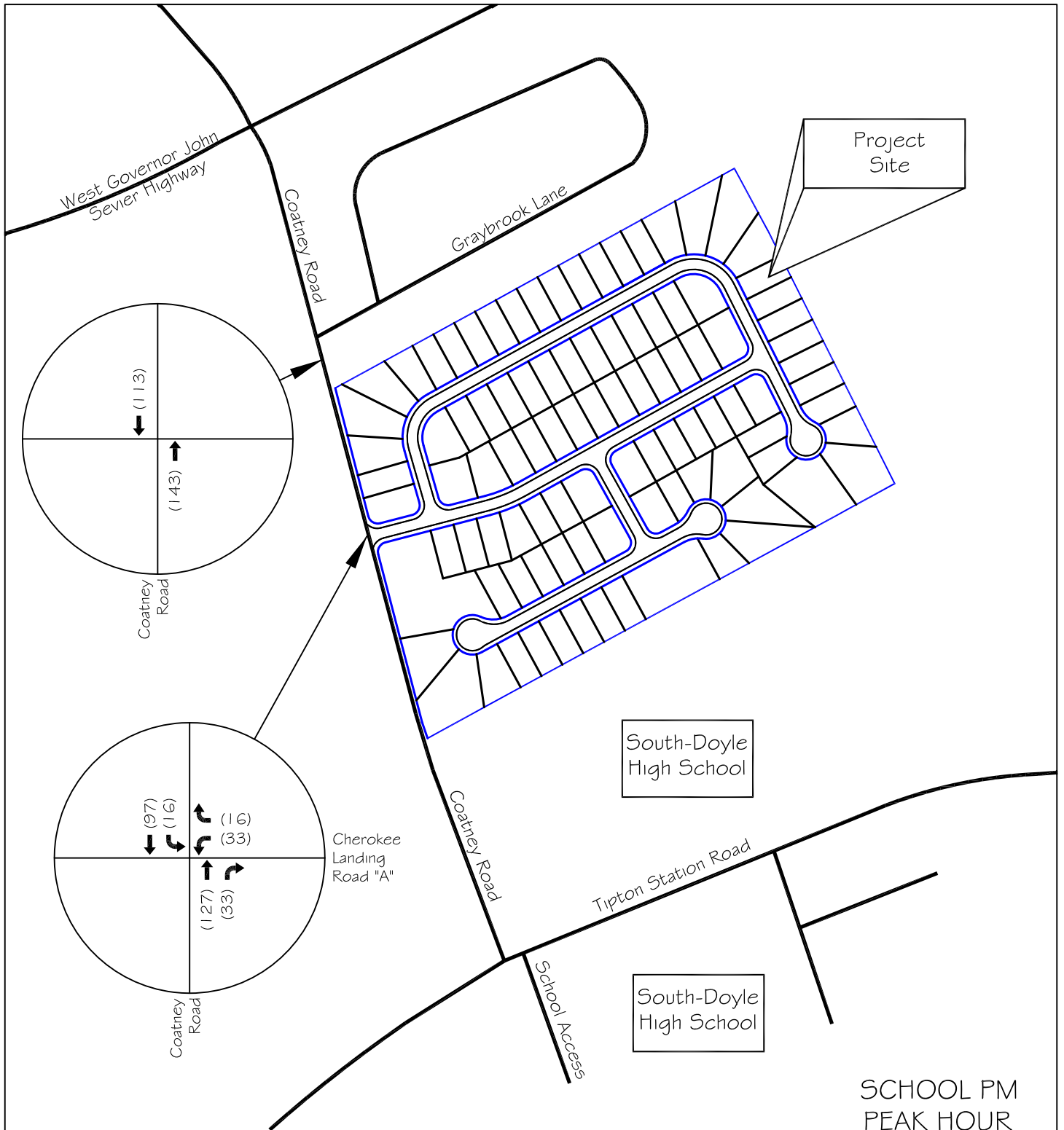
## PROJECTED TRAFFIC VOLUMES

Overall, several additive steps were taken to ascertain the total future projected traffic volumes at the studied intersection when the residential subdivision is fully constructed, built-out, and occupied by 2021. The steps are illustrated below for clarity:



To calculate the total future projected traffic volumes at the intersection, application of the calculated peak hour traffic generated by the new proposed Cherokee Landing were added to the 2021 background traffic volumes (shown in Figures 4a and 4b) in accordance to the predicted directional distributions and assignments (shown in Figures 5a, 5b, 6a, and 6b). This procedure was necessary to obtain the total projected traffic volumes at the time the development is fully built-out by the year 2021. Figure 7a shows the projected peak PM school hour volumes at the studied intersection for the year 2021. Figure 7b shows the “traditional” projected AM and PM peak hour volumes at the studied intersection for the year 2021.





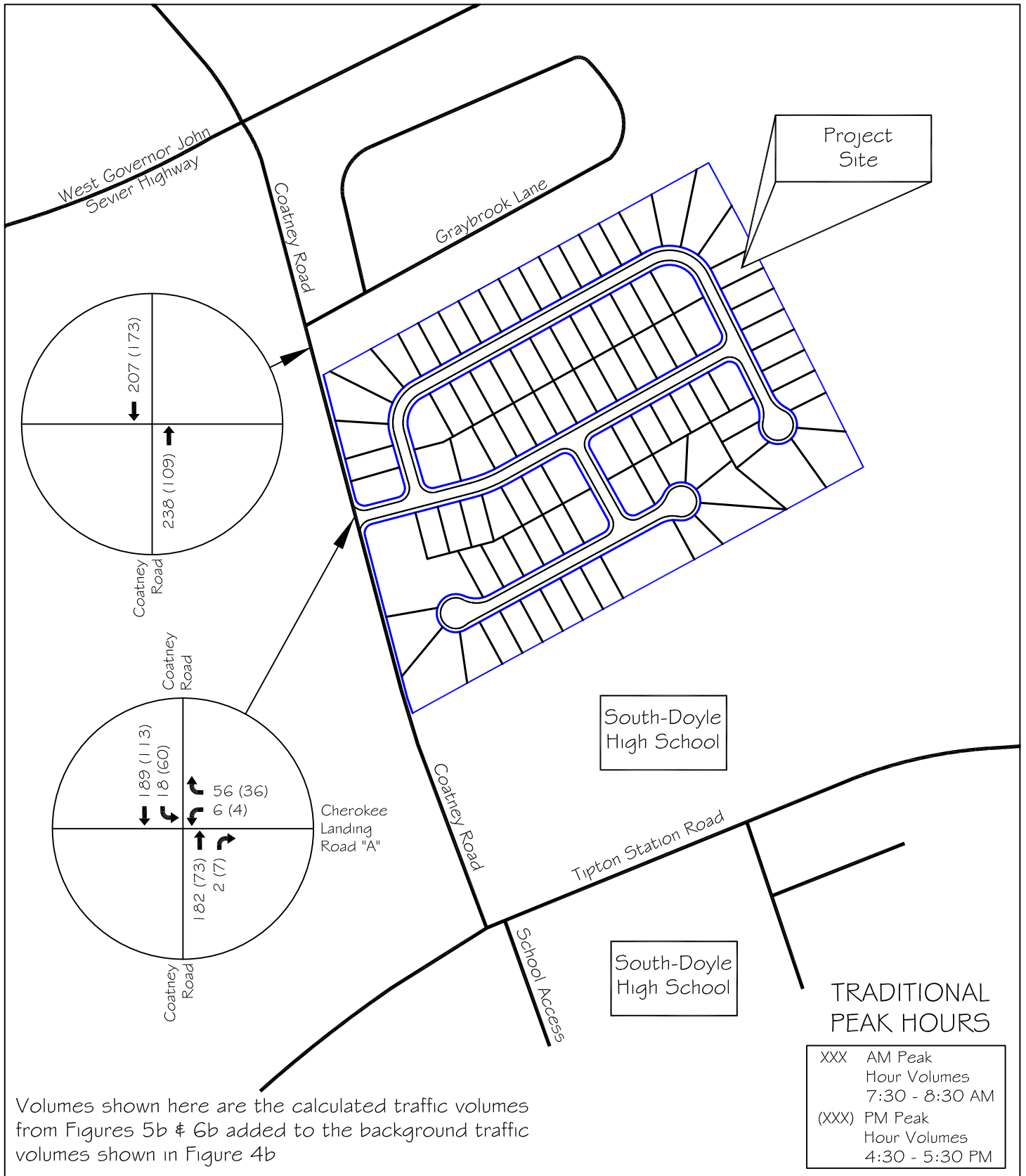
Volumes shown here are the calculated traffic volumes from Figures 5a & 6a added to the background traffic volumes shown in Figure 4a

11812 Black Road  
Knoxville, TN 37932  
Phone: (865) 556-0042  
Email: ajaxengineering@gmail.com

NOT TO SCALE

NORTH

FIGURE 7a  
Cherokee Landing  
2021 PM School Peak Hour  
Traffic Volumes - PROJECTED



11812 Black Road  
 Knoxville, TN 37932  
 Phone: (865) 556-0042  
 Email: ajaxengineering@gmail.com

NOT TO SCALE



FIGURE 7b

Cherokee Landing

2021 Traditional Peak Hour Traffic  
 Volumes - PROJECTED

Capacity analyses were undertaken to determine the anticipated Level of Service (LOS) for the proposed site access intersection. 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. 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. LOS for unsignalized intersections are only calculated for turning movements associated with stop or yield control and also for left turns on "un-controlled" major streets.



(Source: FDOT)

**TABLE 2**

**LEVEL OF SERVICE AND DELAY FOR UNSIGNALIZED INTERSECTIONS**




LEVEL OF SERVICE	DESCRIPTION	DELAY RANGE (seconds/vehicle)
A	Little or no delay	≤ 10
B	Short Traffic Delays	>10 and ≤15
C	Average Traffic Delays	>15 and ≤25
D	Long Traffic Delays	>25 and ≤35
E	Very Long Traffic Delays	>35 and ≤50
F	Extreme Traffic Delays	>50

Source: Highway Capacity Manual

From the capacity calculations, the results from the projected peak hour traffic can be seen in Table 3 for the proposed intersection. The intersection is shown with a LOS designation for the AM, PM, and PM school peak hours in the table. Appendix E includes the worksheets from the capacity analyses for the projected traffic peak hours. For the projected intersection volumes, the peak hour levels of service are shown to operate at a very good level during the AM, PM, and PM school peak hours with minimal delays.

**TABLE 3  
2021 PEAK HOUR LEVEL OF SERVICE & DELAY - PROJECTED**

INTERSECTION	TRAFFIC CONTROL	APPROACH	LEVEL OF SERVICE			DELAY (seconds)		
			AM PEAK	SCHOOL PM PEAK	PM PEAK	AM PEAK	SCHOOL PM PEAK	PM PEAK
Coatney Road at Road "A"	 Unsignalized	Westbound Left/Right	B	B	A	11.2	13.9	9.6
		Southbound Thru/Left	A	A	A	1.9	1.7	2.8

Note: All analyses were calculated in Synchro 8 software and reported with HCM 2000 methodology

Note: Peak Hour Factor for the westbound approach of Road "A" was assumed to be the same as calculated at Graystone Lane from the existing traffic count

## **SPOT SPEED STUDY**

As a further investigation of the study area, a spot speed study was also conducted. The spot speed study was conducted on Coatney 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 results of the study indicate that the majority of the traffic along Coatney Road travels at a greater speed than the posted speed limit. The posted speed limit for Coatney Road is 30 mph adjacent to the development. The results of the spot speed study indicate that the observed 85<sup>th</sup> percentile speed was just at 41 mph near the proposed intersection at Coatney Road. The spot speed field observations are provided in Appendix F.

## EVALUATION OF TURN LANE THRESHOLDS

The proposed intersection to be located at Coatney Road for the development was also evaluated for the need for separate left and right turn lanes into the development on Coatney Road. Based on the projected traffic volumes at the subdivision intersection on Coatney Road, it does not appear that a separate southbound left turn lane or a northbound right turn lane into the development will be warranted. This was determined by using “Knox County’s Access Control and Driveway Design Policy” for turn lane requirements. The Knox County turn lane policy worksheets are located in Appendix G.

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 85<sup>th</sup> percentile speed was 41 mph. Therefore, this study evaluation used the Knox County classification for speeds of 36 to 45 mph and the calculated projected volumes.

## **CONCLUSIONS AND RECOMMENDATIONS**

The following is an overview of recommendations to minimize the traffic impacts of the proposed development with the surrounding road system while attempting to achieve an acceptable level of traffic flow and safety.

- 1) **Coatney Road at Cherokee Landing Road “A”**: From the capacity calculations, it has been shown (Table 3) that the traffic movements at the new entrance should operate very well during the AM, PM, and PM school peak periods once the development is complete with minimal delays.
  - 1a) **From the capacity calculations, the analysis shows that only a single exiting lane for left and right exiting vehicles is required at the Cherokee Landing Subdivision entrance. Also, a separate left turn lane or right turn lane on Coatney Road into the development is not required due to the low projected volumes.**
  - 1b) Based on a speed of 40 mph on Coatney Road (85<sup>th</sup> percentile observed speed was 41 mph), the recommended intersection sight distance requirement is 400 feet. While not surveyed in the field for this report, from visual observation this distance appears available for vehicles exiting from the new proposed main driveway. To the south on Coatney Road from the proposed entrance there is a significant horizontal and vertical curve. However, it appears that the proposed intersection will be greater than 400 feet away from this horizontal and vertical curve. 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).
  - 1c) **It is recommended that the main entrance approach at the intersection with Coatney Road be designed and constructed with a 24” white stop bar and with a Stop Sign (R1-1).**

- 1d) Intersection sight distance at the new proposed main entrance at Coatney Road must not be impacted by new signage, future landscaping or existing vegetation.
- 1e) Since the proposed layout of the subdivision only includes one means of ingress and egress, the subdivision entrance is recommended to be designed and constructed with a boulevard roadway section to allow for emergency access. The boulevard section at a minimum should have a 10 foot median with 2 - 18 foot lanes within 60 feet of right-of-way. See Figure 8 below for an example of a boulevard typical section. Typically a boulevard road section is designed and constructed to the first intersecting street within the development.

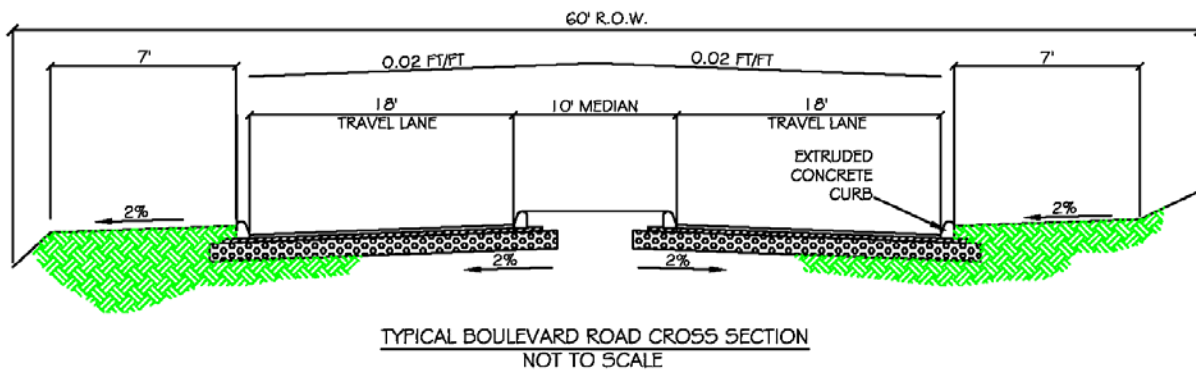


Figure 8

- 2) **Cherokee Landing Subdivision Internal Drives:** The current layout plans show 4 new roadways being constructed within the development labeled Road “A” thru Road “D” as shown on Figure 2. Road “A” will be the connecting road to Coatney Road.
- 2a) A Stop Sign (R1-1) should be installed at the Road “C” northbound approach at the intersection with Road “A”. A Stop Sign (R1-1) should be installed at the Road “D” southbound approach at the intersection with Road “A” on the west side of the development. A Stop Sign (R1-1) should be installed at the Road “A” eastbound approach at the intersection with Road “D”. Also, a Stop Sign (R1-1) should be installed at the Road “C” southbound approach at the intersection with Road “B”.

- 2b) **It is recommended that a 25 mph speed limit be posted at the beginning of Road “A” into the new residential subdivision.**
  
  - 2c) **Sight distance at the new internal intersections must not be impacted by new signage, or future landscaping.** For an assumed posted 25 mph speed for the internal development streets, the internal intersection sight distance requirement is 250 feet. The road layout designer should insure that these sight distance lengths are met, maximized, and they should be labeled on the plans.
  
  - 2d) **The sidewalks that are proposed for the development should have appropriate ADA compliant curbed ramps at the intersection corners and the sidewalks should be 5 feet in width.**
  
  - 2e) **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.**
  
  - 2f) **Traffic calming measures might be needed for this development.** The road alignments within the development are straight and have been designed to maximize the lots on the property. The possible need for traffic calming measures inside the project for the new roads will need to be coordinated with the Knox County Engineering and Public Works during the detailed design phase. Speed humps could be considered to lower speeds through the subdivision.
- 3) **Other Adjacent Existing Intersections:** Even though not required or included in this traffic study, it should be noted that the intersection of Coatney Road with Tipton Station Road and West Governor John Sevier Highway could experience slightly increased delays due to the traffic volumes generated by the new residential development.



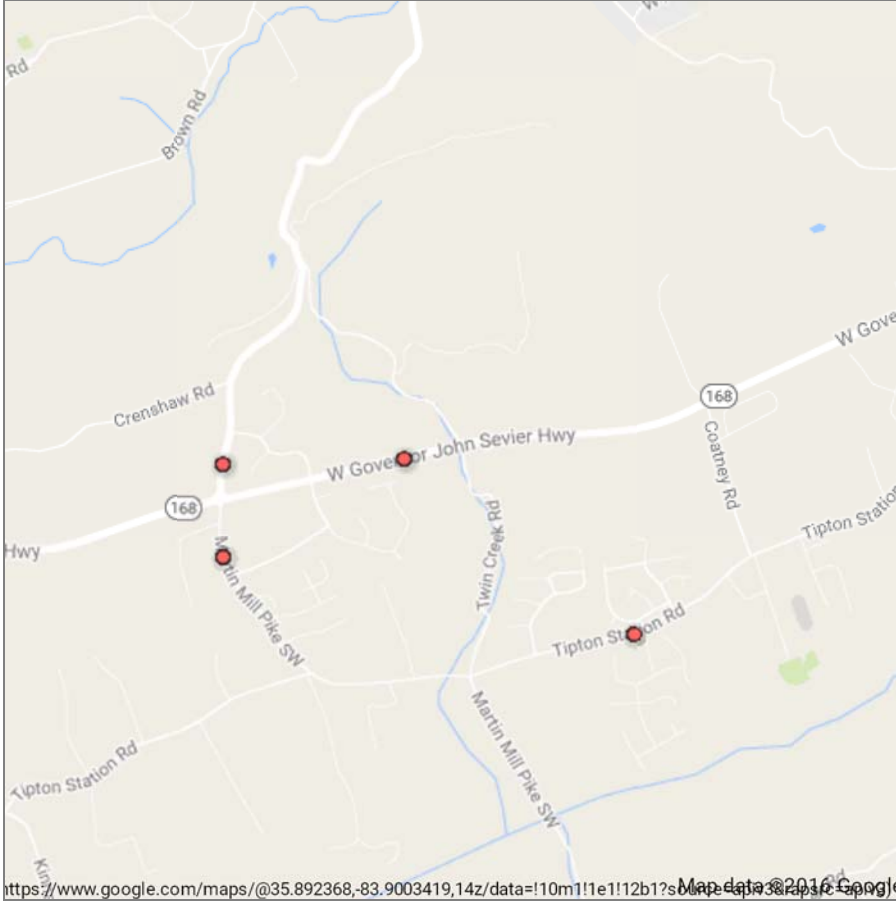
**APPENDIX A**  
**HISTORICAL TRAFFIC COUNT DATA**



# Traffic History

Traffic History reflects the Annual Average Daily Traffic (AADT) count along specific locations on Tennessee's road network

View stations on map:  Non-Map Record Search:  Station Number:



### Station Information

Station	000290
Route	SR168
Location	SOUTH KNOXVILLE
County	Knox
2015	14950
2014	14440
2013	14430
2012	15754
2011	15577
2010	14364
2009	15064
2008	15433
2007	15068
2006	15281
2005	14987
2004	15338
2003	14495
2002	13604
2001	13901
2000	14941
1999	13110
1998	11635
1997	11701

Download File:	KML (/Applications/Files /TrfcHist.kmz)	ESRI Geodatabase (/Applications/Files /TrfcHistFGDB.zip)	ESRI Shapefile (/Applications/Files /TrfcHistSHP.zip)	Database Table (/Applications/Files /TrfcHistDBF.zip)
Open With:	Google Earth (https://earth.google.com/)	ArcGIS Explorer (http://www.esri.com/software /arcgis/explorer/index.html)		MS Access or Excel

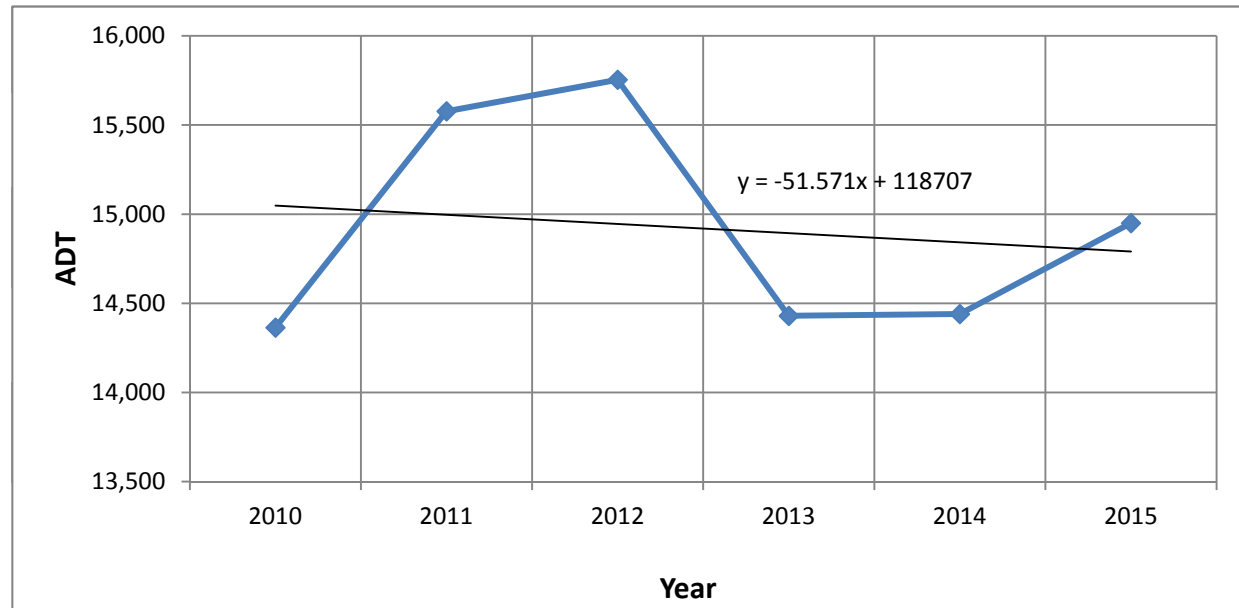
## Historical Traffic Counts

Organization: TDOT

Station ID #: 000290

Location: John Sevier Highway (SR 168) - approximately 2,700 feet to the east of Martin Mill Pike

YEAR	ADT	
2010	14,364	
2011	15,577	
2012	15,754	
2013	14,430	Trendline
2014	14,440	
2015	14,950	



2013 - 2015 Growth Rate = 3.6%

Annual Growth Rate = 1.2%

**APPENDIX B**  
**MANUAL TRAFFIC COUNT DATA**

## TRAFFIC COUNT DATA

Major Street: Coatney Road (NB-SB)  
 Minor Street: Graybrook Lane (WB)  
 Traffic Control: Stop Control (Graybrook Lane Approach)

10/19/2016 (Wednesday)  
 Sunny  
 Conducted by: Ajax Engineering

Primary Movement: Vehicles

TIME BEGIN	Coatney Road		Graybrook Lane		Coatney Road		VEHICLE TOTAL	PEAK HOUR
	SOUTHBOUND LT	THRU	WESTBOUND LT	RT	NORTHBOUND THRU	RT		
7:00 AM	1	16	0	2	13	0	32	
7:15 AM	1	32	0	4	23	0	60	
7:30 AM	<b>0</b>	<b>36</b>	<b>0</b>	<b>3</b>	<b>46</b>	<b>0</b>	<b>85</b>	7:30 AM - 8:30 AM
7:45 AM	<b>1</b>	<b>50</b>	<b>0</b>	<b>3</b>	<b>27</b>	<b>0</b>	<b>81</b>	
8:00 AM	<b>4</b>	<b>41</b>	<b>1</b>	<b>7</b>	<b>54</b>	<b>0</b>	<b>107</b>	
8:15 AM	<b>0</b>	<b>44</b>	<b>0</b>	<b>2</b>	<b>38</b>	<b>0</b>	<b>84</b>	
8:30 AM	0	13	0	1	19	0	33	
8:45 AM	1	9	0	3	9	0	22	
TOTAL	8	241	1	25	229	0	504	
2:00 PM	0	14	0	0	17	0	31	
2:15 PM	0	17	0	3	12	0	32	
2:30 PM	1	13	1	1	10	1	27	
2:45 PM	2	16	0	1	23	0	42	
3:00 PM	<b>2</b>	<b>18</b>	<b>0</b>	<b>3</b>	<b>11</b>	<b>1</b>	<b>35</b>	3:00 PM - 4:00 PM
3:15 PM	<b>1</b>	<b>23</b>	<b>0</b>	<b>0</b>	<b>10</b>	<b>1</b>	<b>35</b>	
3:30 PM	<b>2</b>	<b>23</b>	<b>0</b>	<b>2</b>	<b>67</b>	<b>0</b>	<b>94</b>	
3:45 PM	<b>3</b>	<b>23</b>	<b>1</b>	<b>1</b>	<b>26</b>	<b>0</b>	<b>54</b>	
4:00 PM	3	9	0	3	13	2	30	
4:15 PM	3	23	0	2	3	0	31	
4:30 PM	<b>3</b>	<b>22</b>	<b>1</b>	<b>1</b>	<b>18</b>	<b>1</b>	<b>46</b>	4:30 PM - 5:30 PM
4:45 PM	<b>3</b>	<b>25</b>	<b>0</b>	<b>1</b>	<b>15</b>	<b>1</b>	<b>45</b>	
5:00 PM	<b>2</b>	<b>23</b>	<b>0</b>	<b>0</b>	<b>15</b>	<b>0</b>	<b>40</b>	
5:15 PM	<b>2</b>	<b>32</b>	<b>0</b>	<b>1</b>	<b>16</b>	<b>1</b>	<b>52</b>	
5:30 PM	1	17	1	1	23	1	44	
5:45 PM	1	16	0	1	12	1	31	
TOTAL	29	314	4	21	291	10	669	

**2016 Traditional AM Peak Hour**      7:30 AM - 8:30 AM

TIME BEGIN	SOUTHBOUND		WESTBOUND		NORTHBOUND	
	LT	THRU	LT	RT	THRU	RT
7:30 AM	0	36	0	3	46	0
7:45 AM	1	50	0	3	27	0
8:00 AM	4	41	1	7	54	0
8:15 AM	0	44	0	2	38	0
TOTAL	5	171	1	15	165	0
PHF	0.31	0.86	0.25	0.54	0.76	-

**2016 School PM Peak Hour**      3:00 PM - 4:00 PM

TIME BEGIN	SOUTHBOUND		WESTBOUND		NORTHBOUND	
	LT	THRU	LT	RT	THRU	RT
3:00 PM	2	18	0	3	11	1
3:15 PM	1	23	0	0	10	1
3:30 PM	2	23	0	2	67	0
3:45 PM	3	23	1	1	26	0
TOTAL	8	87	1	6	114	2
PHF	0.67	0.95	0.25	0.50	0.43	0.50

**2016 Traditional PM Peak Hour**      4:30 PM - 5:30 PM

TIME BEGIN	SOUTHBOUND		WESTBOUND		NORTHBOUND	
	LT	THRU	LT	RT	THRU	RT
4:30 PM	3	22	1	1	18	1
4:45 PM	3	25	0	1	15	1
5:00 PM	2	23	0	0	15	0
5:15 PM	2	32	0	1	16	1
TOTAL	10	102	1	3	64	3
PHF	0.83	0.80	0.25	0.75	0.89	0.75

**APPENDIX C**  
**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)

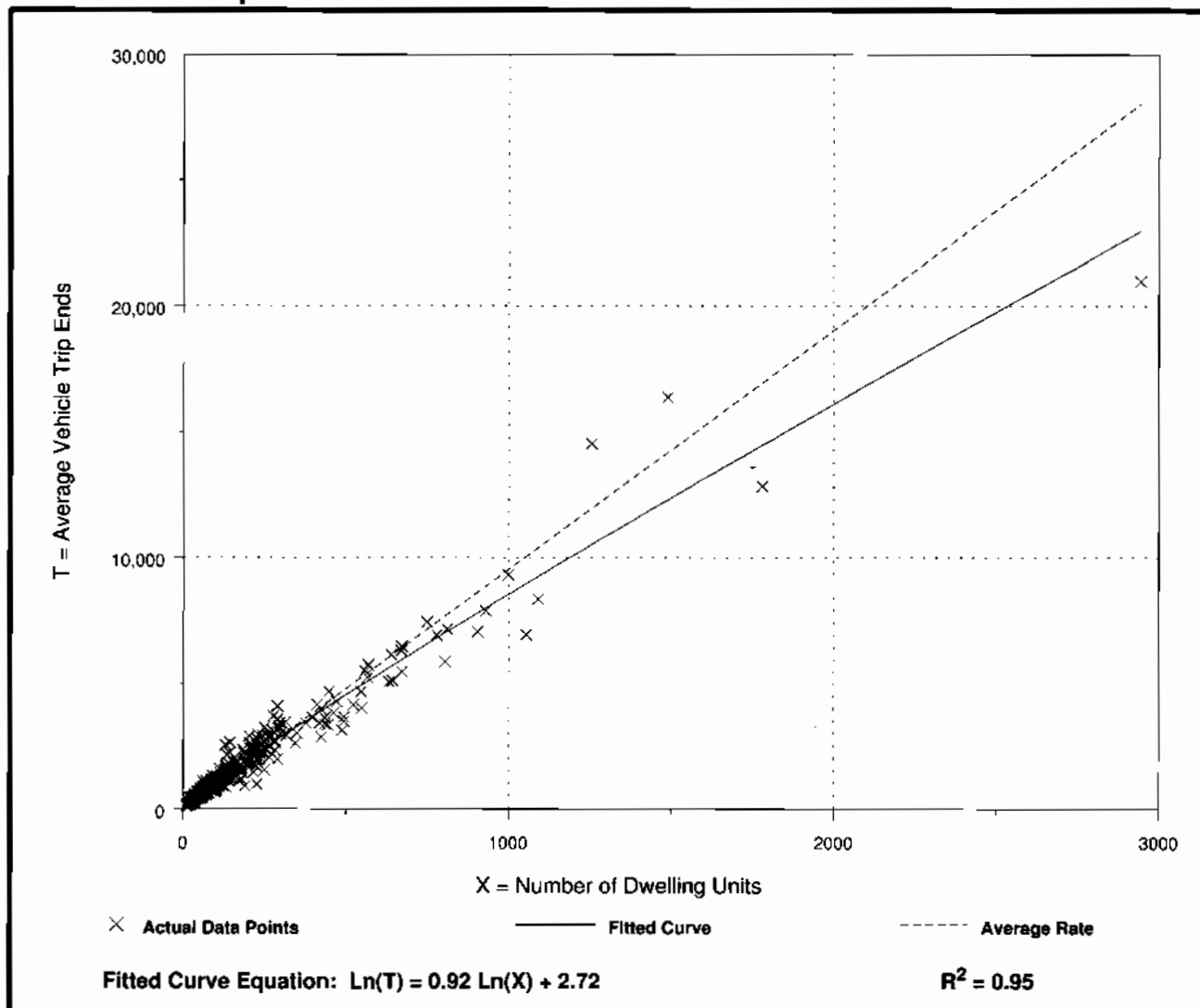
Average Vehicle Trip Ends vs: Dwelling Units  
On a: Weekday

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

## Data Plot and Equation





# Single-Family Detached Housing (210)

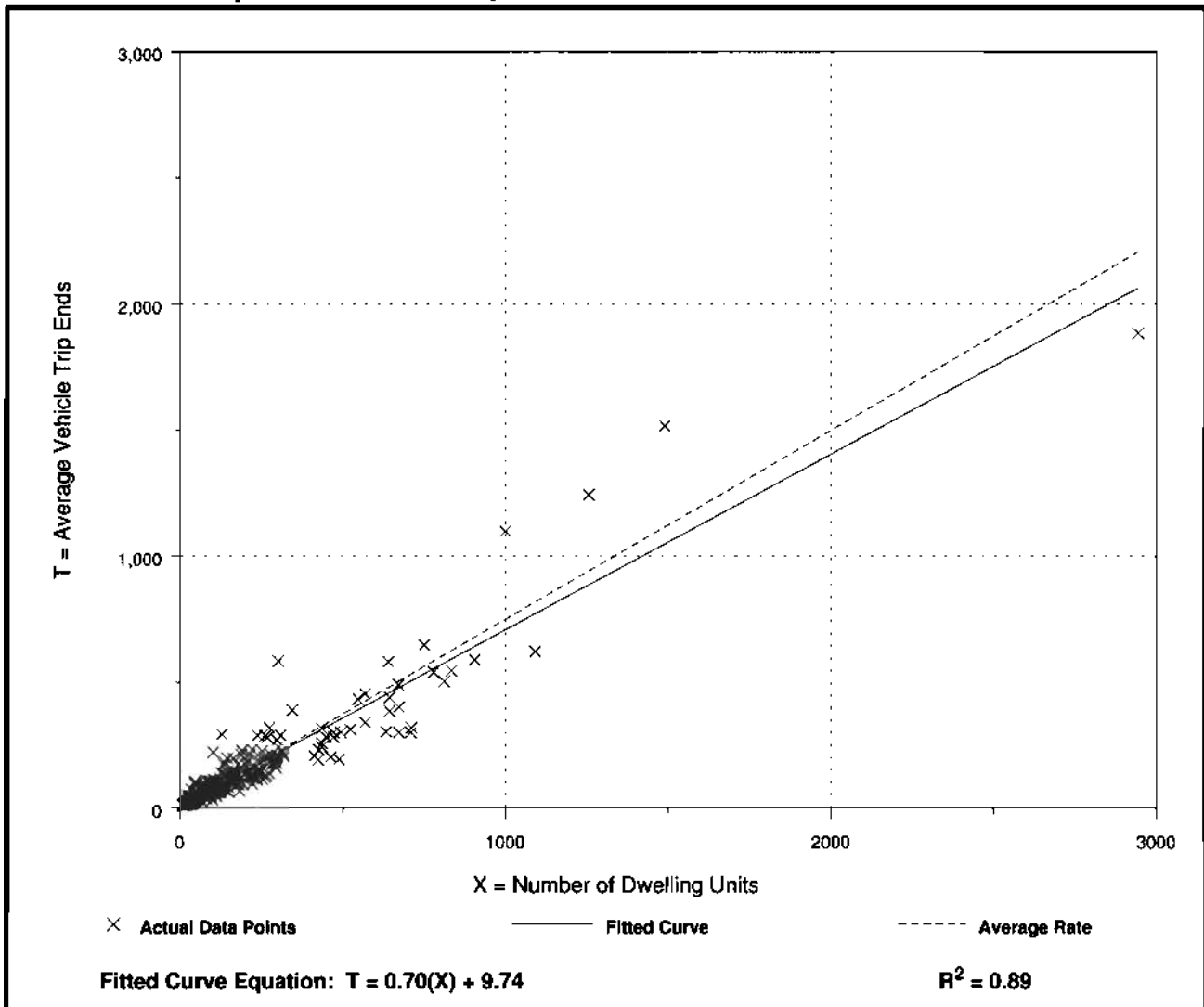
**Average Vehicle Trip Ends vs: Dwelling Units**  
**On a: Weekday,**  
**Peak Hour of Adjacent Street Traffic,**  
**One Hour Between 7 and 9 a.m.**

Number of Studies: 292  
 Avg. Number of Dwelling Units: 194  
 Directional Distribution: 25% entering, 75% exiting

## Trip Generation per Dwelling Unit

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

## Data Plot and Equation



# Single-Family Detached Housing (210)

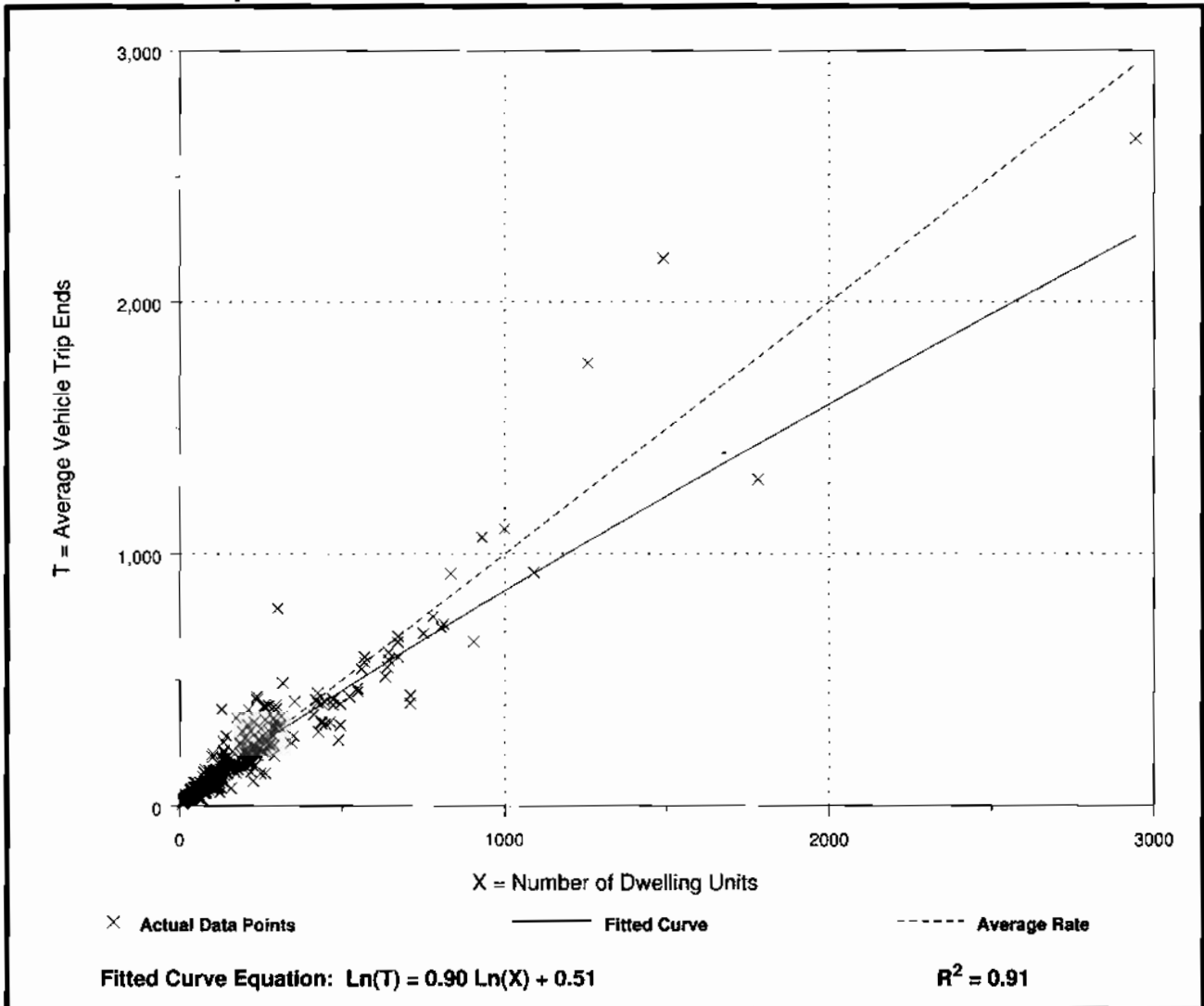
**Average Vehicle Trip Ends vs: Dwelling Units**  
**On a: Weekday,**  
**Peak Hour of Adjacent Street Traffic,**  
**One Hour Between 4 and 6 p.m.**

Number of Studies: 321  
 Avg. Number of Dwelling Units: 207  
 Directional Distribution: 63% entering, 37% exiting

## Trip Generation per Dwelling Unit

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

## Data Plot and Equation



**APPENDIX D**  
**MPC REZONING REPORT**

# CASE SUMMARY

## APPLICATION TYPE: REZONING

KNOXVILLE-KNOX COUNTY

**M P C**  
METROPOLITAN  
P L A N N I N G  
C O M M I S S I O N

T E N N E S S E E

Suite 403 • City County Building  
400 Main Street  
Knoxville, Tennessee 37902  
865 • 215 • 2500  
FAX • 215 • 2068  
www.knoxmpc.org

**File Number:** 7-F-16-RZ                      **Related File Number:**  
**Application Filed:** 5/27/2016              **Date of Revision:**  
**Applicant:** NORVELL & POE ENGINEERS

### PROPERTY INFORMATION

**General Location:** East side Coatney Rd., south of W. Governor John Sevier Hwy.  
**Other Parcel Info.:**  
**Tax ID Number:** 136 119                      **Jurisdiction:** County  
**Size of Tract:** 25.92 acres  
**Accessibility:** Access is via Coatney Rd., a local street with 21' of pavement width within 45' of right-of-way.

### GENERAL LAND USE INFORMATION

**Existing Land Use:** Vacant land  
**Surrounding Land Use:**  
**Proposed Use:** Detached residential development                      **Density:** 5 du/ac  
**Sector Plan:** South County                      **Sector Plan Designation:** LDR  
**Growth Policy Plan:** Planned Growth Area  
**Neighborhood Context:** This area is developed with agricultural and rural to low density residential uses under A, PR and RA zoning. South Doyle High School abuts the subject property to the south.

### ADDRESS/RIGHT-OF-WAY INFORMATION (where applicable)

**Street:**  
**Location:**  
**Proposed Street Name:**  
**Department-Utility Report:**  
**Reason:**

### ZONING INFORMATION (where applicable)

**Current Zoning:** A (Agricultural)  
**Former Zoning:**  
**Requested Zoning:** PR (Planned Residential)  
**Previous Requests:** None noted  
**Extension of Zone:** Yes, extension of PR zoning from the north  
**History of Zoning:** None noted

### PLAN INFORMATION (where applicable)

**Current Plan Category:**  
**Requested Plan Category:**

## **SUBDIVISION INFORMATION (where applicable)**

Subdivision Name:

No. of Lots Proposed:

No. of Lots Approved: 0

Variances Requested:

S/D Name Change:

## **OTHER INFORMATION (where applicable)**

Other Bus./Ord. Amend.:

## **MPC ACTION AND DISPOSITION**

**Planner In Charge:** Michael Brusseau

**Staff Recomm. (Abbr.):** RECOMMEND that County Commission APPROVE PR (Planned Residential) zoning at a density of up to 5 du/ac.

**Staff Recomm. (Full):** PR zoning at the requested density is consistent with the sector plan designation and will allow uses compatible with the surrounding land uses and zoning pattern. The site is relatively flat with no known environmental constraints, so is appropriate for development at the maximum density allowed under the LDR sector plan designation. The site has access to a 21 feet wide road and is adjacent to a high school, making it even more desirable for the requested density.

**Comments:** REZONING REQUIREMENTS FROM ZONING ORDINANCES (must meet all of these):

THE PROPOSED AMENDMENT SHALL BE NECESSARY BECAUSE OF SUBSTANTIALLY CHANGED OR CHANGING CONDITIONS IN THE AREA AND DISTRICTS AFFECTED, OR IN THE CITY/COUNTY GENERALLY:

1. This site is accessed from Coatney Rd., a local street, just off of W. Governor John Sevier Hwy., a major arterial street, and is in the vicinity of other residential developments that are zoned PR and RA at comparable densities. Graybrook Park, directly to the north of the site is zoned and developed at about 4 du/ac. Tipton Station to the south is zoned for 5 du/ac and developed at about 2 du/ac. Woodhaven to the southwest is zoned at 3 du/ac and developed at about 2 du/ac. Woodcreek Reserve to the west is zoned at 1-4 du/ac and developed at about 2.56 du/ac. A map showing these surrounding PR developments has been attached.
2. The property is located in the Planned Growth Area on the Growth Policy Plan and is proposed for low density residential uses on the sector plan, consistent with the proposal.
3. The proposed low density residential zoning and development is compatible with the scale and intensity of the surrounding development and zoning pattern.
4. The site is appropriate to be developed under PR zoning at the maximum permissible density in the LDR category. The site does not have significant slope or other environmental constraints, and has access to a sufficiently wide street.
5. The PR zone requires use on review approval of a development plan by MPC prior to construction. This will provide the opportunity for staff to review the plan and address issues such as traffic circulation, lot layout, recreational amenities, drainage, types of units and other potential development concerns. It will also give the opportunity for public comment at the MPC meeting.

THE PROPOSED AMENDMENT SHALL BE CONSISTENT WITH THE INTENT AND PURPOSE OF THE APPLICABLE ZONING ORDINANCE:

1. PR zoning is intended to provide optional methods of land development which encourage more imaginative solutions to environmental design problems. Residential areas thus established would be characterized by a unified building and site development program, open space for recreation and provision for commercial, religious, educational and cultural facilities which are integrated with the total project by unified architectural and open space treatment.
2. Additionally, the zoning states that each development shall be compatible with the surrounding or adjacent zones. Such compatibility shall be determined by the Planning Commission by review of development plans. Staff maintains that PR is the most appropriate zone for this development.

THE PROPOSED AMENDMENT SHALL NOT ADVERSELY AFFECT ANY OTHER PART OF THE COUNTY, NOR SHALL ANY DIRECT OR INDIRECT ADVERSE EFFECTS RESULT FROM SUCH AMENDMENT:

1. At the requested density of up to 5 du/ac on the 25.92 acres reported, up to 129 dwelling units could be proposed for the site. If developed with the proposed, detached residential units, this would add approximately 1310 trips to the street system and about 49 children to the school system.
2. PR zoning at the recommended density is compatible with surrounding development and should have a minimal impact on adjacent properties.
3. The approval of this request will allow the applicant to submit a development plan with up to 129

dwelling units for MPC's consideration.

4. If the proposed development generates more than 750 trips, a Traffic Impact Study will be required to be submitted with the development plan for MPC's consideration.

5. The site is located directly adjacent to South Doyle High School, obviously with the Parental Responsibility Zone. Therefore, sidewalks will be required on at least one side of each interior street with the development and along the Coatney Rd. frontage.

6. The PR zoning district has provisions for preservation of open space and providing recreational amenities as part of the development plan. The applicant will be expected to demonstrate how these provisions are met as part of the required development plan review.

7. Public water and sanitary sewer utilities are available in the area, but may need to be extended to serve the site.

THE PROPOSED AMENDMENT SHALL BE CONSISTENT WITH AND NOT IN CONFLICT WITH THE GENERAL PLAN OF KNOXVILLE AND KNOX COUNTY, INCLUDING ANY OF ITS ELEMENTS, MAJOR ROAD PLAN, LAND USE PLAN, COMMUNITY FACILITIES PLAN, AND OTHERS:

1. The South County Sector Plan proposes low density residential uses for this property, consistent with the requested PR zoning at up to 5 du/ac.

2. The site is located within the Planned Growth Area on the Knoxville-Knox County-Farragut Growth Policy Plan map.

3. Approval of this request could lead to future requests for PR zoning, consistent with the sector plan's low density residential proposal for the area.

Upon final approval of the rezoning, the developer will be required to submit a development plan for MPC consideration of use on review approval prior to the property's development. The plan will show the property's proposed development, landscaping and street network and will also identify the types of residential units that may be constructed. Grading and drainage plans may also be required at this stage, if deemed necessary by Knox County Engineering and MPC staff.

**Action:** Approved **Meeting Date:** 7/14/2016

**Details of Action:** RECOMMEND that County Commission APPROVE PR (Planned Residential) zoning at a density of up to 4 du/ac.

**Summary of Action:** Recommend the Knox County Commission approve PR (Planned Residential) zoning at a density up to 4 dwelling units per acre

**Date of Approval:** 7/11/2013 **Date of Denial:** **Postponements:**

**Date of Withdrawal:** **Withdrawn prior to publication?:**  **Action Appealed?:**

## LEGISLATIVE ACTION AND DISPOSITION

**Legislative Body:** Knox County Commission

**Date of Legislative Action:** 8/22/2016 **Date of Legislative Action, Second Reading:**

**Ordinance Number:** **Other Ordinance Number References:**

**Disposition of Case:** Approved **Disposition of Case, Second Reading:**

**If "Other":** **If "Other":**

**Amendments:** **Amendments:**

**Date of Legislative Appeal:** **Effective Date of Ordinance:**

**APPENDIX E**  
**CAPACITY ANALYSES -**  
**HCM WORKSHEETS**  
**(SYNCHRO 8)**

# HCM Unsignalized Intersection Capacity Analysis

## 4: Coatney Road & Road "A"



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	6	56	182	2	18	189
Sign Control	Stop		Free			Free
Grade	0%		2%			-2%
Peak Hour Factor	0.25	0.54	0.76	0.92	0.31	0.86
Hourly flow rate (vph)	24	104	239	2	58	220
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	576	241			242	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	576	241			242	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	95	87			96	
cM capacity (veh/h)	461	803			1337	
<b>Direction, Lane #</b>	<b>WB 1</b>	<b>NB 1</b>	<b>SB 1</b>			
Volume Total	128	242	278			
Volume Left	24	0	58			
Volume Right	104	2	0			
cSH	705	1700	1337			
Volume to Capacity	0.18	0.14	0.04			
Queue Length 95th (ft)	16	0	3			
Control Delay (s)	11.2	0.0	1.9			
Lane LOS	B		A			
Approach Delay (s)	11.2	0.0	1.9			
Approach LOS	B					
<b>Intersection Summary</b>						
Average Delay			3.1			
Intersection Capacity Utilization			34.4%		ICU Level of Service	A
Analysis Period (min)			15			



# HCM Unsignalized Intersection Capacity Analysis

## 4: Coatney Road & Road "A"



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	33	16	127	33	16	97
Sign Control	Stop		Free			Free
Grade	0%		2%			-2%
Peak Hour Factor	0.25	0.50	0.43	0.50	0.67	0.95
Hourly flow rate (vph)	132	32	295	66	24	102
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	478	328			361	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	478	328			361	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	75	96			98	
cM capacity (veh/h)	539	718			1208	
<b>Direction, Lane #</b>	<b>WB 1</b>	<b>NB 1</b>	<b>SB 1</b>			
Volume Total	164	361	126			
Volume Left	132	0	24			
Volume Right	32	66	0			
cSH	566	1700	1208			
Volume to Capacity	0.29	0.21	0.02			
Queue Length 95th (ft)	30	0	2			
Control Delay (s)	13.9	0.0	1.7			
Lane LOS	B		A			
Approach Delay (s)	13.9	0.0	1.7			
Approach LOS	B					
<b>Intersection Summary</b>						
Average Delay			3.8			
Intersection Capacity Utilization			28.0%		ICU Level of Service	A
Analysis Period (min)			15			

# HCM Unsignalized Intersection Capacity Analysis

## 4: Coatney Road & Road "A"



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	4	36	73	7	60	113
Sign Control	Stop		Free			Free
Grade	0%		2%			-2%
Peak Hour Factor	0.25	0.75	0.89	0.75	0.83	0.80
Hourly flow rate (vph)	16	48	82	9	72	141
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	373	87			91	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	373	87			91	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	97	95			95	
cM capacity (veh/h)	602	977			1516	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	64	91	214
Volume Left	16	0	72
Volume Right	48	9	0
cSH	846	1700	1516
Volume to Capacity	0.08	0.05	0.05
Queue Length 95th (ft)	6	0	4
Control Delay (s)	9.6	0.0	2.8
Lane LOS	A		A
Approach Delay (s)	9.6	0.0	2.8
Approach LOS	A		

Intersection Summary			
Average Delay		3.3	
Intersection Capacity Utilization		25.9%	ICU Level of Service A
Analysis Period (min)		15	

**APPENDIX F**  
**SPOT SPEED STUDY DATA**

## SPOT SPEED STUDY

Location: Coatney Road (adjacent to proposed property)  
 Posted Speed Limit: 30 mph  
 Equipment: Bushnell Speedster III Radar Speed Gun

Date: 10/20/2016  
 Weather: Sunny  
 Time: 11:45 AM

Vehicle	Speed (mph)
1	41
2	41
3	38
4	43
5	36
6	38
7	50
8	34
9	38
10	50
11	33
12	31
13	32
14	31
15	30
16	36
17	35
18	38
19	37
20	39
21	32
22	36

Sample Size Requirements (from *ITE Manual of Transportation Engineering Studies*)

$$N = (S * K/E)^2$$

where: N = minimum number of measured speeds  
 S = estimated sample standard deviation (mph)  
 K = constant corresponding to the desired confidence level  
 E = permitted error in the average speed estimate (mph)

S = 5 mph (Table 3-2, page 38)  
 K = 2.58 (Confidence level of 99% - Table 3-3, page 38)  
 E = 2 mph assumed error range

Therefore, N = 42

## SPOT SPEED STUDY

Location: Coatney Road (adjacent to proposed property)  
Posted Speed Limit: 30 mph  
Equipment: Bushnell Speedster III Radar Speed Gun

Date: 10/20/2016  
Weather: Sunny  
Time: 11:45 AM

23	37
24	33
25	42
26	40
27	40
28	36
29	31
30	35
31	35
32	39
33	34
34	41
35	41
36	35
37	34
38	40
39	35
40	41
41	39
42	50

85th percentile speed = 41.0 mph

**APPENDIX G**

**KNOX COUNTY LEFT & RIGHT TURN LANE  
VOLUME THRESHOLD WORKSHEETS**

TABLE 5A

**LEFT-TURN LANE VOLUME THRESHOLDS  
FOR TWO-LANE ROADWAYS WITH A PREVAILING SPEED OF 36 TO 45 MPH**

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

OPPOSING VOLUME	THROUGH VOLUME PLUS RIGHT-TURN VOLUME *					
	100 - 149	150 - 199	200 - 249	250 - 299	300 - 349	350 - 399
100 - 149	250	180	140	110	80	70
150 - 199	200	140	105	90	70	60
200 - 249	160	115	85	75	65	55
250 - 299	130	100	75	65	60	50
300 - 349	110	90	70	60	55	45
350 - 399	100	80	65	55	50	40
400 - 449	90	70	60	50	45	35
450 - 499	80	65	55	45	40	30
500 - 549	70	60	45	35	35	25
550 - 599	65	55	40	35	30	25
600 - 649	60	45	35	30	25	25
650 - 699	55	35	35	30	25	20
700 - 749	50	35	30	25	20	20
750 or More	45	35	25	25	20	20

OPPOSING VOLUME	THROUGH VOLUME PLUS RIGHT-TURN VOLUME *					
	350 - 399	400 - 449	450 - 499	500 - 549	550 - 599	= / > 600
100 - 149	70	60	50	45	40	35
150 - 199	60	55	45	40	35	30
200 - 249	55	50	40	35	30	30
250 - 299	50	45	35	30	30	30
300 - 349	45	40	35	30	25	25
350 - 399	40	35	30	25	25	20
400 - 449	35	30	30	25	20	20
450 - 499	30	25	25	20	20	20
500 - 549	25	25	20	20	20	15
550 - 599	25	20	20	20	20	15
600 - 649	25	20	20	20	20	15
650 - 699	20	20	20	20	20	15
700 - 749	20	20	20	15	15	15
750 or More	20	20	20	15	15	15

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

TABLE 5B

RIGHT-TURN LANE VOLUME THRESHOLDS  
FOR TWO-LANE ROADWAYS WITH A PREVAILING SPEED OF 36 TO 45 MPH

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

RIGHT-TURN VOLUME	THROUGH VOLUME PLUS LEFT-TURN VOLUME *					
	350 - 399	400 - 449	450 - 499	500 - 549	550 - 600	+ / > 600
Fewer Than 25 25 - 49 50 - 99				Yes	Yes	Yes
100 - 149 150 - 199		Yes	Yes	Yes	Yes	Yes
200 - 249 250 - 299	Yes	Yes	Yes	Yes	Yes	Yes
300 - 349 350 - 399	Yes	Yes	Yes	Yes	Yes	Yes
400 - 449 450 - 499	Yes	Yes	Yes	Yes	Yes	Yes
500 - 549 550 - 599	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.