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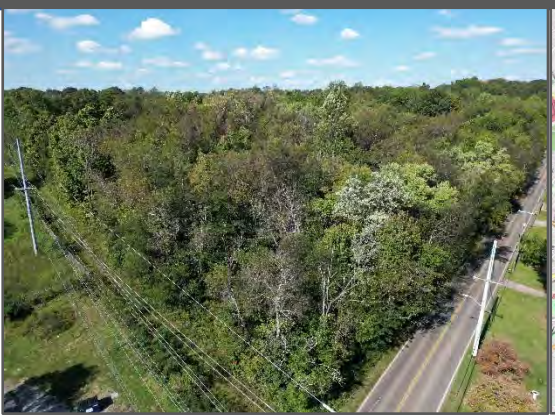
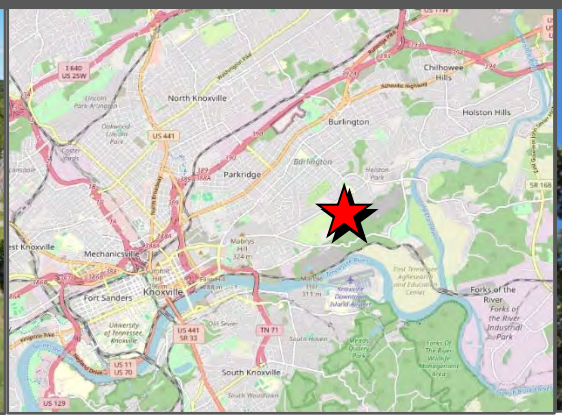
Transportation Impact Study

Cardinal Place

Knoxville, Tennessee





Updated February 28, 2025

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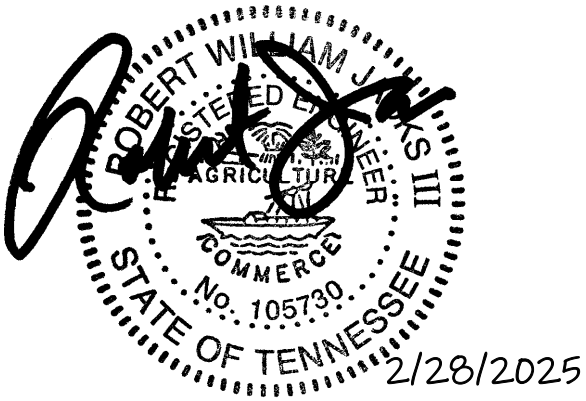

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EXECUTIVE SUMMARY

Preface:

Cardinal Place, LLC proposes a residential development between Brooks Avenue, Delrose Drive, and Riverside Road in East Knoxville, TN. The proposed development will include constructing 570 apartments and 80 multi-family attached townhouses on two parcels containing 30.15 +/- acres. The development is named and referenced in this study as "Cardinal Place". Cardinal Place proposes three entrances – one to Riverside Road to the east and two to the south at Delrose Drive and is anticipated to be fully built and occupied by 2027.

The primary purpose of this study is to determine and evaluate the potential impacts of the development on the adjacent transportation system. The study includes a review of the primary access roads, adjacent existing intersections, and proposed entrance intersections. This report is a Level 2 study established by Knoxville/Knox County Planning. Recommendations and mitigation measures are offered if transportation operations are projected to be below recognized engineering standards.

Study Results:

The significant findings of this study include the following:

- The Cardinal Place development, with 570 apartments and 80 multi-family attached townhouses, is estimated to generate 5,076 vehicle trips at full build-out and occupancy on an average weekday. Of these daily trips, 295 are estimated to occur during the AM peak hour and 432 in the PM peak hour in 2027.
- All studied existing and proposed entrance intersections are projected to operate with minimal vehicle delays and queues. The existing intersections included in the study are not expected to be substantially impacted by the proposed Cardinal Place development.
- The main entrance for the proposed development, the Proposed Southeast Entrance, is estimated to meet a warrant for a separate eastbound left-turn lane on Delrose Drive in the projected 2027 PM peak hour. The Proposed Southwest Entrance is projected to almost warrant a separate eastbound left-turn lane. The other proposed entrance, the East Entrance at Riverside Road, is not projected to warrant separate entering turn lanes.

Recommendations:

The following recommendations are offered based on the study analyses to minimize the impacts of the proposed development on the adjacent transportation system while attempting to achieve an acceptable traffic flow and improved safety. The recommendations marked with an asterisk indicate an existing transportation need and are not associated with the proposed development's projected impacts. More details regarding all the recommendations are discussed at the end of the report.

Brooks Avenue at Dandridge Avenue and Wilder Place:

- From a transportation engineering perspective, the Cardinal Place development will have minimal impact on this intersection. No specific recommendations are provided based on these findings.
- * It is recommended, however, that the City of Knoxville seriously consider eliminating the northwestbound approach of Dandridge Avenue at the 5-legged intersection by rerouting this approach further to the east at Brooks Avenue. An initial recommendation to eliminate this approach would be to reroute it east of the corner gas station/market and intersect Brooks Avenue at a t-intersection.

Delrose Drive at Riverside Drive:

- From a transportation engineering perspective, the Cardinal Place development will have minimal impact on this intersection. No specific recommendations are provided based on these findings.
- * It is recommended, however, that the City of Knoxville seriously consider rerouting the southeast approach of Riverside Drive to intersect Delrose Drive further to the east and away from the Vulcan Materials Driveway.

Delrose Drive and Brooks Avenue at Riverside Road:

- Due to the projected increased traffic volumes on Riverside Road, it is recommended that this roadway be widened to have a minimum width of 20 feet its entire length. This road was recently repaved and slightly widened in spots but still has sections less than 18 feet wide. Details regarding the particulars of this road widening should be discussed further with the City of Knoxville Engineering Department.

Riverside Road at Proposed East Entrance:

- It is recommended that a Stop Sign (R1-1) be installed and a 24" white stop bar be applied to the Proposed East Entrance approach at Riverside Road. The stop bar should be applied a minimum of 4 feet away from the edge of Riverside Road and placed at the desired stopping point that maximizes the sight distance.
- Intersection sight distance at the Proposed East Entrance at Riverside Road must not be impacted by existing vegetation or future landscaping or signage. The existing utility pole on the west side of Riverside Road near the proposed entrance location will need to be relocated. Based on a posted speed limit of 25 mph on Riverside Road, the required intersection sight distance (ISD) is 280 feet for exiting left-turning vehicles at the Proposed East Entrance and 240 feet for exiting right-turning vehicles. The site designer must verify that these distances will be available.

Delrose Drive at Proposed Southwest Entrance:

- Due to the projected volumes nearly meeting a warrant for an eastbound left-turn lane on Delrose Drive, serious consideration should be given to providing a separate entering lane into the development at this entrance. A separate left-turn lane on Delrose Drive at this proposed entrance is nearly warranted based on the projected 2027 PM peak hour traffic volumes and Knox County thresholds. If provided, the recommended lengths for this proposed left-turn lane were based on TDOT standards and include an approach taper of 225 feet, a bay taper of 90 feet (8:1), and a vehicle storage length of 75 feet lane.
- It is recommended that a Stop Sign (R1-1) be installed and a 24" white stop bar be applied to the Proposed Southwest Entrance approach at Delrose Drive. The stop bar should be applied a minimum of 4 feet away from the edge of Delrose Drive and placed at the desired stopping point that maximizes the sight distance.
- Intersection sight distance at the Proposed Southwest Entrance at Delrose Drive must not be impacted by existing vegetation or future landscaping or signage. Based on a posted speed limit of 35 mph on Delrose Drive, the required ISD is 390 feet for exiting left-turning vehicles at the Proposed Southwest Entrance and 335 feet for exiting right-turning vehicles. The site designer must verify that these distances will be available.

Delrose Drive at Proposed Southeast Entrance:

- A separate left-turn lane on Delrose Drive at this proposed main entrance is warranted based on the projected 2027 PM peak hour traffic volumes and Knox County thresholds. The recommended lengths for this proposed left-turn lane were based on TDOT standards and include an approach taper of 225 feet, a bay taper of 90 feet (8:1), and a vehicle storage length of 75 feet lane.
- It is recommended that a Stop Sign (R1-1) be installed and a 24" white stop bar be applied to the Proposed Southeast Entrance approach at Delrose Drive. The stop bar should be applied a minimum of 4 feet away from the edge of Delrose Drive and placed at the desired stopping point that maximizes the sight distance.
- Intersection sight distance at the Proposed Southeast Entrance at Delrose Drive must not be impacted by existing vegetation or future landscaping or signage. Based on a posted speed limit of 35 mph on Delrose Drive, the required ISD is 390 feet for exiting left-turning vehicles at the Proposed Southeast Entrance and 335 feet for exiting right-turning vehicles. The site designer must verify that these distances will be available.

Cardinal Place Internal Drives/Parking Lot Aisleways:

- A 15 mph Speed Limit Sign (R2-1) is recommended to be posted near the beginning of the development entrance driveways off Riverside Road and Delrose Drive.
- As shown in the report, Stop Signs (R1-1) and 24" white stop bars are recommended on the new internal drives and parking lot aisleways.
- Sight distance at the new internal intersections must not be impacted by new signage, parked cars, or future landscaping. With a speed limit of 15 mph in the development, the internal intersection sight distance is 170 feet. The site designer should ensure that internal sight distance lengths are met.
- With long and straight parking lot aisleways proposed internally, it is recommended that speed humps or tables be considered to reduce internal traffic speeds in the development. Alternatively, parking lot islands could be extended toward the aisleways. Extending the parking lot islands a few feet would narrow the aisleway widths and reduce the available driving surface. A narrower aisleway design would reduce driver comfort and internal vehicle speeds.
- All drainage grates and covers for the residential development must be pedestrian and bicycle-safe.
- Internal sidewalks are proposed throughout the development and include an internal perimeter walking trail. Concrete sidewalks should have appropriate

ADA-compliant ramps at intersection corners with detectable surfaces, and the internal sidewalks are recommended to be 5 feet minimum in width to meet the City of Knoxville regulations. White-painted crosswalks should be applied to the internal road pavement where pedestrians are expected to cross the parking aisleways. Internal crosswalks should include Pedestrian Warning (W11-2) signs with a downward arrow plaque (W16-7p) where appropriate. The internal crosswalks should have a white transverse marking as shown in TDOT Standard Drawing T-M-4.

- The internal sidewalk system for the proposed development should connect to the existing external sidewalk system on Brooks Avenue. It is recommended that this connection be constructed where the development property has a narrow strip of land up to Brooks Avenue. It is recommended that a crosswalk and pedestrian warning signs be applied on Brooks Avenue to connect to the sidewalk on the northern side of Brooks Avenue.
- All road and intersection elements should be designed to AASHTO and the City of Knoxville specifications and guidelines to ensure proper operation.

DESCRIPTION OF EXISTING CONDITIONS

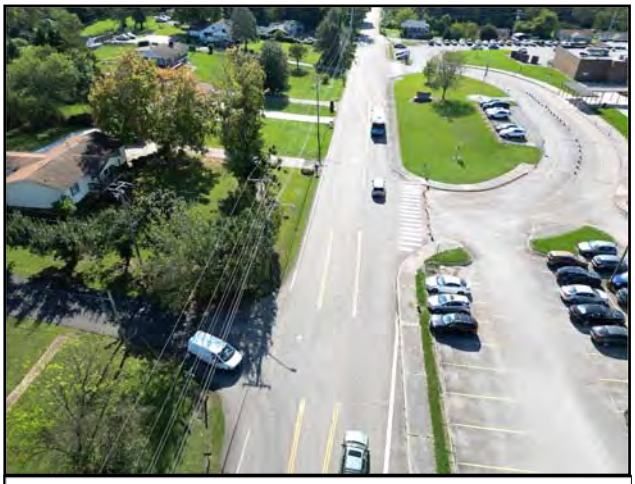
- **STUDY AREA:**

The proposed location of this new residential development is shown on a map in Figure 1. This development will be located between Brooks Avenue to the north, Riverside Road to the east, Delrose Drive to the south, and Williams Creek Golf Course and Mt. Zion Baptist Church to the west in East Knoxville, TN. One of the three proposed entrances will tie to the east at Riverside Road and is referenced as the East Entrance in this report. The other two entrances will tie into Delrose Drive to the south. These two entrances in this report are referred to as the Southwest Entrance and the Southeast Entrance. The proposed Southeast Entrance will be the main access point for the development.

The development will be constructed from two existing parcels that, when combined, include 30.15 +/- acres. The smaller of the two existing parcels will allow access to Riverside Road to the east. As requested, transportation impacts associated with the development were analyzed at the proposed entrances, where the development will have road access to and from external destinations. The scope of work also requested analyses of two nearby intersections, Brooks Avenue at Riverside Road and Delrose Drive at Riverside Road, and two intersections further to the west – Brooks Avenue at Dandridge Avenue and Wilder Place and Delrose Drive at Riverside Drive.

It should be noted that there are two roadways with nearly the same name in the surrounding area: Riverside Road and Riverside Drive. Riverside Road is just east of the development site and runs between Brooks Avenue and Delrose Drive in a north-south configuration. Riverside Drive is further south of the development site, traverses in an east-west configuration, and does not run next to the site.

The proposed development property is in a well-established urban area that has a mix of residential, industrial, and recreational uses. The surrounding area has no particular named residential developments or subdivisions and is generally referred to as "East Knoxville". There are several stretches of houses along Brooks Avenue, Delrose Drive, and Riverside Road in the surrounding area, but other than a smattering of condominiums, all the housing is single-family detached. Nearby industrial properties include Vulcan Materials, a quarry and producer of construction aggregates, and Meridian Waste, a private construction and demolition landfill. These industries attract and make use of heavy trucks in their transportation operations. The



Sarah Moore Greene Magnet Academy on Brooks Avenue Near Riverside Road (Looking West)

Williams Creek Golf Course is adjacent to the development site to the southwest. This private golf course includes 18 holes, a clubhouse, and practice facilities on 98 acres. Mt. Zion Baptist Church is adjacent to the development site to the northwest.

In addition to these land uses, Sarah Moore Greene Magnet Academy is located nearby. It is situated just north of the development site and adjacent to the intersection of Brooks Avenue at Riverside Road. This school is named after a local civil rights leader and educator and provides elementary school education for nearly 600 students.

The Cardinal Place development property is currently 100% forested and unoccupied. According to KGIS historical aerial imaging, the property was used for agricultural purposes around 60 years ago and had a residence on its southwest corner. However, vegetation and trees have slowly overtaken the property for the past 30 years. The topography for the development property is defined by a high point at Riverside Road on its northeastern edge, with the grade of the property falling to the southwest towards the golf course. On an adjacent small parcel to the south, a historic cemetery is on the north side of Delrose Drive. This cemetery is known as Williams–Masterson, and according to Robert McGinnis, a Knox County cemetery historian, the cemetery was in use from 1890 – 1967.

Major road access to this area of Knoxville is provided by the east- and west-oriented Brooks Avenue and Delrose Drive, which transitions to Riverside Drive further to the west and provides access to James White Parkway. This parkway runs just east of downtown Knoxville and provides convenient access to nearby Interstate 40 and 275.

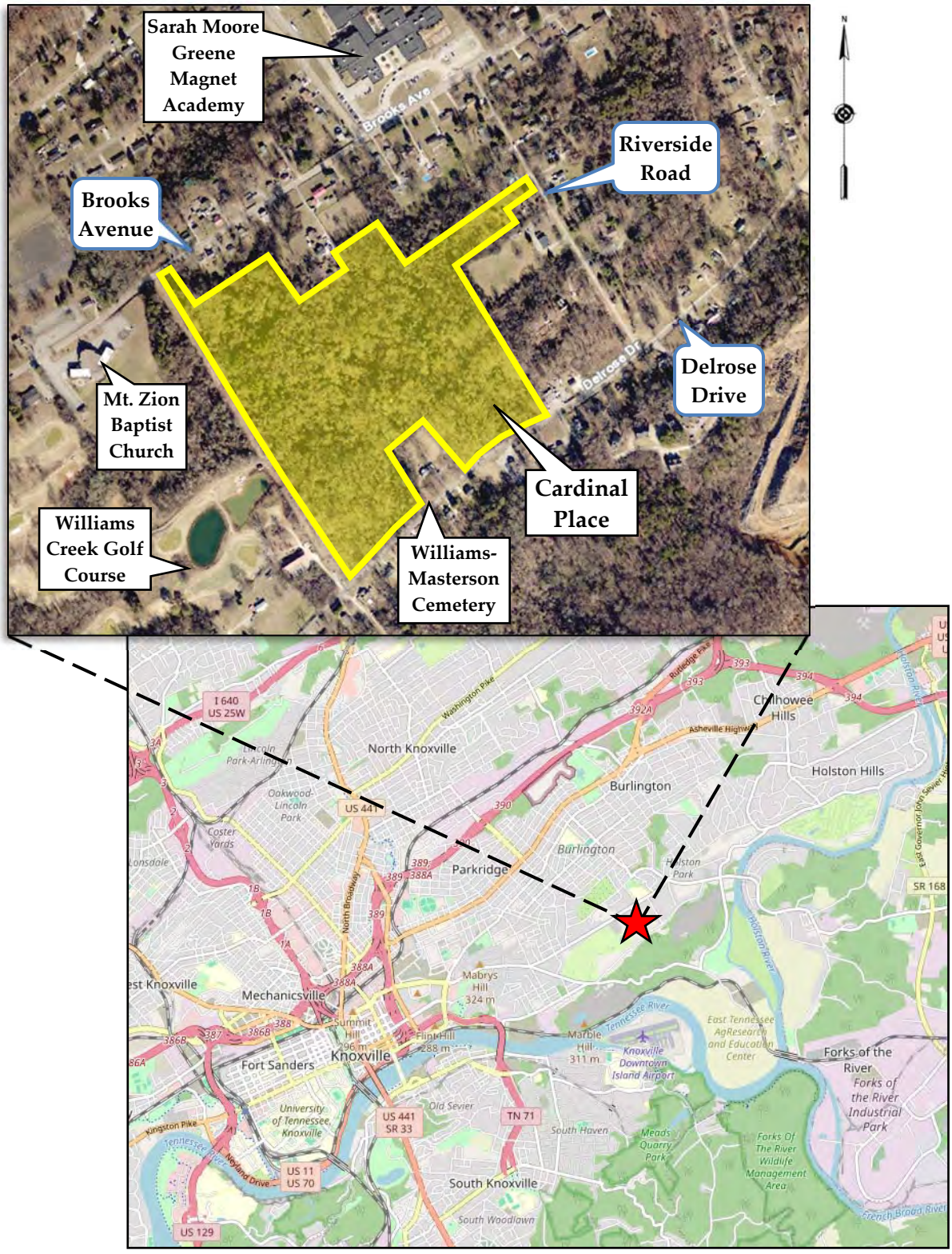


Figure 1
Location Map

- **EXISTING ROADWAYS:**

Table 1 lists the characteristics of the existing primary roadways near the development property and included in the study:

TABLE 1
STUDY CORRIDOR CHARACTERISTICS

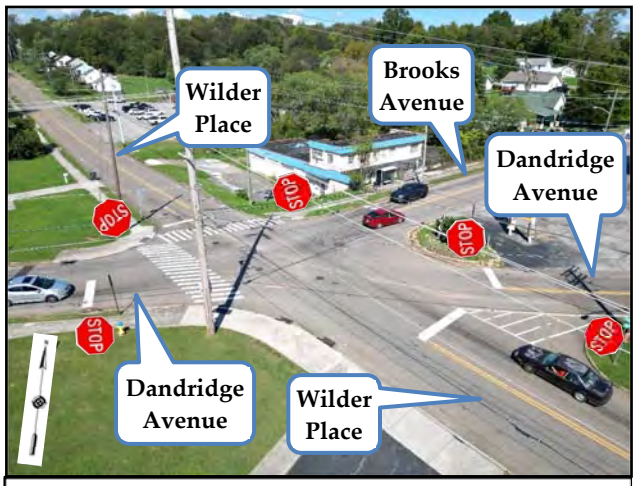
NAME	CLASSIFICATION [1]	SPEED LIMIT	LANES	ROAD WIDTH [2]	TRANSIT [3]	PEDESTRIAN FACILITIES	BICYCLE FACILITIES
Brooks Avenue	Minor Arterial	30 mph	2 lanes	21 - 26 feet	KAT Route 32	5' sidewalk on north side of roadway	No bike lanes
Dandridge Avenue	Minor Arterial / Minor Collector	30 mph	2 lanes	20 - 26 feet	KAT Route 32	5' sidewalk on south side of roadway, west of Wilder Place	No bike lanes
Wilder Place	Minor Collector	25 mph	2 lanes	30 feet	No Transit	5' sidewalk on west side of roadway, north of Brooks Avenue	No bike lanes
Delrose Drive	Major Collector	35 mph	2 lanes	22 - 23 feet	No Transit	No sidewalks along roadway	No bike lanes
Riverside Road	Local Street	25 mph	2 lanes	16 - 19 feet	No Transit	No sidewalks along roadway	No bike lanes
Riverside Drive	Minor Arterial / Minor Collector	30 mph	2 lanes	25 feet	No Transit	No sidewalks along roadway	No bike lanes

[1] 2018 Major Road Plan by Knoxville/Knox County Planning
[2] From edges of pavement near project site
[3] According to Knoxville Area Transit System Map

Brooks Avenue is a 2-lane Minor Arterial that traverses southwest-northeast between Wilder Place and Dandridge Avenue to the southwest and Boyds Bridge Pike to the northeast, a total distance of 1.5 miles. The speed limit on Brooks Avenue is 30 mph, and the road has a 5-foot concrete sidewalk on its northern side for its entire length. On its southwestern end, the sidewalk on Brooks Avenue continues further west on Dandridge Avenue and to the north on Wilder Place. At its northeast end, the sidewalk on Brooks Avenue terminates at its intersection with Boyd Bridge Pike and does not continue further. The proposed development site has a small strip of land on its northern edge that borders Brooks Avenue, but the sidewalk is located on the opposite (north) side.

The pavement width of Brooks Avenue fluctuates between 26 feet on its southwestern end and narrows down to 21 feet closer to the proposed development site. A double yellow centerline is provided on the pavement its entire length with white edge lines on some sections of the road. Knoxville Area Transit (KAT) provides several bus stops along Brooks Avenue on Route 32, "Dandridge Avenue". The closest bus stop to the development property is approximately ¼ mile away. It is located on the south side of Brooks Avenue at Border Street near Sarah Moore Greene Magnet Academy.

At its southwestern beginning, Brooks Avenue comprises the east approach at an uncommon 5-legged, unsignalized intersection. This intersection is quite complex from an operations standpoint, with all five legs operating under stop control. In addition to the five street approaches, a Marathon gas station with a Stop N Go Market & Deli is located on the southeastern corner, with large expanses of pavement provided along the edges of Brooks Avenue and Dandridge Avenue. An entrance to the Lennon Seney United Methodist Church is located just south of the intersection on Wilder Place.



Brooks Avenue at Dandridge Avenue and Wilder Place

All other properties along Brooks Avenue are residential besides the gas station/market, Sarah Moore Greene Magnet Academy, and Mt. Zion Baptist Church.

Dandridge Avenue is a 2-lane Minor Arterial and Minor Collector that traverses in a generally west-east direction between the signalized intersection of E Summit Hill Drive / Martin Luther King Jr Avenue / E Hill Avenue from the west to Riverside Drive to the east, with a total length of 1.4 miles. The road is classified as a Minor Arterial between E Summit Hill Drive / Martin Luther King Jr Avenue / E Hill Avenue and Brooks Avenue / Wilder Place on its western section. It is classified as a Minor Collector between Brooks Avenue / Wilder Place and Riverside Drive on its southeastern section. The speed limit on Dandridge Avenue is 30 mph, with a 5-foot concrete sidewalk on its southern side for its entire western section. On its western end, the sidewalk on Dandridge Avenue continues on E Summit Hill Drive / Martin Luther King Jr Avenue / E Hill Avenue. On its eastern end, the sidewalk on Dandridge Avenue continues on Wilder Place to the north and Brooks Avenue further east but does not continue on its

southeastern section.

Dandridge Avenue comprises the west and southeast approaches at the 5-legged unsignalized intersection with Brooks Avenue and Wilder Place. A white crosswalk on the west approach of Dandridge Avenue is provided at the intersection. The west approach of Dandridge Avenue is 26 feet in width, and the southeast approach has a width of 20 feet. Double yellow centerlines are provided on the pavement of Dandridge Avenue on its entire length. On its southeastern end, Dandridge Avenue intersects Riverside Drive at an acute angle and is controlled by a Stop Sign (R1-1). KAT provides several bus stops along Dandridge Avenue west of the 5-legged intersection on Route 32, "Dandridge Avenue", but none to the southeast.

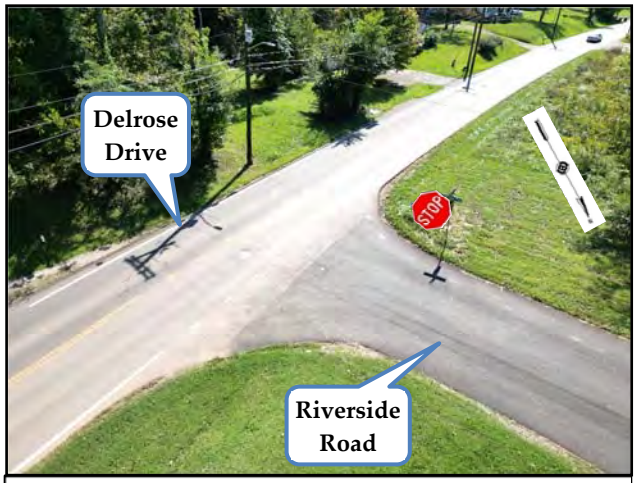
Wilder Place is a 2-lane Minor Collector that traverses in a south-north direction between Riverside Drive from the south to Harold Avenue to the north, with a total length of 0.6 miles. The intersection of Wilder Place at Riverside Drive is an unsignalized t-intersection with Wilder Place operating under stop conditions. Wilder Place, 1,200 feet north of the 5-legged intersection, transitions to McConnell Street, eventually intersecting with Martin Luther King Jr Avenue further north. The speed limit on Wilder Place is 25 mph, and it has a 5-foot concrete sidewalk on its western side to the north of the 5-legged intersection. A short 325' section of sidewalk is on Wilder Place south of the 5-legged intersection but ends abruptly just past the Lennon Seney United Methodist Church property. An unconnected 650' section of sidewalk is also provided on the east side of Wilder Place, 800 feet further to the south.

Wilder Place comprises the south and north approaches at the 5-legged unsignalized intersection with Brooks Avenue and Dandridge Avenue. A white crosswalk on the north approach of Wilder Place is provided at the intersection. Both approaches of Wilder Place are 30 feet in width and have double yellow centerlines on the pavement. KAT does not provide bus transit on Wilder Place other than a bus stop just slightly east of the 5-legged intersection and is on Route 32, "Dandridge Avenue".

Delrose Drive is a 2-lane Major Collector that traverses in a southwest-northeast direction between Riverside Drive from the southwest end to Boyds Bridge Pike to the northeast, totaling 1.4 miles. The speed limit on Delrose Drive is 35 mph, and it does not have sidewalks. At its southwestern beginning, Delrose Drive transitions from the west approach of Riverside Drive at a y-intersection with Riverside Drive's southeast approach combined with a driveway entrance for Vulcan Materials to the south. The pavement width of Delrose Drive is relatively stable along its length and is between 22 and 23 feet. A double yellow centerline and white edge pavement

lines are provided on the pavement on the entire length of Delrose Drive. KAT does not provide bus service on Delrose Drive. Delrose Drive intersects Riverside Road just east of the proposed development site at an unsignalized t-intersection.

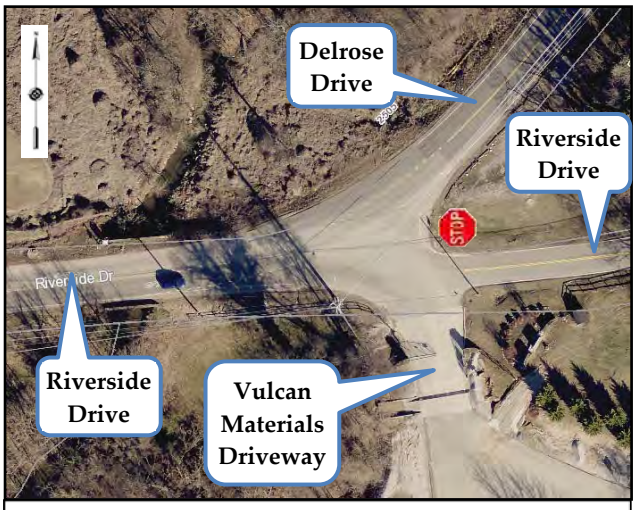
Riverside Road is a 2-lane Local Street that traverses in a southeast-northwest direction between Delrose Drive from the southeast to Brooks Avenue to the northwest, totaling 1,500 feet. The speed limit on Riverside Road is 25 mph, and it does not have sidewalks. On its southeastern end, Riverside Road intersects Delrose Drive at a crest vertical curve with Riverside Road controlled by a Stop Sign (R1-1). Riverside Road to the northwest intersects Brooks Avenue at an unsignalized t-intersection and is controlled by a Stop Sign (R1-1).



Delrose Drive at Riverside Road

Riverside Road has recently been repaved and slightly widened. The pavement width was measured at several points between 16 to 19 feet in width. No pavement markings are applied to the pavement on Riverside Road. KAT does not provide bus service on Riverside Road.

Riverside Drive is a 2-lane Minor Arterial and Minor Collector that traverses in a generally west-east direction between James White Parkway from the west and ends on a University of Tennessee (UT) property near the Tennessee River to the east, with a total length of 3.2 miles. The road is classified as a Minor Arterial between James White Parkway and Delrose Drive. Riverside Drive is classified as a Minor Collector between Delrose Drive and the UT property. The speed limit on Riverside Drive is 30 mph, and no sidewalks are provided.

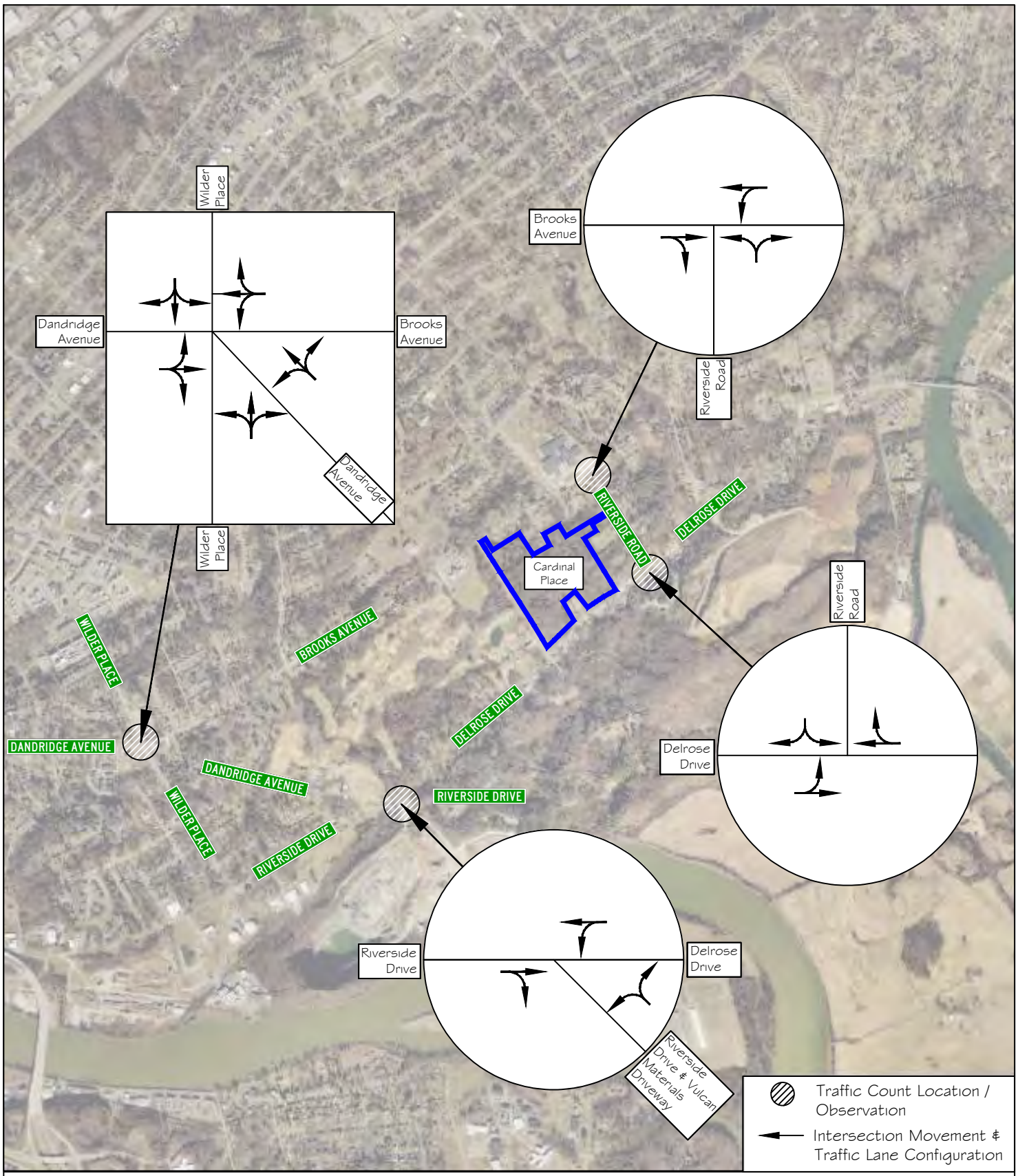


Riverside Drive at Delrose Drive and Vulcan Materials Driveway

The intersection of Riverside Drive at Delrose Drive is uncommon and y-shaped, with the main

thoroughfare consisting of Riverside Drive to the west and Delrose Drive to the east-northeast. At the intersection, the roadway approach to the southeast is designated as Riverside Drive, and directly to the south a driveway entrance to Vulcan Materials ties into the intersection. Only one Stop Sign (R1-1) is provided at the intersection, with Delrose Drive and the west approach of Riverside Drive operating freely.

Figure 2 shows the existing lane configurations of the intersections examined and included in the study and the traffic count locations in the study area. The pages following Figure 2 give a further overview of the site study area with photographs.



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NOT TO SCALE

NORTH

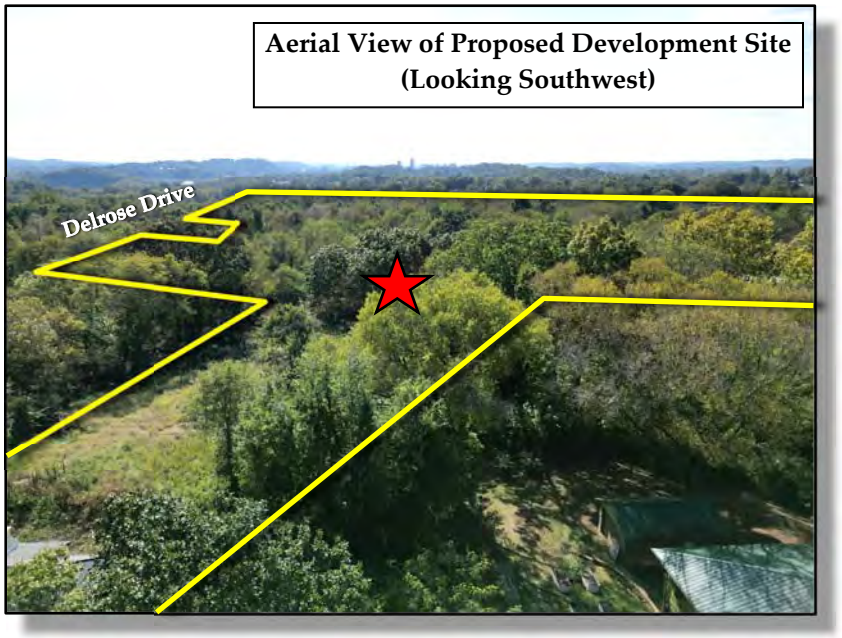
FIGURE 2

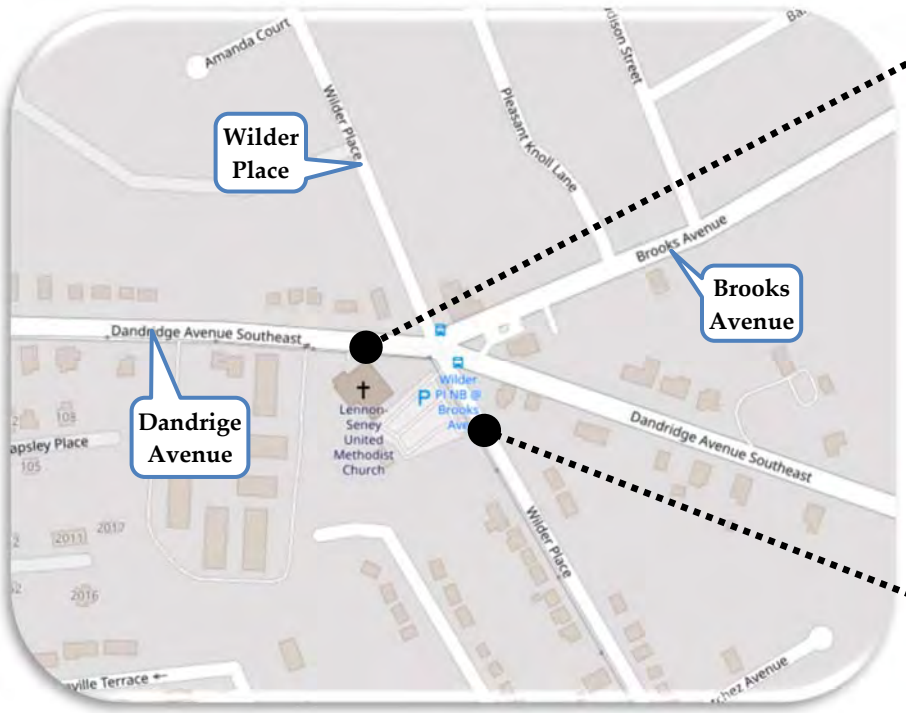
Cardinal Place

Traffic Count Locations & Existing Lane Configurations

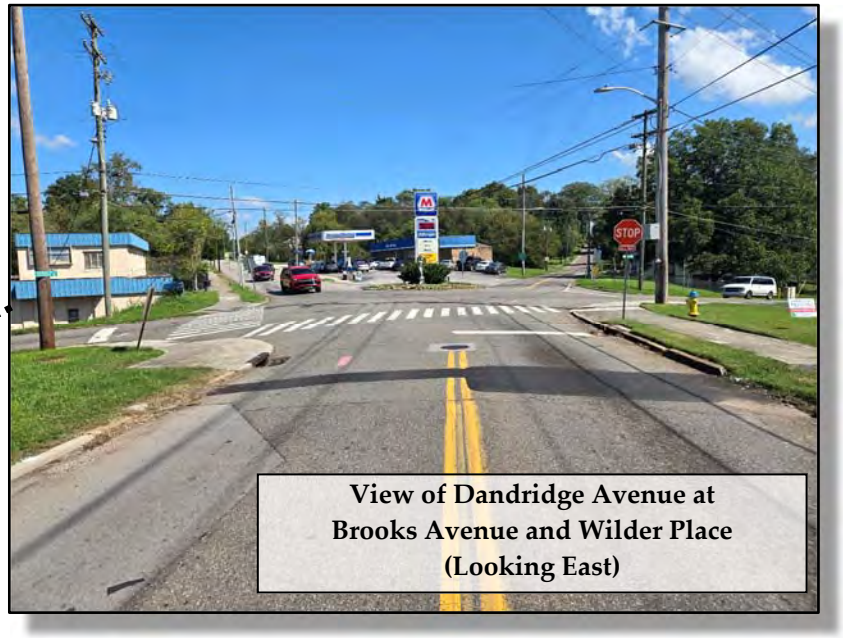
PHOTO EXHIBITS

Proposed Development Site

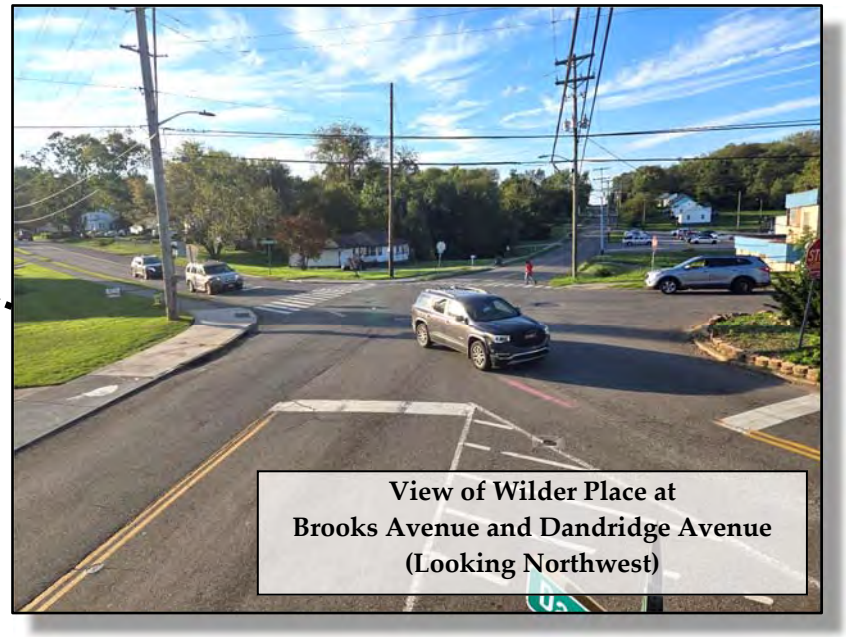




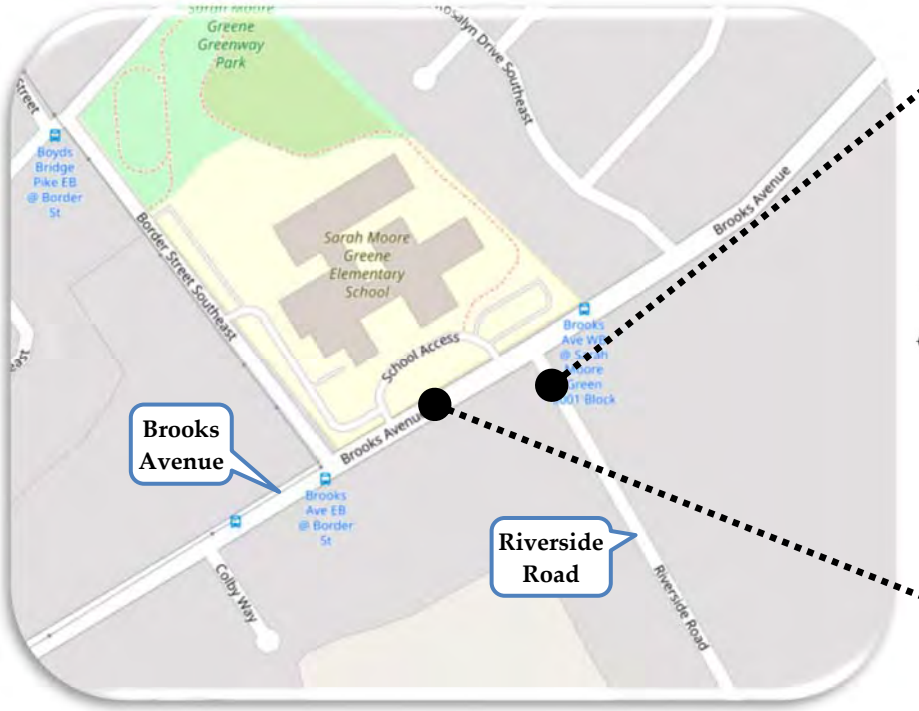
Brooks Avenue at Dandridge Avenue and Wilder Place



View of Dandridge Avenue at Brooks Avenue and Wilder Place (Looking East)

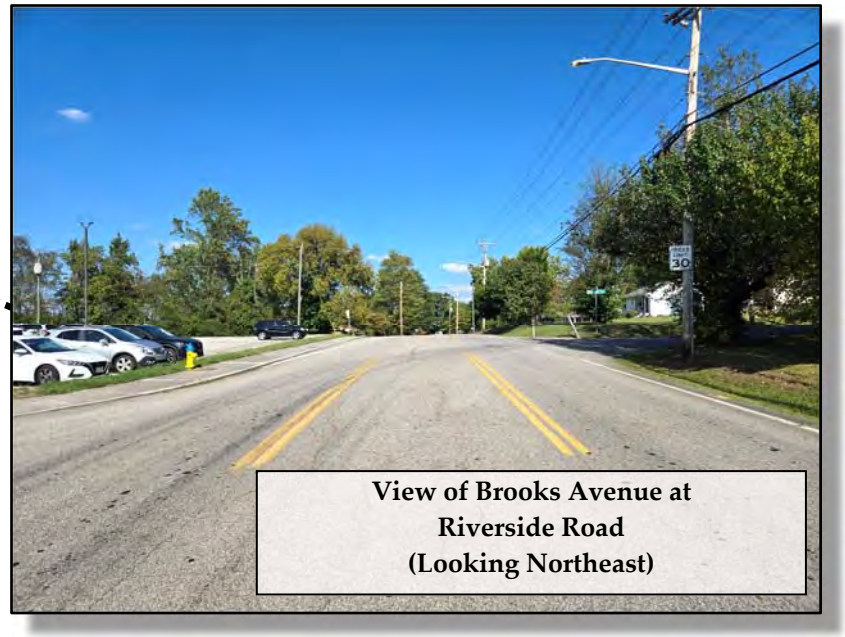


View of Wilder Place at Brooks Avenue and Dandridge Avenue (Looking Northwest)

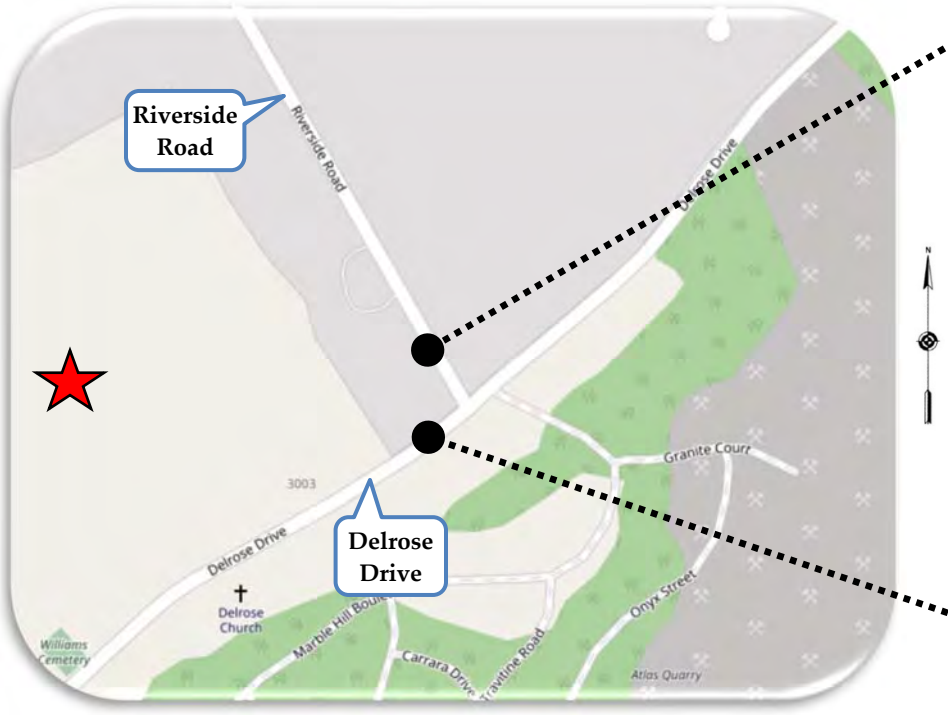


Brooks Avenue at Riverside Road

View of Riverside Road at Brooks Avenue (Looking Northwest)

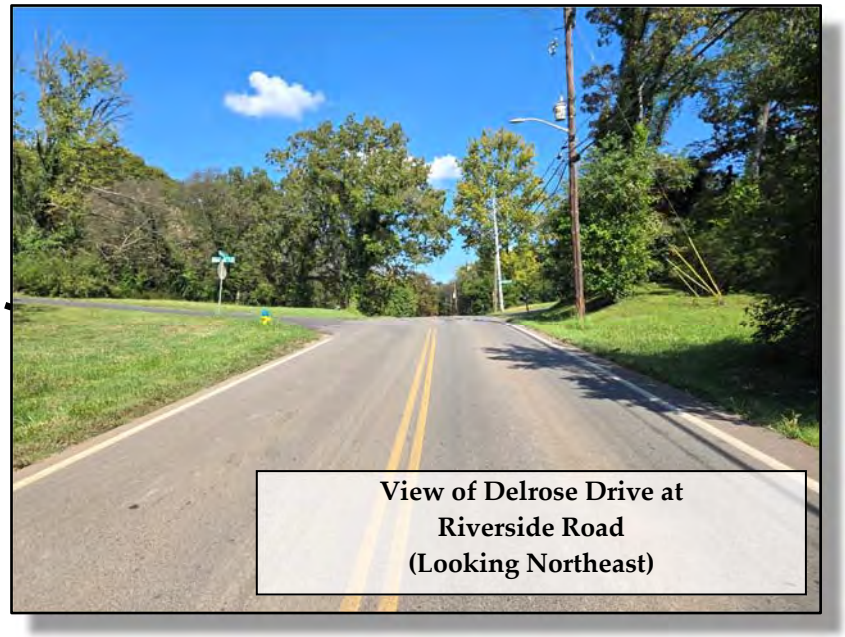


View of Brooks Avenue at Riverside Road (Looking Northeast)

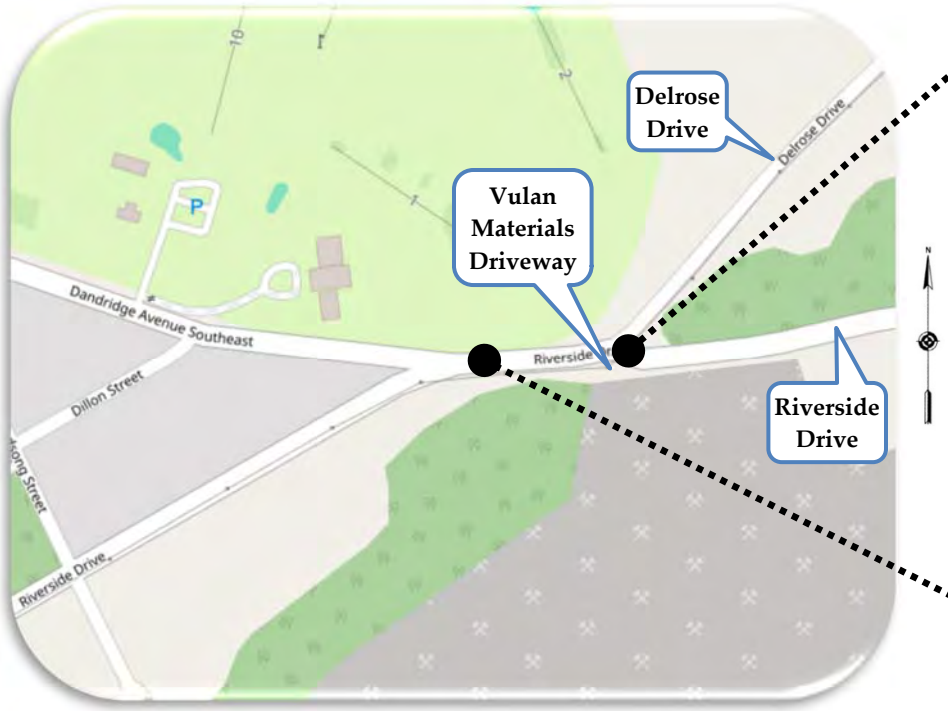


Delrose Drive at Riverside Road

View of Riverside Road at Delrose Drive (Looking Southeast)

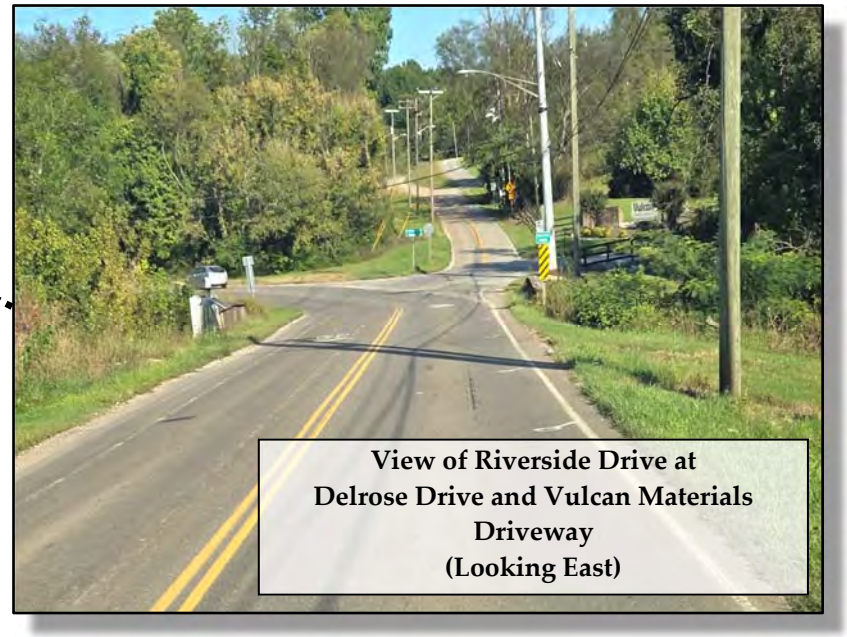


View of Delrose Drive at Riverside Road (Looking Northeast)



Delrose Drive at Riverside Drive

View of Riverside Drive at Vulcan Materials Driveway (Looking East)



View of Riverside Drive at Delrose Drive and Vulcan Materials Driveway (Looking East)

- **EXISTING TRANSPORTATION VOLUMES PER MODE**:

Two annual vehicular traffic count locations are in the study area, and the Tennessee Department of Transportation (TDOT) conducts both these counts. The count location data is the following and can be viewed with further details in Appendix A:

- Existing vehicular roadway traffic:
  - TDOT reported an Average Daily Traffic (ADT) on Brooks Avenue, east of Wilder Place and southwest of the development site, at 2,437 vehicles per day in 2023. From 2013 to 2023, this count station has indicated a 0.6% average annual traffic growth rate.
  - TDOT reported an ADT on Delrose Drive, east of Riverside Drive and southwest of the development site, at 3,711 vehicles per day in 2023. From 2013 to 2023, this count station has indicated a 3.1% average annual traffic growth rate.

- Existing bicycle and pedestrian volumes:
  The average daily pedestrian and bicycle traffic along the roads in the study area is unknown. However, with the limited number of sidewalk locations and lack of bike lanes near the proposed development site, the adjacent roadway sections to the site were assumed to have minimal pedestrian and bicyclist activity.

  During the traffic counts for this project, only a handful of bicyclists were observed, with all of them (except for one on Riverside Drive) observed at the 5-legged intersection. Most of the studied intersections saw zero to minimal amounts of pedestrians. Unsurprisingly, the most active intersection regarding pedestrian activity was the 5-legged intersection. Most of this pedestrian activity was associated with the adjacent gas station/market, with a few associated with the adjacent KAT bus stop. During the 6-hour traffic count for this study, 26 pedestrians at the 5-legged intersection were observed using the crosswalks on the north approach of Wilder Place and the west approach of Dandridge Avenue. An additional 29 pedestrians were observed at the intersection outside of the crosswalks, primarily on the south and southeast approaches of Wilder Place and Dandridge Avenue, and were patrons of the adjacent gas station/market.

  At the other three studied intersections, minimal pedestrian activity was observed. The intersection of Brooks Avenue at Riverside Road had two pedestrian trips on Riverside

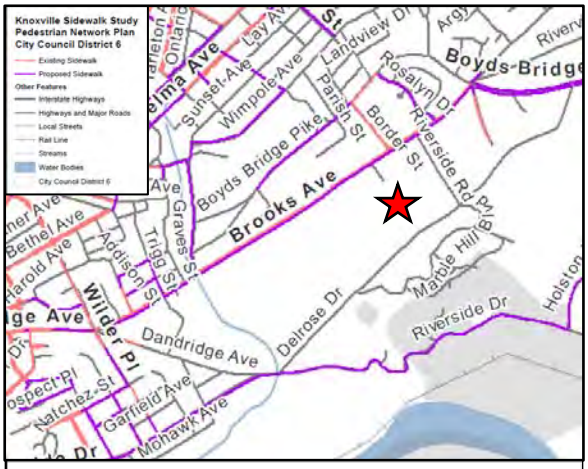
Road to and from the adjacent bus stops on Brooks Avenue; the other pedestrians were adults and several schoolchildren from Sarah Moore Greene Magnet Academy. These pedestrians were observed on the sidewalk on the north side of Brooks Avenue at Riverside Road. At Delrose Drive at Riverside Road, one pedestrian was observed crossing Delrose Drive from Marble Hill Boulevard onto Riverside Road and walking the entire length to access the KAT bus system on Brooks Avenue. No pedestrians were observed at the intersection of Delrose Drive at Riverside Drive and the Vulcan Materials Driveway.

An online website, strava.com, provides "heat" maps detailing routes taken by pedestrians, joggers, and bicyclists. The provided heat maps show the last two years of data, are updated monthly, and are gathered from individuals allowing their smart devices to track and compile their routes (millions of users). The activities in the maps are shown on the roads with color intensities with darker colors signifying higher activity. The Strava heat maps show some pedestrian and bicycle activity in the surrounding area. Overall, higher bicyclist travel than pedestrian travel is shown occurring on the nearby streets. Surprisingly, a reasonably high amount of bicyclist activity is shown along Riverside Drive. With limited sidewalk facilities and no bike lanes in the adjacent area, the map data shows that pedestrian and bicyclist activity is occurring regardless of the lack of facilities.

Strava Heat Map for Pedestrian and Joggers

Strava Heat Map for Bicyclists

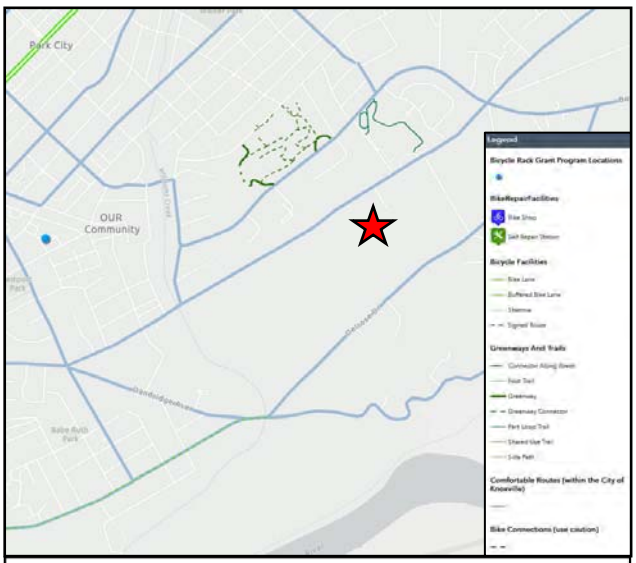
- **PEDESTRIAN AND BICYCLE FACILITIES**:



City of Knoxville Sidewalk Study – City Council District 6

The only sidewalk near the development site is on Brooks Avenue. This sidewalk is 5 feet wide and runs the entire road length on its north side. Sidewalks are not provided on the south side. The City of Knoxville produced a report in June 2020 titled Sidewalk Study. In this study, the report identified the existing sidewalk system in the City of Knoxville, areas of need for sidewalks, and a framework for future sidewalk infrastructure. This study provided maps broken down into City Council District areas showing the existing and the proposed recommended sidewalks. The proposed development site is in City Council District 6, and a map of this area from this study is included in the adjacent image. Brooks Avenue is shown with an existing sidewalk on the north side and a recommended sidewalk on the south side between the 5-legged intersection and Boyds Bridge Pike. In the study, however, this proposed recommended sidewalk is listed fairly low in their rankings. It was reported in the study with an estimated cost of nearly $7 million for 7,748 feet of new sidewalk on the south side of Brooks Avenue.

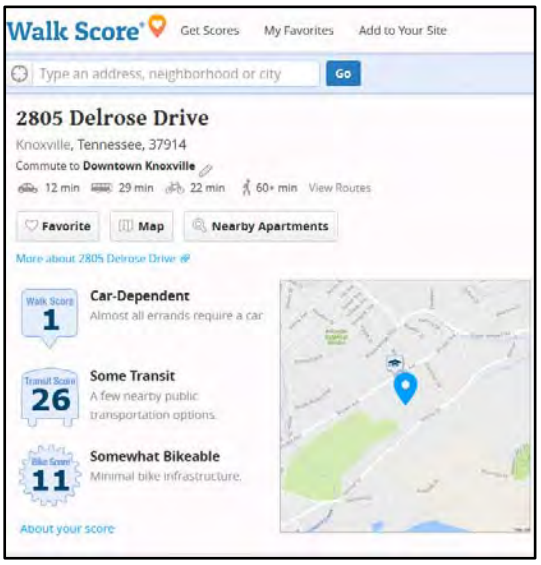
Delrose Drive and Brooks Avenue are shown on Knoxville Transportation Planning Organization (TPO) mapping for bicycle travel as a "Comfortable Route" south and north of the proposed development site. These roads do not have painted white bicycle pavement markings but do have signage warning motorists of potential bicycle activity. A "Comfortable Route" is defined as a route "based on low to medium traffic speeds and volumes along with other criteria. Warning signage is posted on these roads and states, "Share the Road".



Regional Bicycle Facilities in Study Area

- **WALK SCORE**:

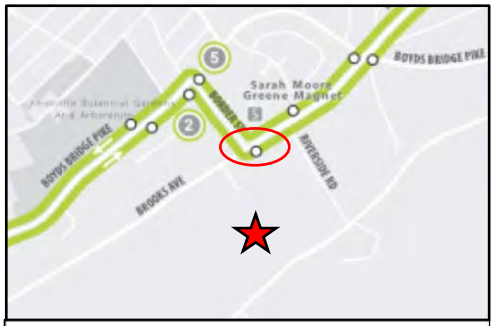
A private company offers a website at walkscore.com that grades and gives scores to locations within the United States based on "walkability", "bikeability", and transit availability based on a patented system. According to the website, the numerical values assigned for the Walk Score and the Bike Score are based on the distance to the closest amenity in various relevant categories (businesses, schools, parks, etc.) and are graded from 0 to 100.



The project site location is graded with a Walk Score of 1 at the development property address. This Walk Score indicates that almost all errands currently require a vehicle for travel to and from the development property. The Walk Score is graded very low due to the lack of sidewalks adjacent to the site and the lack of nearby amenities. The site is given a Bike Score of 11, meaning there is minimal bike infrastructure. The site is given a Transit Score of 26 since a few public transportation options are available.

- **TRANSIT SERVICES:**

The City of Knoxville has a network of public transit opportunities offered by Knoxville Area Transit (KAT). Bus service is available near the development site. The closest bus stop to the development site is approximately ¼ mile to the north. It is on Route 32, "Dandridge Avenue", near the intersection of Brooks Avenue at Border Street close to Sarah Moore Greene Magnet Academy. KAT made several changes and improvements to their routes that began on August 26th, 2024. This recent change removed some bus stops on Brooks Avenue and its travel along Brooks Avenue, where the development property has a narrow access point on its northern edge. Before this change, this route traveled on Brooks Avenue between Biddle Street and Border Street, but now, it skips this section and travels this east-west section a bit further to the north on Boyds Bridge Pike. This route has established bus service every 60 minutes. It operates on weekdays and weekends; the route map



KAT Route 32, "Dandridge Avenue"

is also included in Appendix B. Other transit services in the area include the East Tennessee Human Resource Agency (ETHRA) and the Community Action Committee (CAC), which provides transportation services when requested.

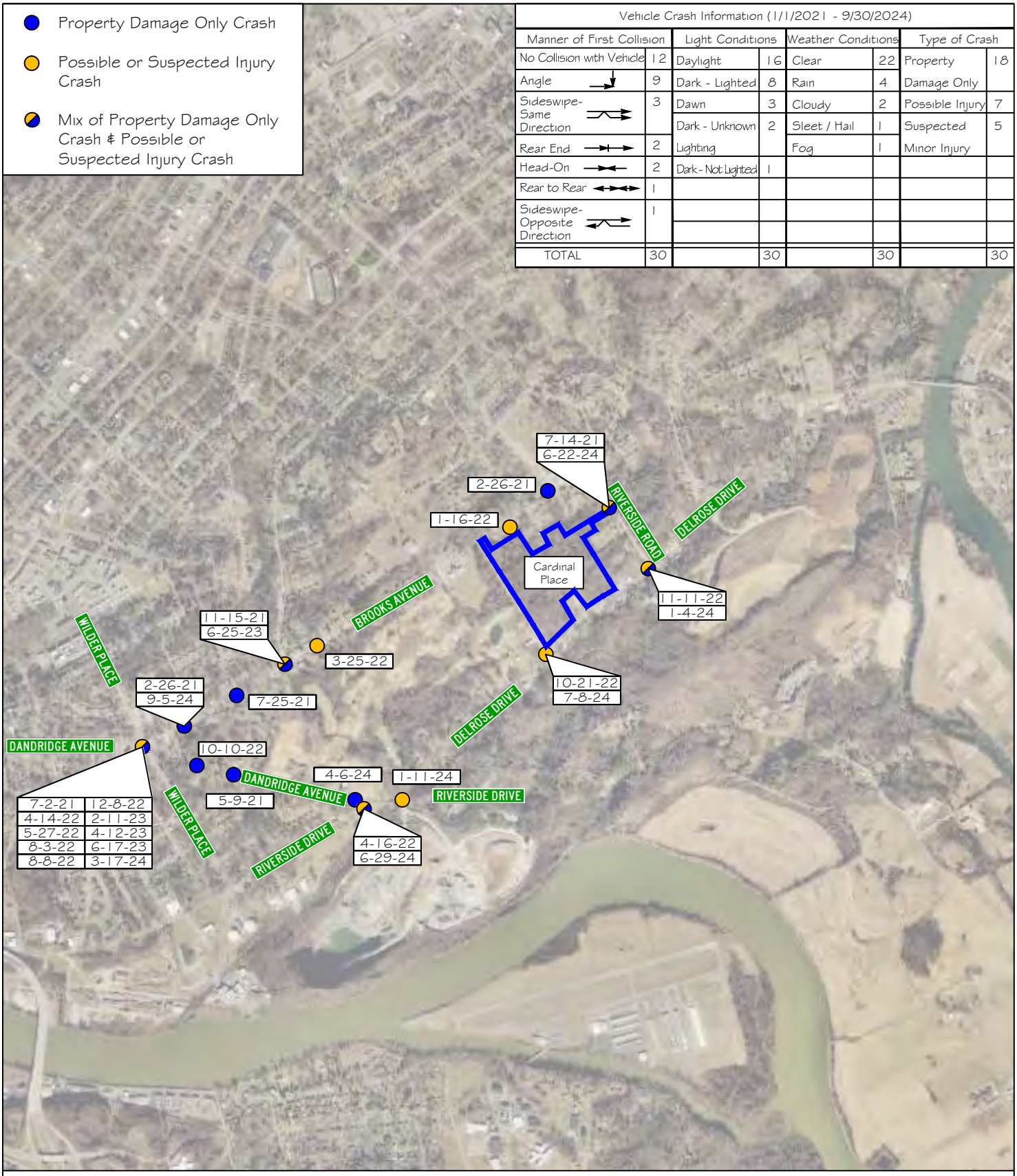
Overall, due to the proximity of this public transportation, this study assumed that 5% of trips would use this alternative travel means and subsequently would reduce vehicle trips by 5% to and from the proposed development. This small percentage would also account for a minor amount of potential travel by future residents via walking or biking.

- **CRASH DATA**:

For this project, TDOT (and the City of Knoxville) provided access to the AASHTOWare Safety online platform. This AASHTO (American Association of State Highway and Transportation Officials) platform is a component of several offerings that include the compilation of crash data for local state DOTs to use in safety analyses. TDOT provides vehicle crash data to this system and is an extension of its existing E-TRIMS (Enhanced Tennessee Roadway Information Management System) database. The crash data in the E-TRIMS system is from the statewide TITAN (Tennessee Integrated Traffic Analysis Network) database. The TITAN database includes all reportable vehicle crash data from Tennessee law enforcement agencies.

Screenshot of Crashes in Study Area from AASHTOWare Safety Platform

In this project's study area, 30 crashes occurred between January 1st, 2021, and September 30th, 2024. At the studied intersections, ten occurred in and around the intersection of Brooks Avenue at Dandridge Avenue and Wilder Place, zero at the intersection of Brooks Avenue at Riverside Road, two at the intersection of Delrose Drive at Riverside Road, and four at the intersection of Delrose Drive at Riverside Drive. The other 14 occurred at other road locations in the study area. A summary of the dates, manner of collision, light conditions, weather conditions, and type of crash are shown in Figure 3. The most common manner of collision was "No Collision with Vehicle", which means that the crash involved a single vehicle colliding with other objects, that included utility poles, mailboxes, ditches, and a wall. Most of the 30 crashes occurred during daylight and with clear weather conditions.



Vehicle Crash Information (1/1/2021 - 9/30/2024)

Manner of First Collision		Light Conditions		Weather Conditions		Type of Crash	
No Collision with Vehicle	12	Daylight	16	Clear	22	Property Damage Only	18
Angle	9	Dark - Lighted	8	Rain	4		
Sideswipe-Same Direction	3	Dawn	3	Cloudy	2	Possible Injury	7
		Dark - Unknown	2	Sleet / Hail	1	Suspected Minor Injury	5
Rear End	2	Lighting		Fog	1		
Head-On	2	Dark - Not Lighted	1				
Rear to Rear	1						
Sideswipe-Opposite Direction	1						
TOTAL	30		30		30		30

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FIGURE 3

Cardinal Place

Vehicle Crash Data in Study Area

Most crashes involved "Property Damage Only" and did not include injuries. No fatalities were recorded, but several resulted in suspected minor injuries or possible injuries. The breakdown of the crashes at the studied intersections is the following:

TABLE 2
CRASH DATA FOR STUDIED INTERSECTIONS

INTERSECTION	MANNER OF FIRST COLLISION	#	TYPE OF CRASH	#
Brooks Avenue at Dandridge Avenue and Wilder Place	Angle	4	Property Damage Only	6
	No Collision with Vehicle	2	Suspected Minor Injury	3
	Rear End	2	Possible Injury	1
	Head On	1		
	Sideswipe - Same Direction	1		
Brooks Avenue at Riverside Road	None	-	None	-
Delrose Drive at Riverside Road	Angle	1	Property Damage Only	1
	No Collision with Vehicle	1	Possible Injury	1
Delrose Drive at Riverside Drive	No Collision with Vehicle	3	Property Damage Only	2
	Angle	1	Suspected Minor Injury	1
			Possible Injury	1

From AASHTOWare Safety online platform

A review of the narratives for the 30 crashes indicated that the intersection of Brooks Avenue at Dandridge Avenue and Wilder Place experienced several crashes that could be attributed to the incorrect or dual assumption of the right of way when motorists proceeded into the intersection. These crashes could be an aspect of the complicated and unusual configuration of the intersection having five approaches. The objects struck at this intersection included utility poles, and the rear-end crashes involved stopped vehicles being struck from behind.

The other intersections also experienced crashes where motorists struck utility poles, a vehicle that ran off the road due to excessive speed, and one motorist who overcorrected after avoiding an oncoming vehicle that crossed into their lane.

PROJECT DESCRIPTION

- **LOCATION AND SITE PLAN:**

The proposed plan layout with 570 apartments and 80 multi-family attached townhouses on 30.15 +/- acres is designed by Heyoh Design + Development and is shown in Figure 4. The proposed property is jigsaw-shaped and has access to Brooks Avenue, Riverside Road, and Delrose Drive.

As shown in the figure, three entrances will be constructed for the development, with one at Riverside Road to the east and two to the south at Delrose Drive. The main entrance will be the Proposed Southeast Entrance at Delrose Drive. The Proposed Southwest Entrance will be constructed 715 feet west of this main entrance. The Proposed Southeast (main) Entrance will be built with a 23-foot wide landscaped median in the center separating the entering and exiting traffic. The Proposed Southwest Entrance will be constructed with an entering and exiting lane and no median. The Proposed East Entrance will tie into Riverside Road just north of the existing house at 1521 Riverside Road with a single exiting and entering lane. The Proposed East Entrance will intersect Riverside Road approximately 575 feet to the south of the intersection with Brooks Avenue.

As shown in the site layout, an existing property to the south with a single-family detached house at 2819 Delrose Drive will remain and is owned by a private owner. At the southwest corner of this private property, a small separate parcel contains the Historic Williams-Masterson Cemetery. The current plan in Figure 4 shows six buildings, each four stories in height, containing 570 apartment units. Four buildings will contain 75 apartment units, and two will have 135 units. The townhouses will be grouped into 10 clusters, each containing between 6 and 13 units, for a total of 80 townhouses.

In addition to the housing units, several on-site amenities are proposed for the future residents, including a community building and swimming pool, shaded outdoor area, sand volleyball court, playground, dog park, natural park, pickleball courts, public art, community gardens, and a 1-mile perimeter walking path. The development will also include signage about the historic adjacent cemetery. None of the townhouses will have separate driveways or garages.

A total of 981 parking spaces will be provided in several internal parking lots and will include the appropriate number of ADA-accessible parking spaces. This number will provide each townhouse with a minimum of 2.25 parking spots and 1.45 spaces for each apartment. Concrete

sidewalks are proposed internally for this development along the buildings and parking areas. The site plan also shows a sidewalk between the main campus and Brooks Avenue to the north. Two hundred bicycle parking spaces will also be provided throughout the development. Stormwater detention is proposed along Delrose Drive between the roadway and the proposed housing units and will provide additional separation and buffer.

The schedule for the completion of this new residential development depends on economic factors and construction timelines. This project is also contingent on permitting, design, and other regulatory approvals. Overall, the local real estate market for new housing remains quite competitive. This study assumed that the total construction build-out of the development and full occupancy would occur within the next three years (2027) to provide a conservative outlook.

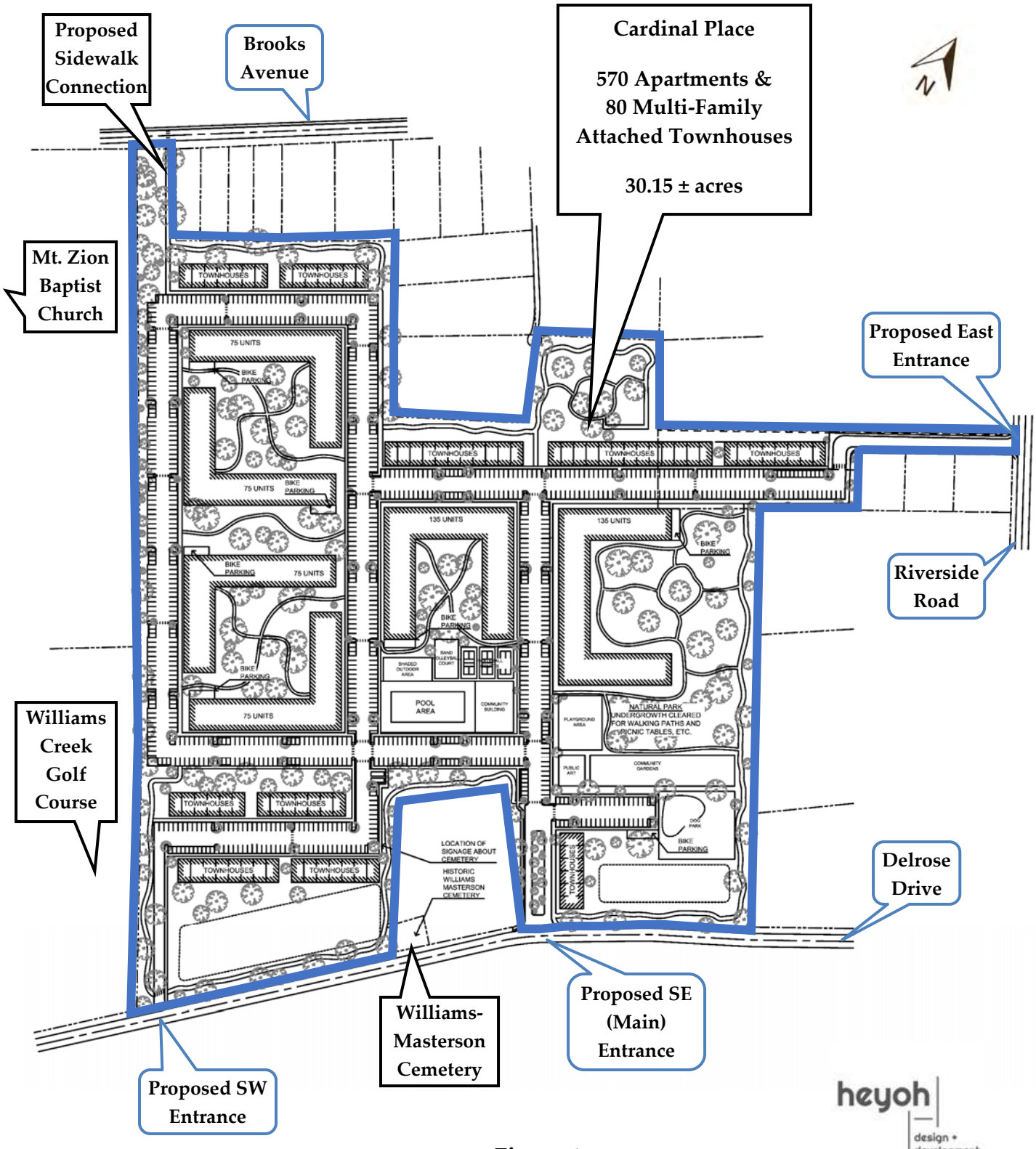


Figure 4
Proposed Plan Layout
Cardinal Place

Not to Scale

- **PROPOSED USES AND ZONING REQUIREMENTS:**

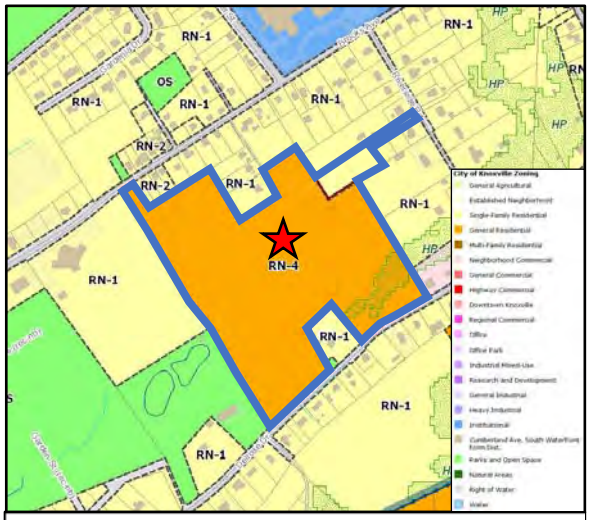
The two parcels comprising the Cardinal Place development property are in the City of Knoxville, and the largest, main parcel, was requested to be rezoned. The Knoxville/Knox County Planning Commission approved the rezoning, and the Knoxville City Council gave final approval on March 19th, 2024. This parcel's previous zoning was Single-Family Residential Neighborhood (RN-1) and was approved for a General Residential Neighborhood (RN-4) zoning. According to the City of Knoxville's Zoning Code, the "RN-4 General Residential Neighborhood Zoning District is intended to accommodate mixed medium density residential development within the City of Knoxville. Single-family, two-family, and townhouse dwellings are permitted with low-rise multi-family dwellings and new development forms such as pocket neighborhoods allowed by review and in some cases with special use approval." The other, smaller, flag-shaped parcel between the main parcel and Riverside Road is zoned as Single-Family Residential Neighborhood (RN-1) and was not and is not requested to be changed.

Additionally, a small portion of the development property to the southeast is overlaid with a Hillside Protection (HP) area. The most recently published online KGIS zoning map is provided in Appendix C. The existing adjacent surrounding zoning and land uses are the following:

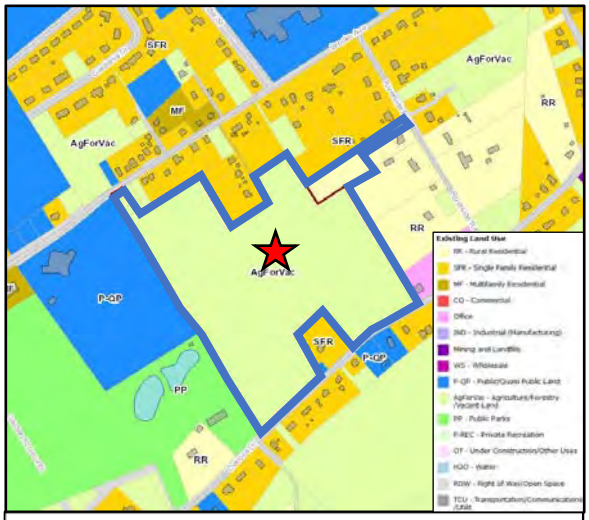
- To the north, the development property is bound by Brooks Avenue and single-family detached houses along Brooks Avenue zoned as Single-Family Residential Neighborhood (RN-1). A handful of the parcels to the north are undeveloped and unoccupied. These properties to the north have road access to Brooks Avenue and Colby Way, a private drive south and off Brooks Avenue.
- To the east, the development property is bound by Riverside Road and single-family detached houses along Riverside Road that are zoned as Single-Family Residential Neighborhood (RN-1). These houses have road access to Riverside Road. One property to the southeast and adjacent to the development property is zoned as Neighborhood Commercial (C-N). This property has two commercial buildings with road access to the south to Delrose Drive. According to Google Maps, an auto repair business occupies one of these buildings.
- The development property is bound by Delrose Drive to the south and abuts two parcels on the same side of Delrose Drive. The largest abutting property has a single-family detached house and is zoned Single-Family Residential Neighborhood (RN-1). This house will remain and will be surrounded by the proposed development. The smaller abutting property is adjacent, right next to Delrose Drive, and is zoned Parks and Open

Space (OS). The Historic Williams-Masterson Cemetery is located on this parcel and was used from 1890 – 1967. Across the street on the south side, all the properties are zoned as Single-Family Residential Neighborhood (RN-1) and are occupied by single-family detached houses and a small church.

- Williams Creek Golf Course is zoned as Parks and Open Space (OS) and to the southwest of the development site. The primary road access to this golf course is provided further to the west off Dandridge Avenue. To the northwest, the property is zoned as Single-Family Residential Neighborhood (RN-1) and is owned and occupied by Mt. Zion Baptist Church. The sanctuary and main parking lot are located just south of Brooks Avenue, and the church also has auxiliary parking across Brooks Avenue to the north.



KGIS Existing Zoning Map



KGIS Existing Land Use Map

- **<u>ON-SITE CIRCULATION</u>:**

The driveway and internal parking lot aisleways will be approximately 6,055 feet (1.15 miles) in length. They will be designed and constructed according to the specifications of the City of Knoxville, TN. The internal drives and aisleways will be asphalt-paved and include concrete curbs. The lane widths will be 13 feet each for a 26-foot pavement driveway and parking lot aisle width, except the roadway for the Proposed Southwest Entrance, which will be 20 feet wide. A few parking lot aisleways will be 30 feet in width. Concrete sidewalks are being proposed internally along the parking lot aisleways and adjacent to the buildings. The driveway entrance and internal aisleways will be private and maintained by the development owner in the future.

- **SERVICE AND DELIVERY VEHICLE ACCESS AND CIRCULATION:**

Besides residential passenger vehicles, the development's entrances will also provide access to service, delivery, maintenance, and fire protection/rescue vehicles. None of these other vehicle types will impact roadway operations other than when they occasionally enter and exit the development. Trash collection areas will be designed on-site for the residents, and City trash collection trucks are expected to enter and exit this development. The new entrances and parking lot aisleways will be designed and constructed to the City of Knoxville specifications and are expected to be adequate for fire protection and rescue vehicles. The development's internal drives are anticipated to accommodate the larger vehicle types and residents' standard passenger vehicles.

ANALYSIS OF EXISTING AND PROJECTED CONDITIONS

- **EXISTING TRAFFIC CONDITIONS:**

This study conducted 6-hour traffic counts on Thursday, October 3rd, 2024, at four unsignalized intersections as requested in the scope of work. Manual traffic counts were conducted to identify and tabulate the morning and afternoon peak period volumes and the travel directions near and around the proposed development site. All the intersections had an AM and PM peak hour at 7:15 – 8:15 a.m. and 5:00 – 6:00 p.m., except for the intersection of Delrose Drive at Riverside Drive, which had a slightly earlier PM peak hour of 4:45 – 5:45 p.m. The manual tabulated traffic counts can be reviewed in Figures 5a and 5b and Appendix D. Some observations at the intersections include the following:

Brooks Avenue at Dandridge Avenue and Wilder Place:

- As described earlier, due to the adjacent neighborhood gas station/market, many pedestrians and a handful of bicyclists were observed at this intersection. In addition to the market, the adjacent KAT bus stop in the northeast corner of the intersection attracted a couple of pedestrians.
- Vehicles observed at this intersection, in addition to passenger cars, included school buses, KAT buses, dump trucks, and trash collection trucks. In the afternoon, a public school bus stopped in the northwest corner of the intersection and let out several school-age children who used the crosswalks on Dandridge Avenue and Wilder Place.
- Several motorists were observed using the generously provided gas station/market parking lot area to travel between Brooks Avenue and the southeast approach of Dandridge Avenue. For motorists wanting to turn left from westbound Brooks Avenue to the southeast approach of Dandridge Avenue (and vice versa), cutting through the parking area is much more manageable than turning sharply to navigate the acute angle of these intersecting streets. Likewise, several turns occurred to and from the gas station/market and directly in and from the intersection because of the openness of the parking area. Note: these turning volumes are not included in the figures.
- With the unusual nature of the 5-legged intersection, many motorists were observed hesitating to proceed due to confusion about which motorist had the right-of-way. Also, due to the unusual layout, several vehicles were observed traveling near each other in the center of the intersection.
- The acute angles of some of the approaches at the intersection presented challenges for several motorists attempting to turn left or right to and from these approaches.

Brooks Avenue at Riverside Road:

- The heaviest traffic flows near the intersection occurred during the student arrival and departure times of the adjacent Sarah Moore Greene Magnet Academy. During these periods, several vehicles were observed using Riverside Road when entering and leaving the school. The observed school traffic peaks occurred from 7:15 – 8:15 a.m. and 2:15 – 3:15 p.m. In the afternoon, parents were observed queueing on the school property beginning at 2:00 p.m. For the most part, all school vehicle queues were contained on the school property and off Brooks Avenue.
- A few school-age children and several adults were observed walking on the sidewalk on the north side of Brooks Avenue. One individual was observed walking via Riverside Road to and from the KAT bus stops on Brooks Avenue.

Delrose Drive at Riverside Road:

- The vehicles observed at this intersection included passenger cars, school buses, and many dump trucks, assumed to be associated with the nearby construction debris landfill off Delrose Drive further to the east. The largest vehicle observed on Riverside Road was a public school bus.
- Only one individual was observed at this intersection. This person walked across Delrose Drive from Marble Hill Boulevard, continued along Riverside Road to Brooks Avenue, and caught a KAT bus. This same individual returned from the KAT bus stop on Brooks Avenue later in the day.

Delrose Drive at Riverside Drive:

- Many dump trucks were observed entering and leaving Vulcan Materials via the private driveway that ties into the intersection of Delrose Drive and Riverside Drive. Nearly all these dump trucks were observed leaving and returning from the west on Riverside Drive.
- Only one bicyclist was observed at this intersection, and no pedestrians were observed. The bicyclist traveled eastbound on Riverside Drive and continued on Riverside Drive at the intersection with Delrose Drive.
- The acute angle at which Riverside Drive from the southeast intersects at Delrose Drive, combined with the available view when approaching the intersection, allowed some determined motorists to continue driving west on Riverside Drive without stopping during times of lower volumes.

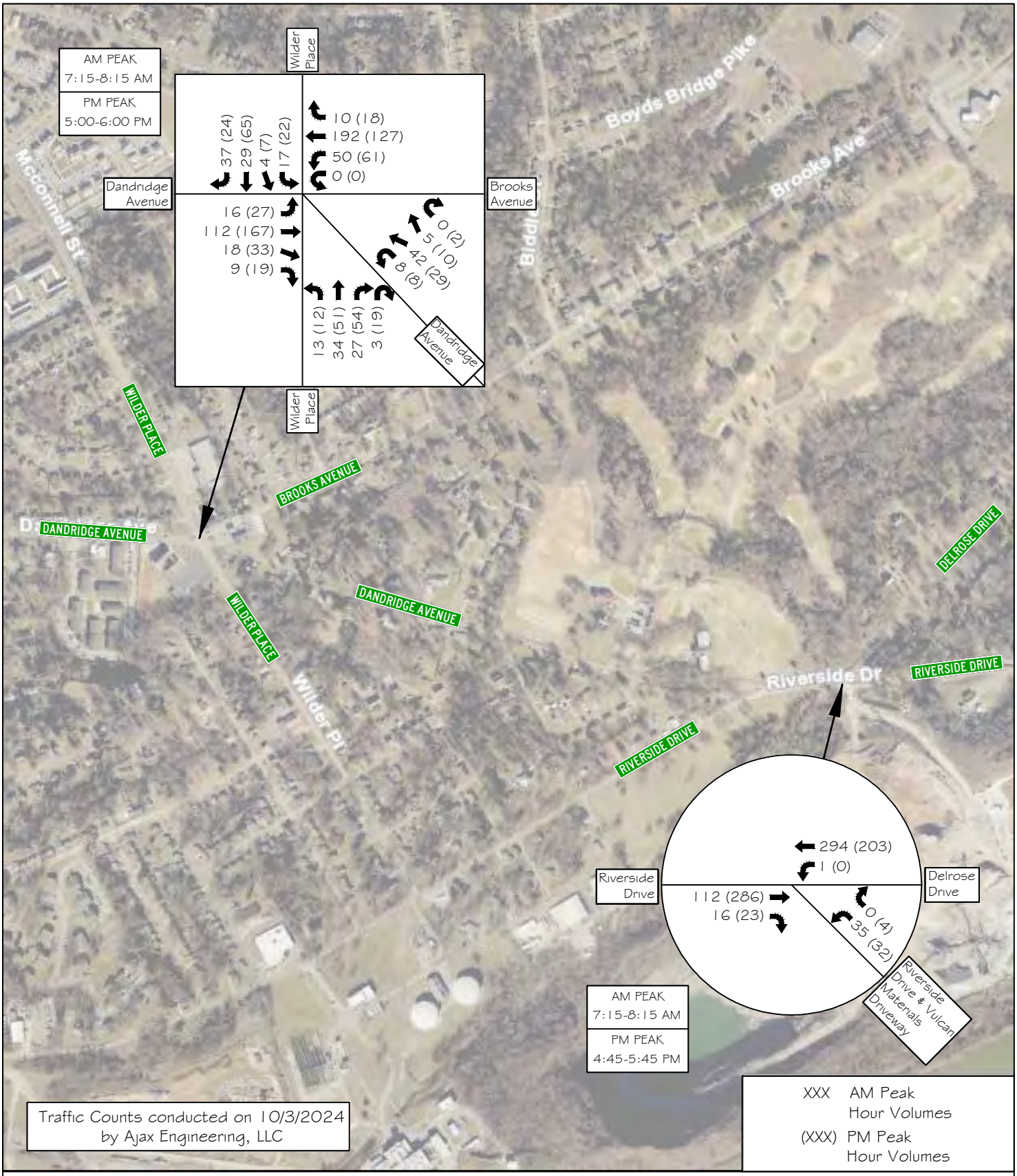


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FIGURE 5a

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2024 Peak Hour Traffic Volumes - EXISTING TRAFFIC CONDITIONS

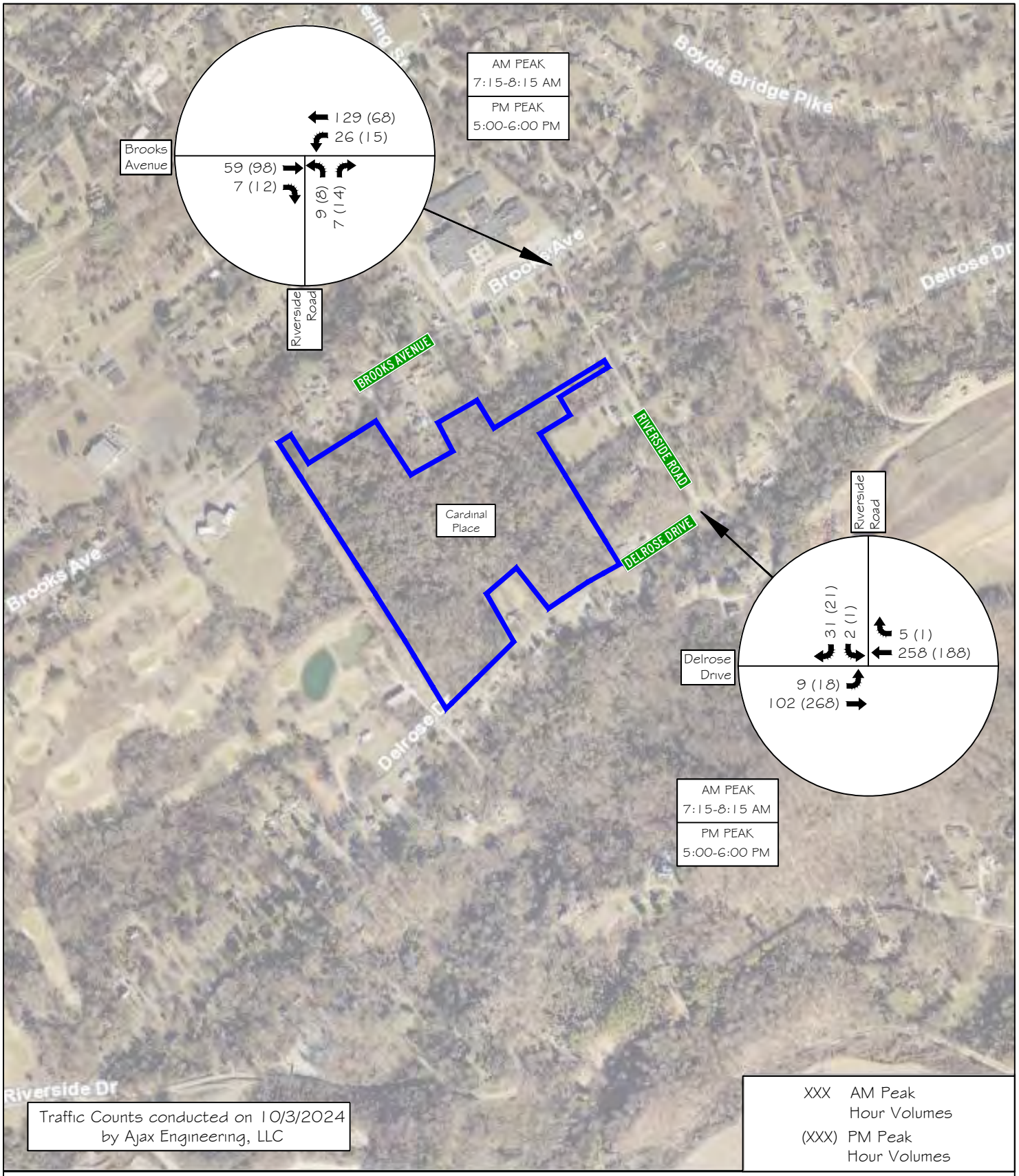

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FIGURE 5b

Cardinal Place

2024 Peak Hour Traffic Volumes - EXISTING TRAFFIC CONDITIONS

Capacity analyses were undertaken to determine the Level of Service (LOS) for the existing 2024 intersection traffic volumes shown in Figures 5a and 5b. The capacity analyses were calculated following the Highway Capacity Manual (HCM) methods and utilizing Synchro Traffic Software (Version 12).

Methodology:

LOS is a qualitative measurement developed by the transportation profession to express 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 worst. This grading system provides a reliable, straightforward means to communicate road operations to the public. The HCM lists the level of service criteria for unsignalized intersections and signalized intersections.

LOS is defined by delay per vehicle (seconds), and roadway facilities are also characterized by the volume-to-capacity ratio (v/c). LOS designations, which are based on delay, are reported differently for unsignalized and signalized intersections. For example, a delay of 20 seconds at an unsignalized intersection would indicate LOS C, representing the additional delay a motorist would experience traveling through the intersection. Also, for example, a v/c ratio of 0.75 for an approach at an unsignalized intersection would indicate that it is operating at 75% of its available capacity. This difference is primarily due to motorists' different expectations between the two road facilities. Generally, for most instances, the LOS D / LOS E boundary is considered the upper limit of acceptable delay during peak periods in urban and suburban areas.

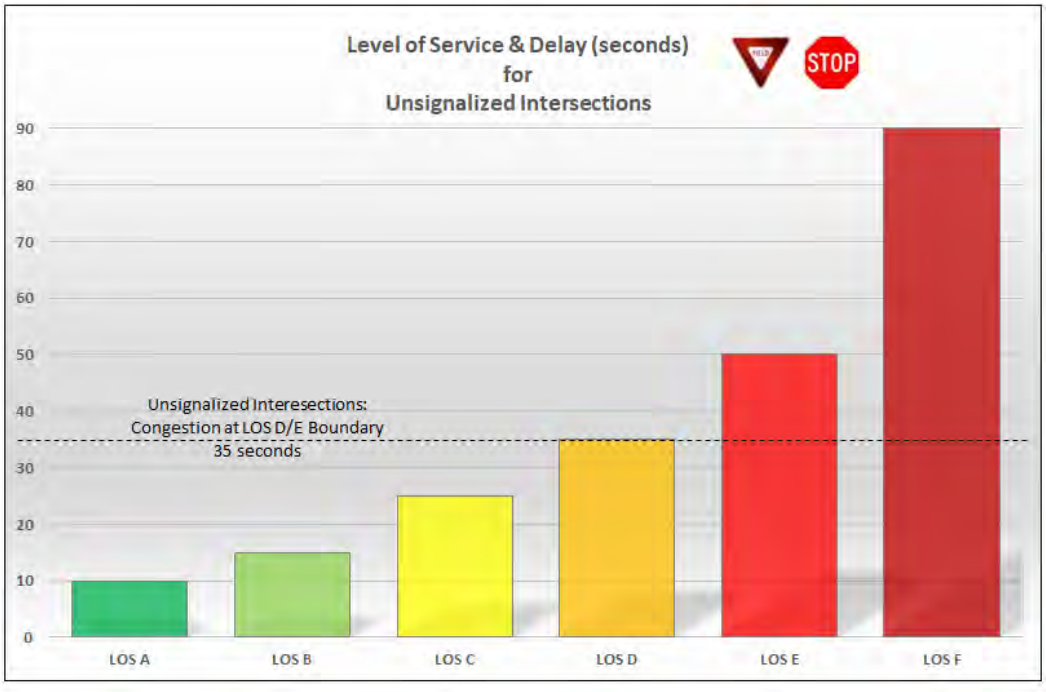
For unsignalized intersections, LOS is measured in terms of delay (in seconds). This measure attempts to quantify delay, including travel time, driver discomfort, and fuel consumption. For unsignalized intersections, the analysis assumes that the mainline thru and right-turn traffic does not stop and is not affected by the traffic on the minor side streets. Thus, 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 movements. Table 3 lists the level of service criteria for unsignalized intersections. The analysis results of unsignalized intersections using the HCM methodologies are conservative due to the more significant vehicle gap parameters used. More often, in normal road conditions, drivers are more willing to accept smaller gaps in traffic than what is modeled using the HCM methodology. The unsignalized intersection methodology also does not account for more significant gaps sometimes produced by nearby upstream and downstream signalized intersections. For unsignalized intersections, in most instances, the upper limit of acceptable delay during peak hours is the LOS D/E boundary at 35 seconds.

TABLE 3
LEVEL OF SERVICE AND DELAY FOR UNSIGNALIZED INTERSECTIONS

LEVEL OF SERVICE	DESCRIPTION	CONTROL DELAY (seconds/vehicle)
A	Little or no delay	0 - 10
B	Short Traffic Delays	>10 -15
C	Average Traffic Delays	>15 - 25
D	Long Traffic Delays	>25 - 35
E	Very Long Traffic Delays	>35 - 50
F	Extreme Traffic Delays	>50

Source: Highway Capacity Manual, 6th Edition



Unfortunately, the 5-legged intersection of Brooks Avenue at Dandridge Avenue and Wilder Place cannot be analyzed using standard unsignalized HCM methods or in the Synchro 12 software, which is limited to a maximum of 4 intersection approaches. Due to this limitation, a companion software, SimTraffic 12, was utilized. SimTraffic performs micro-simulation and animation of vehicular traffic, and based on the simulation, it can calculate performance measures such as delay, vehicle queues, fuel efficiency, vehicle speeds, and other factors. According to the software, the "total delay is total travel time minus the travel time for the vehicle with no other vehicles or traffic control devices." Thus, the delay per vehicle is calculated by dividing the total delay by the number of vehicles in the simulation, and this measure was selected as the most appropriate means to overcome the HCM's limitation and provide intersection performance measures. The vehicle delay results presented in this study for this 5-legged intersection were based on ten simulations.

Intersection capacity results from the existing 2024 peak hour traffic are shown in Tables 4a and 4b. The 5-legged intersection approach results are shown in Table 4a, which shows the total delay per vehicle (in seconds) from the simulation. The other intersections are shown in Table 4b with a LOS designation, delay (in seconds), and v/c ratio (volume/capacity) for the AM and PM peak hours. Appendix E includes the worksheets for the existing 2024 peak hour capacity analyses.

The approaches of the 5-legged intersection in Table 4a are shown in the existing peak hour conditions with reasonable delay outcomes. As shown in Table 4b, all the other studied intersections are calculated to operate with excellent LOS and short vehicle delays in the existing peak hour 2024 conditions.

TABLE 4a
2024 INTERSECTION CAPACITY ANALYSIS RESULTS -
EXISTING TRAFFIC CONDITIONS

INTERSECTION	TRAFFIC CONTROL	APPROACH/ MOVEMENT	AM PEAK TOTAL DELAY PER VEHICLE (seconds)	PM PEAK TOTAL DELAY PER VEHICLE (seconds)
Brooks Avenue (WB) at Dandridge Avenue (EB) and Dandridge Avenue (NW) and Wilder Place (SB & NB)	 Unsignalized	Eastbound	6.6	8.0
		Westbound	7.7	7.6
		Northbound	4.8	5.7
		Southbound	4.9	6.3
		Northwestbound	5.0	5.4
		All Lanes	6.4	7.0

Note: Results were obtained from SimTraffic 12 Performance Analyses from Simulation

TABLE 4b
2024 INTERSECTION CAPACITY ANALYSIS RESULTS -
EXISTING TRAFFIC CONDITIONS

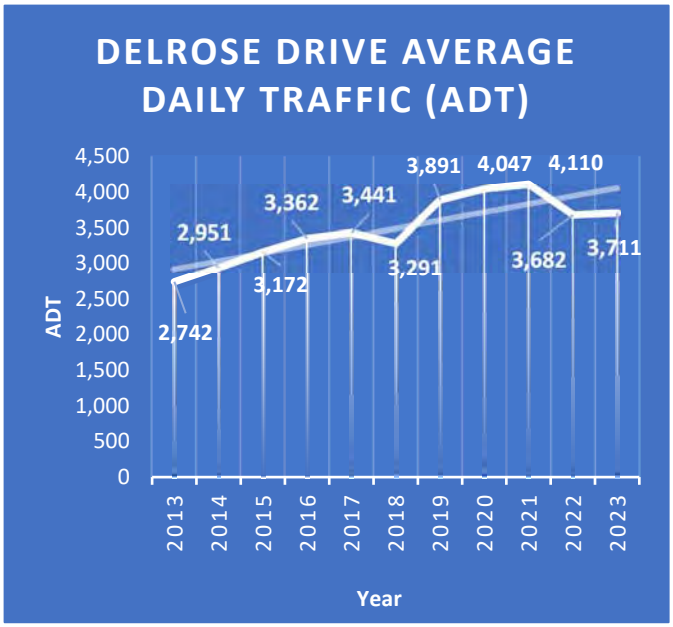
INTERSECTION	TRAFFIC CONTROL	APPROACH/ MOVEMENT	AM PEAK			PM PEAK		
			LOS	DELAY (seconds)	V/C	LOS	DELAY (seconds)	V/C
Delrose Drive (WB) / Riverside Drive (EB) at Riverside Drive & Vulcans Materials Driveway (NWB)	STOP Unsignalized	Northwestbound Left/Right	B	12.0	0.085	B	13.0	0.131
		Westbound Left	A	8.6	0.004	A	0.0	-
Delrose Drive (WB & EB) at Riverside Road (SB)	STOP Unsignalized	Eastbound Left/Thru	A	8.0	0.013	A	7.7	0.024
		Southbound Left/Right	B	10.1	0.059	A	9.9	0.047
Brooks Avenue (WB & EB) at Riverside Road (NB)	STOP Unsignalized	Northbound Left/Right	A	9.8	0.031	A	9.4	0.042
		Westbound Left/Thru	A	7.4	0.024	A	7.5	0.016

Note: All analyses were calculated in Synchro 12 software and reported using 7th Edition intersection methodology
[a] Level of Service , [b] Average Delay (sec/vehicle) , [c] Volume-to-Capacity Ratio

- **PROJECTED TRAFFIC CONDITIONS WITHOUT THE PROJECT:**

Horizon year traffic conditions represent the projected traffic volumes in the study area without the proposed project being developed (no-build option). This proposed development's build-out and full occupancy are assumed to occur by 2027.

According to the nearby TDOT count stations, vehicular traffic on the surrounding roads has shown low and moderate growth on Brooks Avenue and Delrose Drive, respectively, over the past few years. Specifically, the TDOT data provided in Appendix A shows that Brooks Avenue has experienced annual growth of +0.6%, and Delrose Drive has experienced +3.1% over the past ten years. The traffic count stations both showed a drop in vehicular volumes in 2018 but have experienced stable to slight growth since.



This study used an annual growth rate of +2% to calculate future growth on Brooks Avenue, Dandridge Avenue, Wilder Place, and Riverside Road. An annual growth rate of 3% was assumed for Delrose Drive and Riverside Drive. These annual growth rates were applied to the existing 2024 intersection volumes to estimate the future volumes in the horizon year of 2027 without the potential additional development traffic. Figures 6a and 6b show the projected 2027 horizon year traffic volumes at the studied intersections without the project during the AM and PM peak hours.

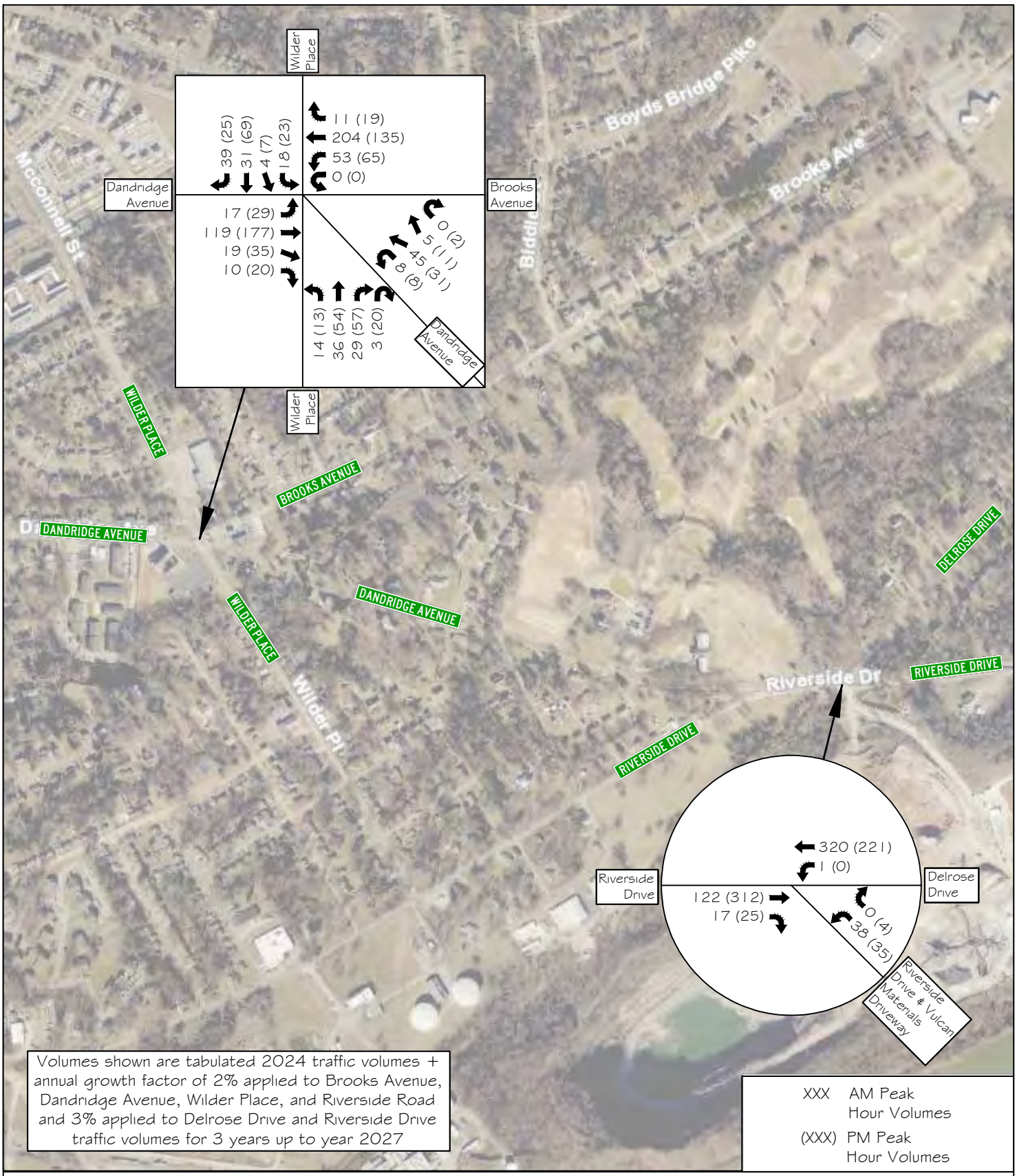


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FIGURE 6a

Cardinal Place

2027 Peak Hour Traffic Volumes - PROJECTED TRAFFIC CONDITIONS WITHOUT THE PROJECT

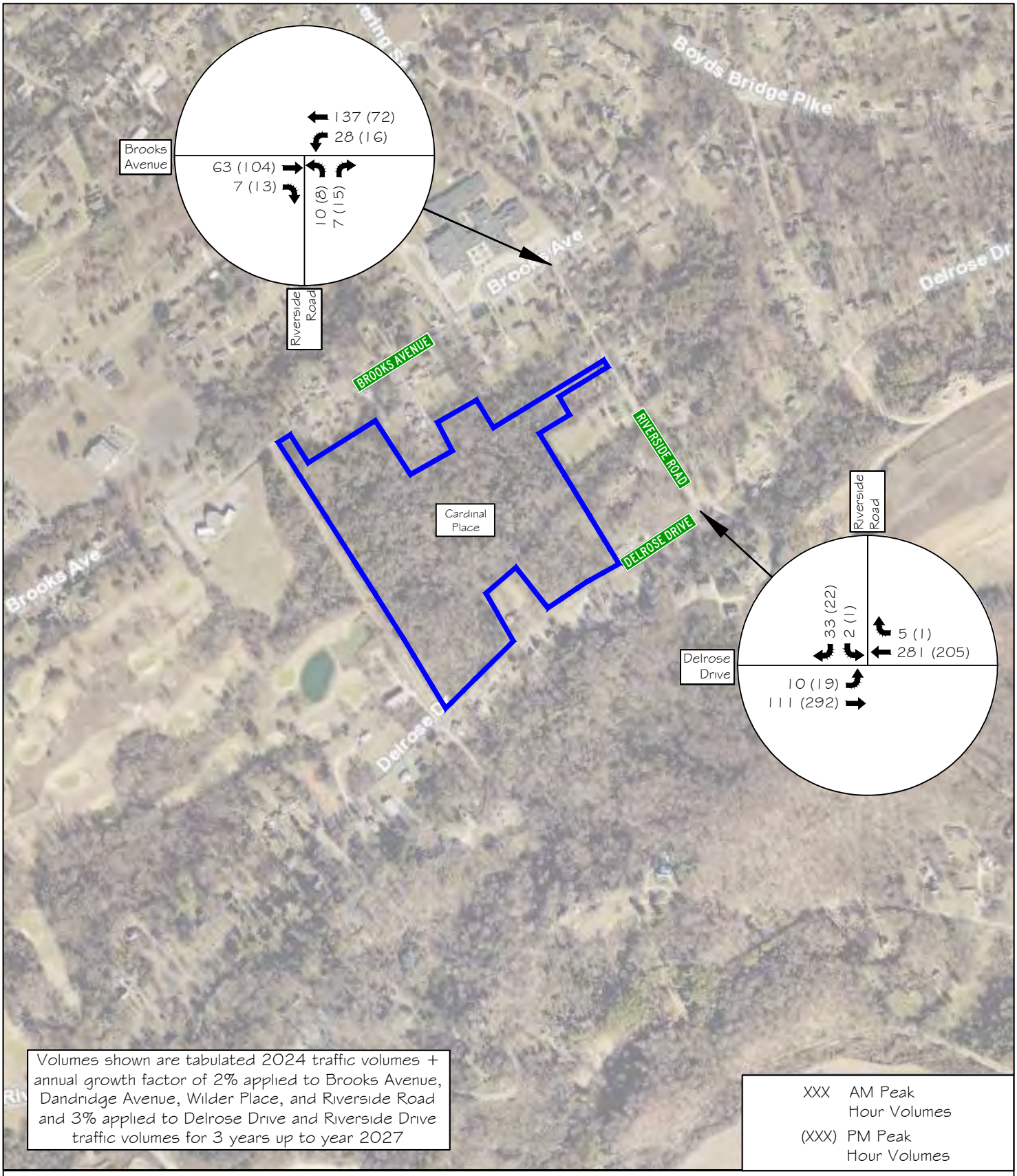

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FIGURE 6b

Cardinal Place

2027 Peak Hour Traffic Volumes - PROJECTED TRAFFIC CONDITIONS WITHOUT THE PROJECT

Capacity analyses were undertaken to determine the total delay per vehicle and projected LOS in 2027 without the project at the studied intersections. The results are shown in Tables 5a and 5b, and Appendix E includes the capacity analysis worksheets from the software.

As expected, Tables 5a and 5b show slightly worse vehicle delays at the intersections in the 2027 projected conditions versus the existing 2024 conditions. This result is due to the slight increase in traffic volumes due to the assumed general growth unrelated to the proposed development.

TABLE 5a
2027 INTERSECTION CAPACITY ANALYSIS RESULTS -
PROJECTED TRAFFIC CONDITIONS WITHOUT THE PROJECT

INTERSECTION	TRAFFIC CONTROL	APPROACH/ MOVEMENT	AM PEAK TOTAL DELAY PER VEHICLE (seconds)	PM PEAK TOTAL DELAY PER VEHICLE (seconds)
Brooks Avenue (WB) at Dandridge Avenue (EB) and Dandridge Avenue (NW) and Wilder Place (SB & NB)	STOP Unsignalized	Eastbound	6.7	8.5
		Westbound	8.0	7.9
		Northbound	5.0	5.8
		Southbound	5.1	6.2
		Northwestbound	5.0	5.4
		All Lanes	6.6	7.3

Note: Results were obtained from SimTraffic 12 Performance Analyses from Simulation

TABLE 5b
2027 INTERSECTION CAPACITY ANALYSIS RESULTS -
PROJECTED TRAFFIC CONDITIONS WITHOUT THE PROJECT

INTERSECTION	TRAFFIC CONTROL	APPROACH/ MOVEMENT	AM PEAK LOS	AM PEAK DELAY (seconds)	AM PEAK V/C	PM PEAK LOS	PM PEAK DELAY (seconds)	PM PEAK V/C
Delrose Drive (WB) / Riverside Drive (EB) at Riverside Drive & Vulcans Materials Driveway (NWB)	STOP Unsignalized	Northwestbound Left/Right	B	12.5	0.097	B	13.7	0.151
		Westbound Left	A	8.6	0.004	A	0.0	-
Delrose Drive (WB & EB) at Riverside Road (SB)	STOP Unsignalized	Eastbound Left/Thru	A	8.1	0.015	A	7.8	0.026
		Southbound Left/Right	B	10.3	0.064	B	10.1	0.050
Brooks Avenue (WB & EB) at Riverside Road (NB)	STOP Unsignalized	Northbound Left/Right	A	10.0	0.034	A	9.5	0.045
		Westbound Left/Thru	A	7.4	0.025	A	7.6	0.018

Note: All analyses were calculated in Synchro 12 software and reported using 7th Edition intersection methodology
[a] Level of Service , [b] Average Delay (sec/vehicle) , [c] Volume-to-Capacity Ratio

- **TRIP GENERATION:**

A generated trip is a single or one-direction vehicle movement entering or exiting the study site. The estimated traffic the 570 apartments and 80 townhouses in the Cardinal Place development will generate was based on the equations provided by Knoxville/Knox County Planning. These equations from Knoxville/Knox County Planning were developed from an extensive local study to estimate townhouse (and apartment) trip generation in the surrounding area. For Knox County, this is the preferred rate to use for townhouses and apartments. This local rate calculates slightly higher trip rates than the similar land use in the often-used ITE (Institute of Transportation Engineers) Trip Generation Manual.

As previously mentioned, this study assumed a 5% reduction in vehicle trips due to the proximity of the KAT bus transit system on Brooks Avenue. This reduction was approved beforehand by Knoxville/Knox County Planning and the City of Knoxville Engineering Department.

The data and calculations from the local trip generation study for the proposed land uses are shown in Appendix F. A summary of this information is presented in Table 6:

TABLE 6
TRIP GENERATION FOR CARDINAL PLACE
570 Apartments and 80 Townhouses

ITE LAND USE CODE	LAND USE DESCRIPTION	# OF UNITS	GENERATED DAILY TRAFFIC	GENERATED TRAFFIC AM PEAK HOUR			GENERATED TRAFFIC PM PEAK HOUR		
				ENTER	EXIT	TOTAL	ENTER	EXIT	TOTAL
Local Trip Rate	Apartments	570	4,562	22%	78%		55%	45%	
				59	208	267	215	176	391
Local Trip Rate	Multi-Family Attached Townhouses	80	781	22%	78%		55%	45%	
				9	34	43	35	29	64
New Volume Site Trips			5,343	68	242	310	250	205	455
Vehicle Trip Reduction due to Transit Activity (5%)			-267	-3	-12		-13	-10	
Total New Volume Site Trips			**5,076**	**65**	**230**	**295**	**237**	**195**	**432**

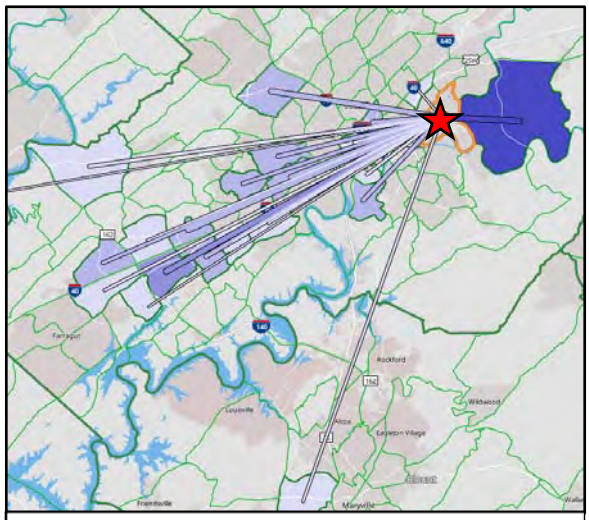
Local Trip Rates calculated by using Fitted Curve Equations

For the proposed Cardinal Place development, it is estimated that 65 vehicles will enter and 230 will exit, for a total of 295 generated trips during the AM peak hour in the year 2027. Similarly, it is estimated that 237 vehicles will enter and 195 will exit, for a total of 432 generated trips during

the PM peak hour in the year 2027. The calculated trips generated for an average weekday are estimated to be 5,076 vehicles for the proposed development. The table shows the assumed 5% trip reduction applied to account for transit activity and overall vehicle trip reductions.

- **TRIP DISTRIBUTION AND ASSIGNMENT:**

The projected trip distribution and assignment for the Cardinal Place development are based on several sources and engineering judgment. The first source is based on the existing traffic count volumes and the observed travel directions collected at the studied intersections and adjacent roadways. Overall, during the traffic counts, motorists in the area showed a distinct inclination for westbound travel towards Knoxville in the morning and the opposite in the afternoon peak period.

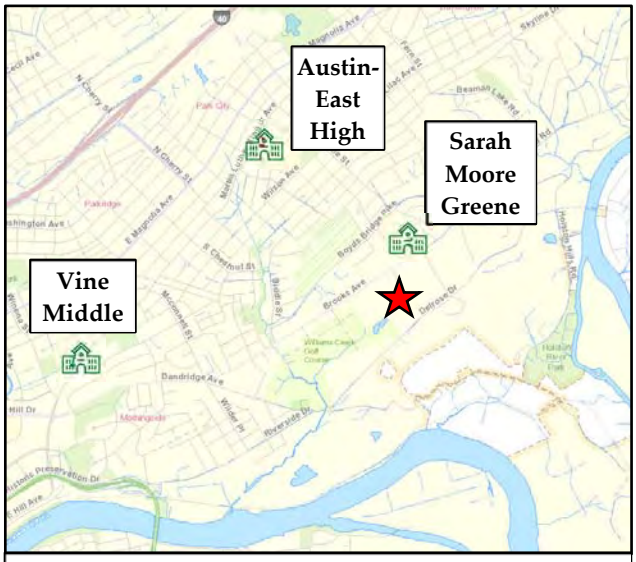


Top 25 Locations of 2021 Census Bureau Work-Based Trips to & from Census Tract 21

The second source for determining the projected trip distribution is based on work-related trips in the local area. Work-based trips will be a significant impetus for trips generated by the development, and these trips are more likely to travel to and from the west and southwest. This assertion is based on data from the United States Bureau website for Census Tract 21, where the development property is located. Based on 2021 (latest available) census data and as presented in Appendix G, most work-based trips in the surrounding area correspond to Oak Ridge, TN, downtown Knoxville, the University of Tennessee, and areas of West Knoxville. However, the largest area of work-related trips is shown just to the east. This area is assumed to be associated with the Forks of the River Industrial Park and the other businesses along E Governor John Sevier Highway.

In addition to employment centers, some generated traffic will travel to and from public and private schools. Schools will be another impetus for external trip-making. The development property is currently zoned for Sarah Moore Greene Magnet Academy (elementary), Vine Middle, and Austin-East (high school). This development property's zoned elementary and high school are all located to the north. The middle school, Vine, is slightly to the west. Sarah Moore Greene Magnet Academy is approximately 1,500 feet to the north, and Austin-East is 1.5 miles to the north. Vine Middle School is 2.1 miles away to the west. The shortest travel to the elementary and high school will be via Riverside Road, Brooks Avenue, and Boyds Bridge Pike to and from the north. The shortest and quickest routes from the proposed development to and from Vine Middle on Martin Luther King Jr Avenue will be made by traveling to and from the west via

Brooks Avenue, Delrose Drive, Dandridge Avenue, and Wilder Place.



Zoned Public School Locations

The Knox County Schools Transportation Department has developed Parental Responsibility Zones (PRZ) to determine whether students are offered transportation services to and from school. The PRZ is defined as being 1.5 miles for grades 6 – 12 and 1.0 miles for grades K – 5 from where the students' parcel is accessed to the point where the buses unload at the school. Except for elementary students at Sarah Moore Greene Magnet Academy, this development will be outside the PRZ for all the middle and high schools, and all school-age children attending these schools in the development will be able to utilize the school bus service if desired.

For shopping, grocery, and similar retail and business services, the closet opportunities will be provided along Magnolia Avenue to the north, with the quickest route provided via Brooks Avenue and Boyds Bridge Pike to and from the north.

Based on these factors, Figures 7a and 7b show the projected distribution of traffic entering and exiting the proposed residential development at the proposed entrances and the studied intersections. The percentages shown in the figure only pertain to the trips generated by the proposed dwellings in the development calculated from the local trip rates. Ultimately, the projected trip distribution was heavily based on the observed traffic at the intersections, the traffic flows adjacent to the site, and the expected work, school-related, and shopping-related travel. Overall, 10% was assumed to and from the north, 20% east, and 70% west (and south via west travel).

Figures 8a and 8b show the traffic assignment of the computed trips generated by the Cardinal Place development. These assignments are based on the assumed distribution of trips shown in Figures 7a and 7b.

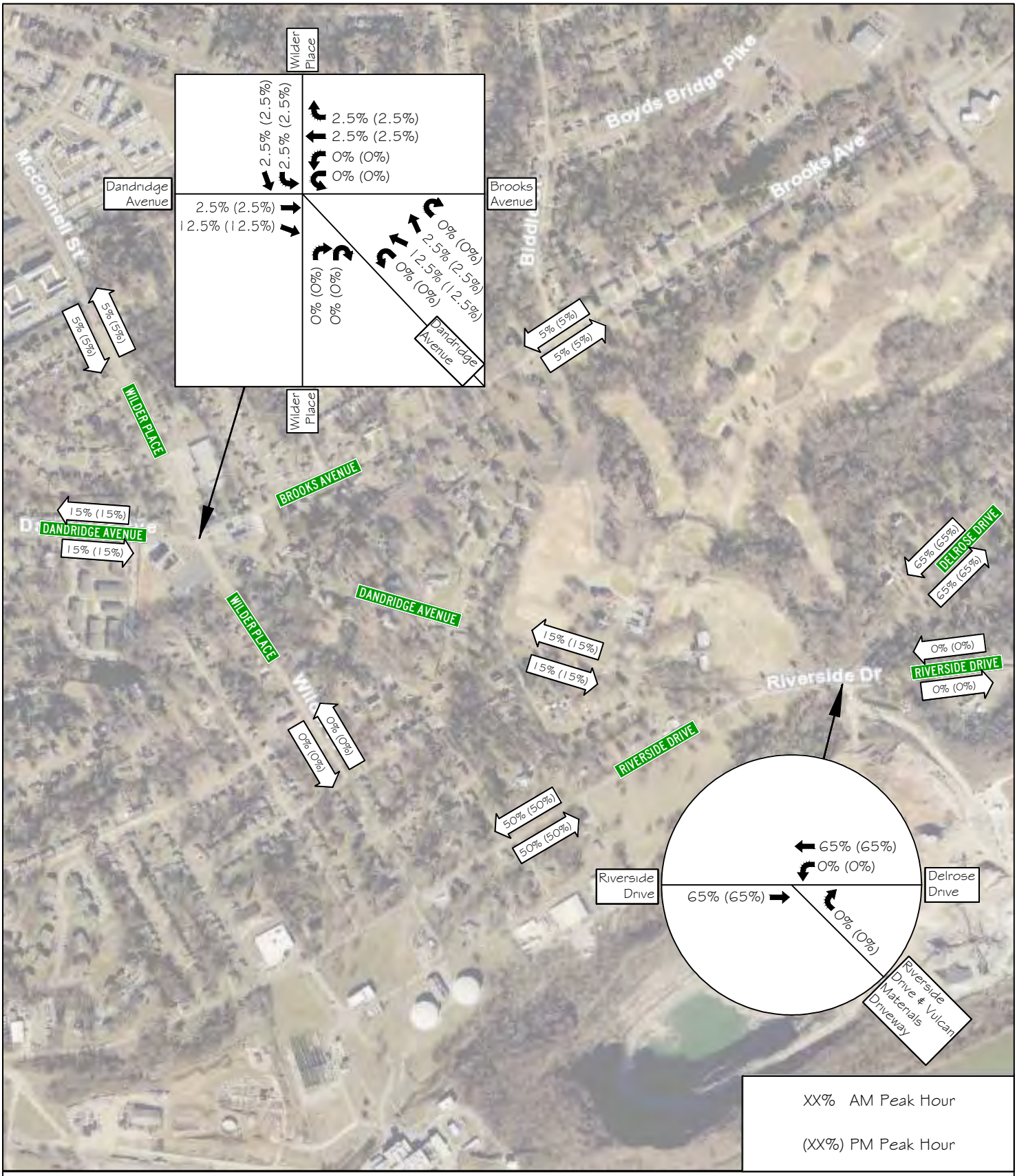


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FIGURE 7a

Cardinal Place

Directional Distribution of Generated Traffic during AM and PM Peak Hour

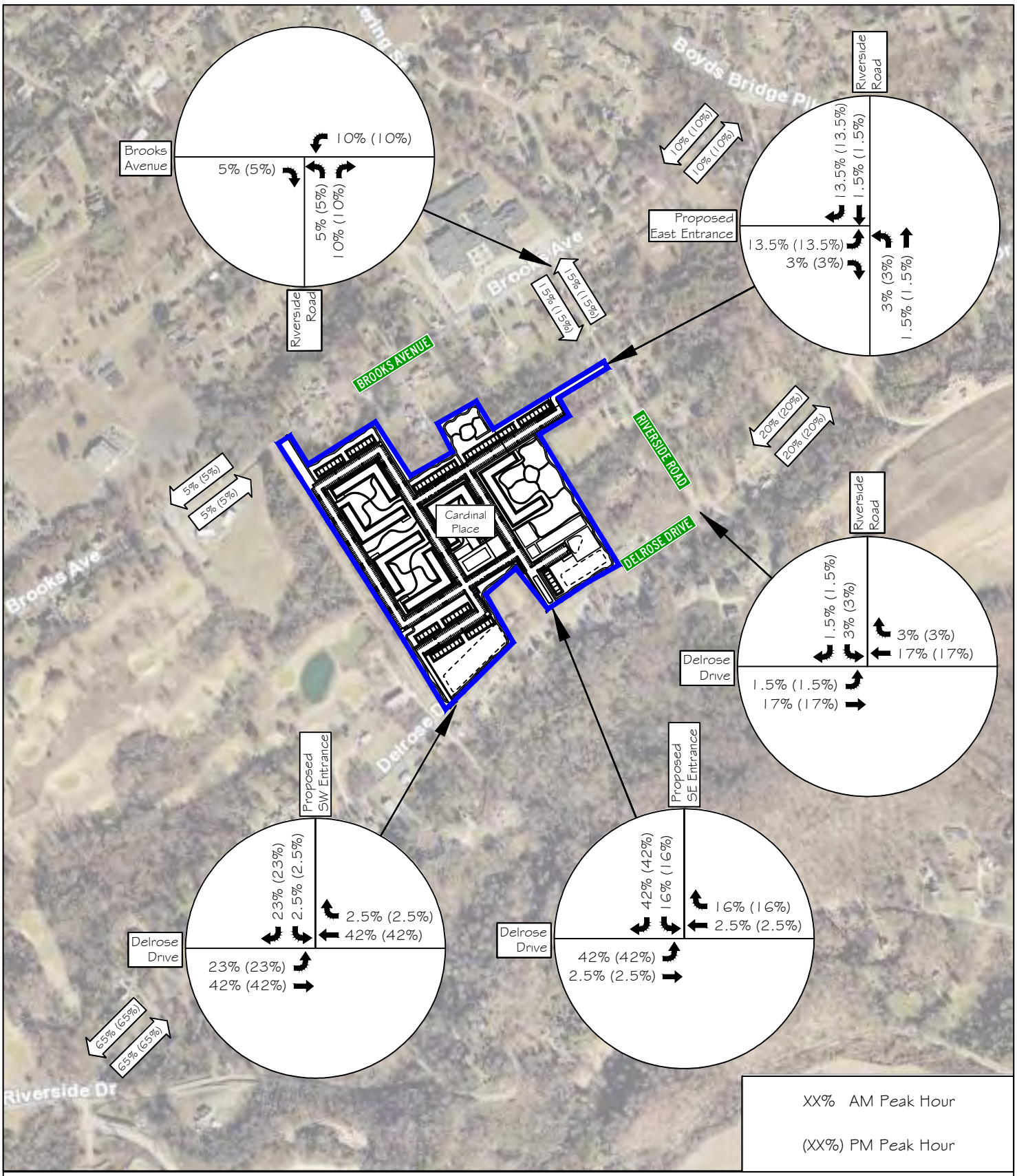

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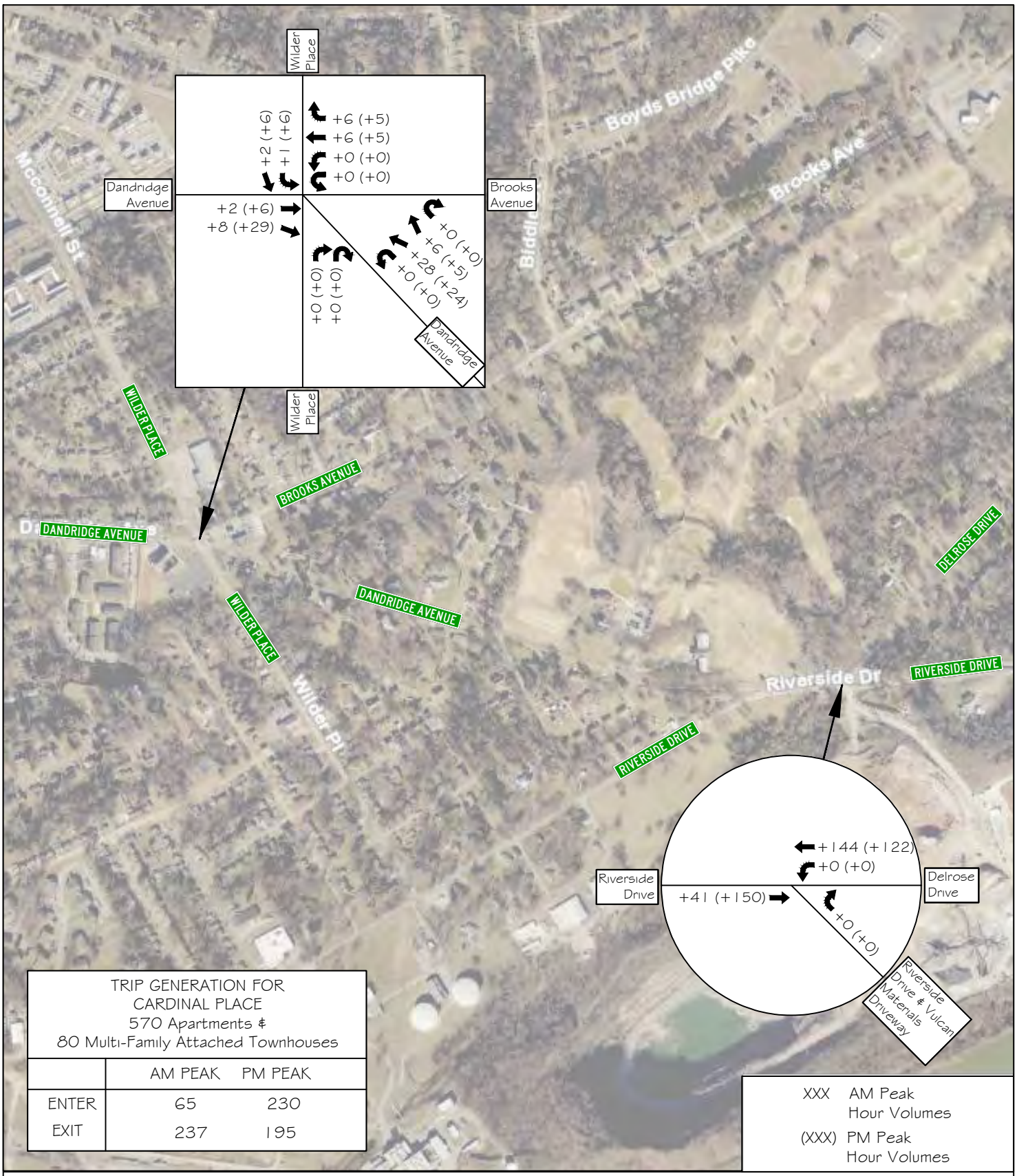
FIGURE 7b

Cardinal Place

Directional Distribution of Generated Traffic during AM and PM Peak Hour



TRIP GENERATION FOR
CARDINAL PLACE
570 Apartments &
80 Multi-Family Attached Townhouses

	AM PEAK	PM PEAK
ENTER	65	230
EXIT	237	195

XXX AM Peak Hour Volumes

(XXX) PM Peak Hour Volumes

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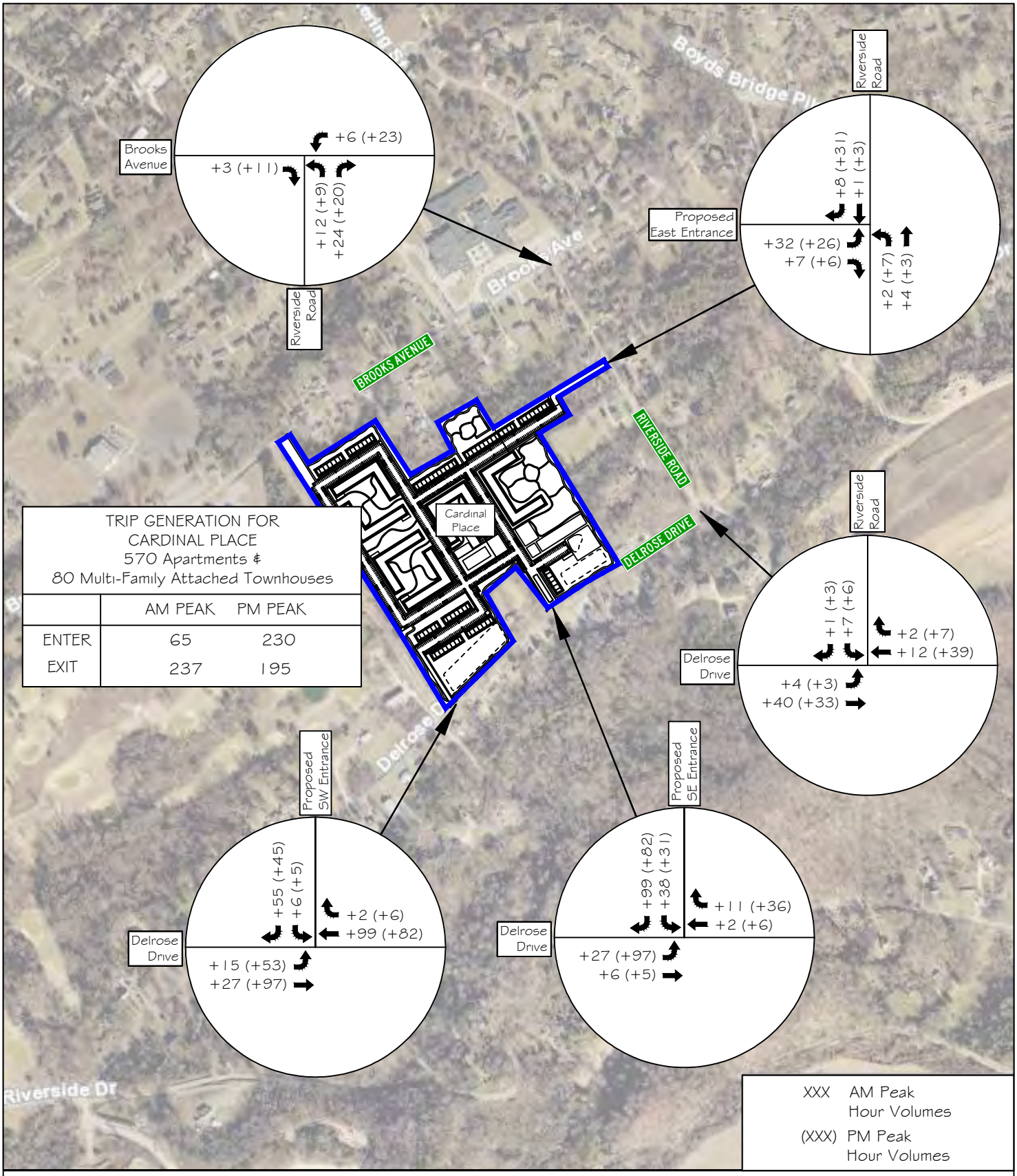
FIGURE 8a

Cardinal Place

Traffic Assignment of Generated Traffic during AM and PM Peak Hour



TRIP GENERATION FOR
CARDINAL PLACE
570 Apartments &
80 Multi-Family Attached Townhouses

	AM PEAK	PM PEAK
ENTER	65	230
EXIT	237	195

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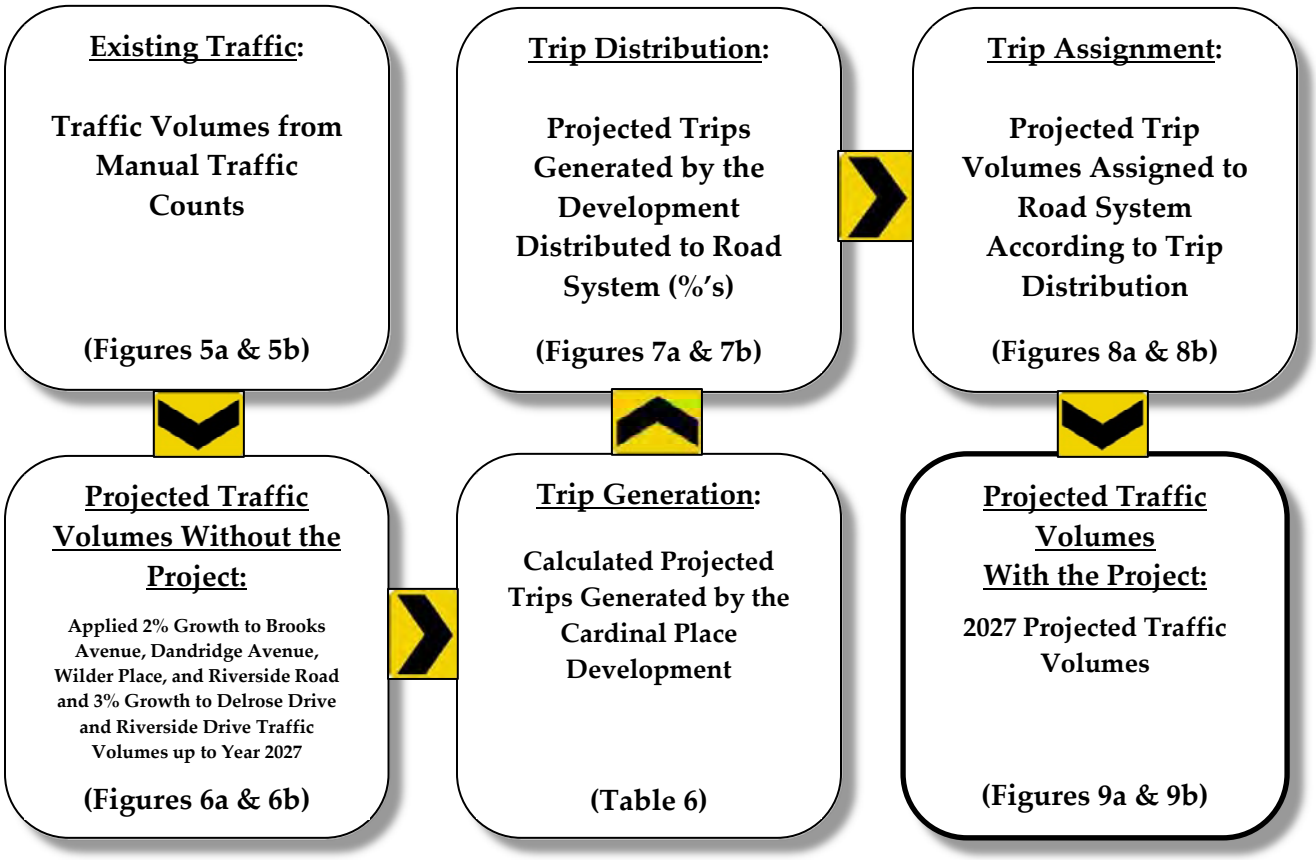
FIGURE 8b

Cardinal Place

Traffic Assignment of Generated Traffic during AM and PM Peak Hour

- **PROJECTED TRAFFIC CONDITIONS WITH THE PROJECT:**

Several additive steps were taken to estimate the total projected traffic volumes at the proposed entrances and other studied intersections when the Cardinal Place development is constructed and fully occupied in 2027. The steps are illustrated below for clarity and review:



The calculated peak hour traffic generated by the Cardinal Place development was added to the 2027 horizon year traffic by following the predicted trip distributions and assignments. This procedure was completed to obtain the total projected traffic volumes at the studied intersections and proposed entrances when the Cardinal Place development is fully built and occupied in 2027. Figures 9a and 9b show the projected 2027 AM and PM peak hour volumes with the Cardinal Place development trips.

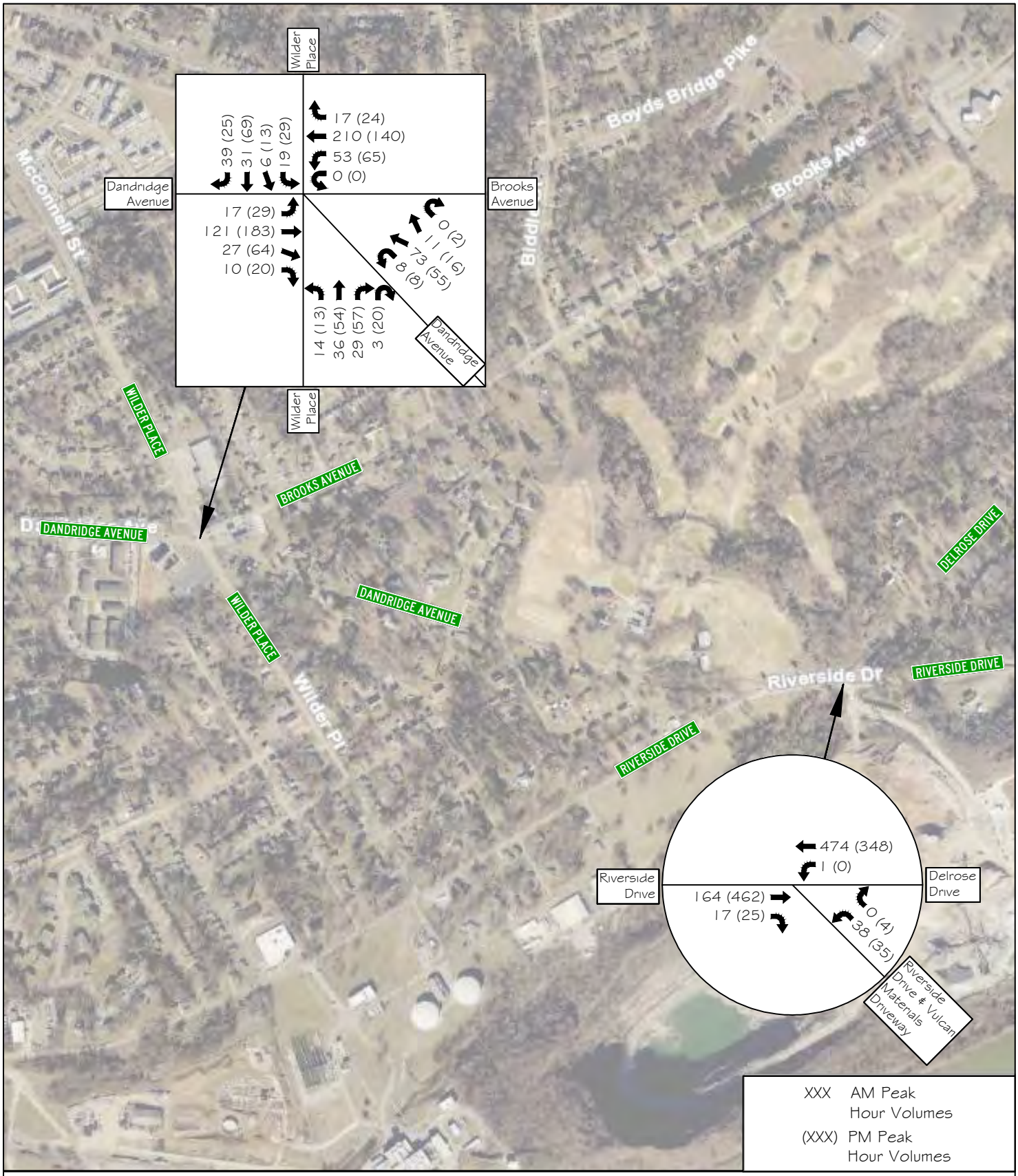


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FIGURE 9a

Cardinal Place

2027 Peak Hour Traffic Volumes - PROJECTED TRAFFIC CONDITIONS WITH THE PROJECT

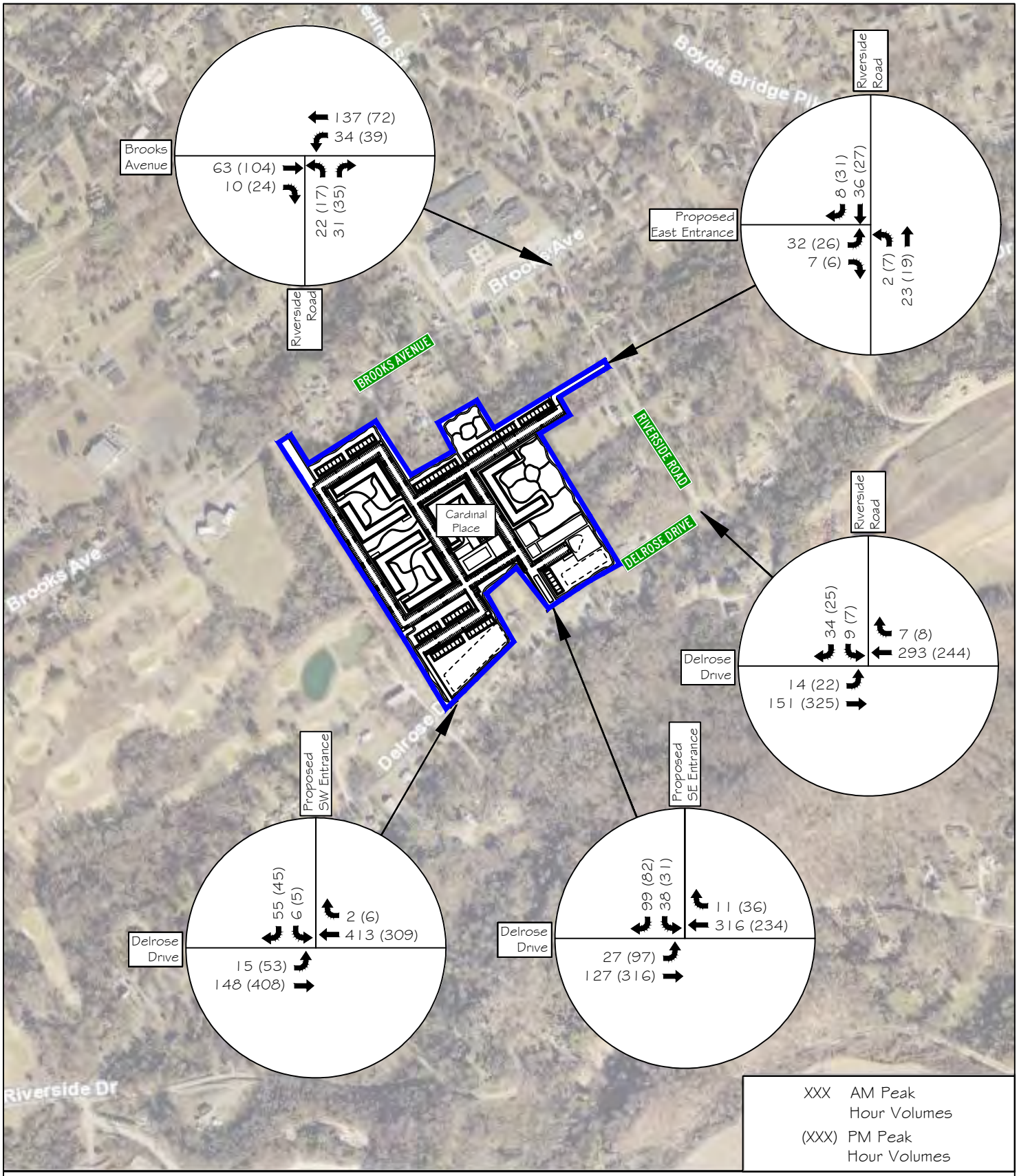

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FIGURE 9b

Cardinal Place

2027 Peak Hour Traffic Volumes - PROJECTED TRAFFIC CONDITIONS WITH THE PROJECT

Capacity analyses were conducted to determine the total delay per vehicle and projected LOS at the studied intersections and proposed entrances with the development traffic in 2027, shown in Figures 9a and 9b. Intersection capacity results from the projected 2027 peak hour traffic are shown in Tables 7a and 7b. Appendix E includes the worksheets for the projected 2027 peak hour capacity analyses.

As shown in Table 7a, the approaches at the 5-legged intersection of Brooks Avenue at Dandridge Avenue and Wilder Place are projected to operate with slightly increased total delays per vehicle compared to the existing conditions. The largest impacted approach, eastbound Dandridge Avenue, will only be increased by 2.1 seconds per vehicle in the PM peak hour compared to the existing result, from 8 seconds to 10.2 seconds. All the other approaches at the 5-legged intersection will experience increased delays of 1.2 seconds per vehicle or less in the AM or PM peak hours compared to the existing conditions, all of which are acceptable.

TABLE 7a
2027 INTERSECTION CAPACITY ANALYSIS RESULTS -
PROJECTED TRAFFIC CONDITIONS WITH THE PROJECT

INTERSECTION	TRAFFIC CONTROL	APPROACH/ MOVEMENT	AM PEAK TOTAL DELAY PER VEHICLE (seconds)	PM PEAK TOTAL DELAY PER VEHICLE (seconds)
Brooks Avenue (WB) at Dandridge Avenue (EB) and Dandridge Avenue (NW) and Wilder Place (SB & NB)	STOP Unsignalized	Eastbound	7.2	10.1
		Westbound	8.9	8.8
		Northbound	5.3	6.3
		Southbound	5.4	7.3
		Northwestbound	5.7	6.6
		All Lanes	7.3	8.4

Note: Results were obtained from SimTraffic 12 Performance Analyses from Simulation

All the other studied intersections and proposed entrance intersections are calculated to operate with very good to average LOS and vehicle delays in the projected 2027 AM and PM peak hours. All movements are projected to operate at LOS A or B, except for the northwestbound approach of Riverside Drive/Vulcan Materials Driveway at Delrose Drive, calculated at LOS C. This increased delay on this approach is directly related to the increased thru movements on Riverside Drive and Delrose Drive due to the trips generated by the Cardinal Place development, but is still quite reasonable.

TABLE 7b
2027 INTERSECTION CAPACITY ANALYSIS RESULTS -
PROJECTED TRAFFIC CONDITIONS WITH THE PROJECT

INTERSECTION	TRAFFIC CONTROL	APPROACH/ MOVEMENT	AM PEAK			PM PEAK		
			LOS	DELAY (seconds)	V/C	LOS	DELAY (seconds)	V/C
Delrose Drive (WB) / Riverside Drive (EB) at Riverside Drive & Vulcans Materials Driveway (NWB)	STOP Unsignalized	Northwestbound Left/Right	C	15.1	0.128	C	19.1	0.224
		Westbound Left	A	8.8	0.004	A	0.0	-
Delrose Drive (WB & EB) at Riverside Road (SB)	STOP Unsignalized	Eastbound Left/Thru	A	8.2	0.022	A	8.0	0.032
		Southbound Left/Right	B	11.1	0.094	B	12.5	0.121
Brooks Avenue (WB & EB) at Riverside Road (NB)	STOP Unsignalized	Northbound Left/Right	B	10.1	0.096	A	10.0	0.106
		Westbound Left/Thru	A	7.4	0.031	A	7.7	0.044
Riverside Road (SB & NB) at Proposed East Entrance (EB)	STOP Unsignalized	Northbound Left	A	7.3	0.001	A	7.3	0.005
		Eastbound Left/Right	A	9.0	0.046	A	9.0	0.038
Delrose Drive (WB & EB) at Proposed Southwest Entrance (SB)	STOP Unsignalized	Eastbound Left	A	8.3	0.015	A	8.2	0.050
		Southbound Left/Right	B	12.1	0.118	B	11.9	0.096
Delrose Drive (WB & EB) at Proposed Southeast Entrance (SB)	STOP Unsignalized	Eastbound Left	A	8.1	0.025	A	8.2	0.087
		Southbound Left/Right	B	12.8	0.249	B	14.5	0.249

Note: All analyses were calculated in Synchro 12 software and reported using 7th Edition intersection methodology
[a] Level of Service , [b] Average Delay (sec/vehicle) , [c] Volume-to-Capacity Ratio

- **POTENTIAL TRANSPORTATION SAFETY ISSUES:**

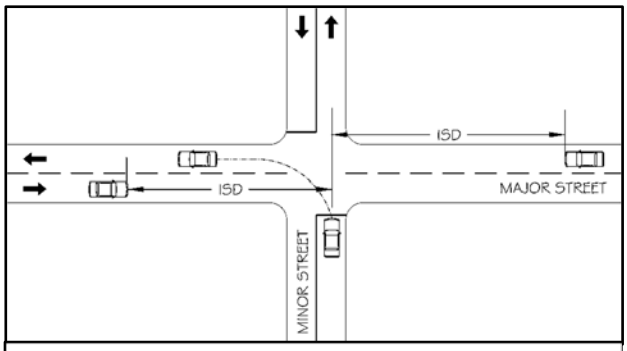
The study area was investigated for potential existing and future safety issues when the development is constructed. These transportation features are discussed in the following pages.

- **EVALUATION OF SIGHT DISTANCE**

For intersections, sight distance evaluations have two categories: Stopping Sight Distance (SSD) and Intersection Sight Distance (ISD).

Methodology:
SSD is the distance required for a motorist on a major street to perceive, react, and the vehicle to come to a complete stop before colliding with an object on the road. For evaluating intersections, this object would be another vehicle entering the intersection from a minor street. SSD can be considered the minimum visibility distance standard for evaluating the safety of an intersection.

ISD is the required visibility distance standard for evaluating the safety of an intersection. ISD is based on the time required to perceive, react, and complete the desired traffic maneuver once a motorist on a minor street decides to perform a traffic maneuver. Three traffic maneuvers are available for vehicles stopped on a minor street at a 4-way intersection: (1) left-turn, (2) right-turn, (3) or a crossing maneuver across the major street. For turns from the minor street, ISD is needed to allow a stopped motorist to turn onto a major street without being overtaken by an approaching vehicle. The most critical ISD is for left turns from the minor street. The ISD for this maneuver includes the time to turn left and clear half of the intersection without conflicting with the oncoming traffic from the left and accelerating to the road's operating speed without causing the approaching vehicles from the right to reduce their speed substantially.



Intersection Sight Distance Diagram

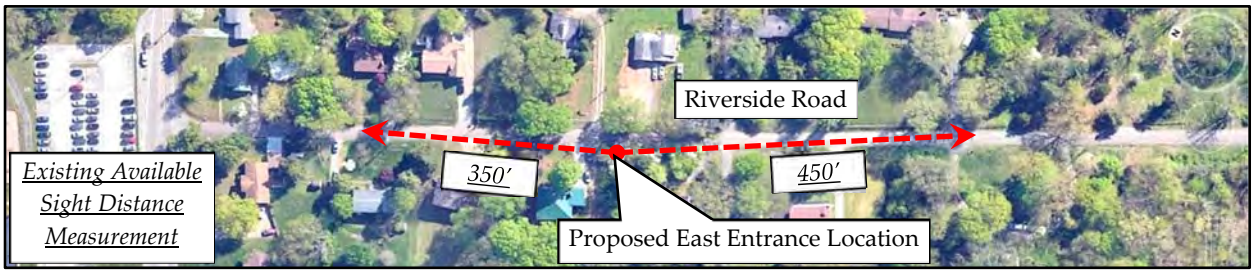
With a posted speed limit of 35 mph on Delrose Drive, the ISD is 390 feet for left turns exiting the development site at the Proposed Southeast and Southwest Entrances. This value is calculated

based on AASHTO's guidance. This distance is required for a motorist to safely exit to the left (eastbound) onto Delrose Drive from the proposed entrances. The ISD for a right-turn movement (westbound) from the proposed entrance is 335 feet.

At the Proposed East Entrance on Riverside Road, with a posted speed limit of 25 mph, the ISD for left turns is 280 feet and 240 feet for right turns.

Visual observations of the sight distances at the proposed entrance locations were undertaken. Using a Nikon Laser Rangefinder at the proposed entrance locations, the available sight distances were measured and are expected to be adequate for motorists exiting the development at all three entrances. These measurements assumed that vegetation along Delrose Drive would be removed along the road frontage and maintained in future conditions. The same was assumed for Riverside Road, which includes an existing utility pole adjacent to the Proposed East Entrance location, which will require relocation.

Images of the existing sight distances at the proposed entrance locations are labeled below with the required ISD and rangefinder-measured sight distances.



View of Sight Distance on Riverside Road at the Proposed East Entrance Location (Looking North)

View of Sight Distance on Riverside Road at the Proposed East Entrance Location (Looking South)

View of Sight Distance on Delrose Drive at the Proposed Southeast Entrance Location (Looking East)

View of Sight Distance on Delrose Drive at the Proposed Southeast Entrance Location (Looking West)

View of Sight Distance on Delrose Drive at the Proposed Southwest Entrance Location (Looking East)

View of Sight Distance on Delrose Drive at the Proposed Southwest Entrance Location (Looking West)

- **EVALUATION OF TURN LANE THRESHOLDS**

The need for separate left and right-turn lanes was evaluated in the projected 2027 conditions for the proposed entrances at Delrose Drive. It was not evaluated for the Proposed East Entrance due to the projected low volumes on Riverside Road.

The criteria used for these turn lane evaluations were based on Knox County's "Access Control and Driveway Design Policy". This design policy relates vehicle volume thresholds based on prevailing speeds for two-lane and four-lane roadways. The Proposed Southeast and Southwest Entrance locations on Delrose Drive are within a 35 mph speed zone; thus, these entrances were evaluated based on this posted speed. The worksheets for these evaluations are provided in Appendix H.

Based on the projected 2027 traffic volumes at the intersections, none of the proposed entrances warrant separate entering right-turn lanes on Delrose Drive. The Proposed Southwest Entrance does not meet a warrant for a separate entering left-turn lane on Delrose Drive, but a warrant for a left-turn lane is met at the Proposed Southeast (main) Entrance during the PM peak hour. Additionally, a warrant for a left-turn lane at the Proposed Southwest Entrance is nearly met during the PM peak hour.

- **PROJECTED VEHICLE QUEUES**

The SimTraffic software also calculates the 95th percentile vehicle queues at intersections. The 95th percentile vehicle queue is the recognized measurement in the transportation engineering profession as the design standard used when considering vehicle queue lengths. A 95th percentile vehicle queue length means 95% certainty that the vehicle queue will not extend beyond that point. The calculated vehicle queue results were based on averaging the outcome obtained during ten traffic simulations in the software. The 95th percentile vehicle queue lengths at the intersections are shown in Table 8 for the projected 2027 conditions. The vehicle queue worksheet results from the SimTraffic software are in Appendix I.

Table 8 shows minimal vehicle queue lengths on all the studied intersection approaches in the 2027 AM and PM peak hours. Based on these results, the longest vehicle queue calculated for the studied intersections will occur on the Dandridge Avenue eastbound approach at the 5-legged intersection in the PM peak hour. This approach was calculated to have a vehicle queue length of 103 feet and will be just over four passenger vehicles, assuming a length of 25 feet per vehicle.

TABLE 8
VEHICLE QUEUE SUMMARY -
2027 PROJECTED TRAFFIC CONDITIONS WITH THE PROJECT

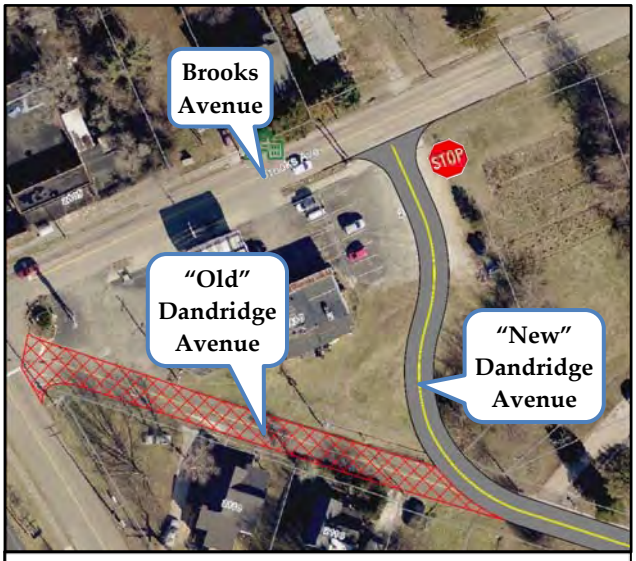
INTERSECTION	TRAFFIC CONTROL	APPROACH/ MOVEMENT	SIMTRAFFIC 95th PERCENTILE QUEUE LENGTH (ft)	
			AM PEAK HOUR	PM PEAK HOUR
Brooks Avenue (WB) at Dandridge Avenue (EB) and Dandridge Avenue (NW) and Wilder Place (SB & NB) Driveway (NWB)	Unsignalized	Eastbound	63	103
		Westbound	92	71
		Northbound	47	58
		Southbound	58	66
		Northwestbound	40	43
Delrose Drive (WB) / Riverside Drive (EB) at Riverside Drive & Vulcans Materials Driveway (NWB)	Unsignalized	Westbound Left/Thru	9	0
		Northwestbound Left/Right	60	47
Delrose Drive (WB & EB) at Riverside Road (SB)	Unsignalized	Eastbound Left/Thru	20	29
		Southbound Left/Right	43	41
Brooks Avenue (WB & EB) at Riverside Road (NB)	Unsignalized	Northbound Left/Right	57	24
		Westbound Left/Thru	17	46
Riverside Road (SB & NB) at Proposed East Entrance (EB)	Unsignalized	Northbound Left	3	4
		Eastbound Left/Right	45	44
Delrose Drive (WB & EB) at Proposed Southwest Entrance (SB)	Unsignalized	Eastbound Left	26	53
		Southbound Left/Right	46	46
Delrose Drive (WB & EB) at Proposed Southeast Entrance (SB)	Unsignalized	Eastbound Left	32	63
		Southbound Left/Right	66	66

Vehicle Queues calculated in SimTraffic 12 Software

CONCLUSIONS & RECOMMENDATIONS

The following is an overview of recommendations to minimize the transportation impacts of the Cardinal Place development on the adjacent transportation system while attempting to achieve an acceptable traffic flow and safety level.

Brooks Avenue at Dandridge Avenue and Wilder Place: This intersection is projected to operate with reasonable total vehicle delays per vehicle and minimal vehicle queues for all approaches. From a transportation engineering perspective, the Cardinal Place development will have minimal impact on this intersection. No specific recommendations are provided based on these findings. However, based on the observations during the traffic counts and the crash history reviewed at the intersection, it is apparent that this unusual 5-legged intersection is difficult for motorists to navigate. This intersection, having five approaches, with one at an acute angle, presents a challenge to motorists in determining which has the right-of-way when proceeding into the intersection. Motorist hesitation and confusion, near misses, and sharp turning movements were observed during the traffic counts, and the crash data lends credence to these observations.



Potential Alternate Dandridge Avenue Route at 5-Legged Intersection

It is recommended that the City of Knoxville seriously consider eliminating the northwestbound approach of Dandridge Avenue at the 5-legged intersection. This approach intersects at an acute angle and provides nearly unlimited turning movement locations to and from the adjacent gas station/market parking area, which is less than desirable. An initial recommendation to eliminate this approach would be to reroute it further east of the corner gas station/market and intersect Brooks Avenue at a t-intersection, as presented in the adjacent image. This alternative routing would traverse private property and a portion of the existing gas station/market parking lot. This alternative route would require

property acquisition and accommodation of a few private driveways on the southern side of Dandridge Avenue. However, eliminating this approach would solve many detrimental issues currently occurring at the 5-legged intersection. As shown in the image, the closed portion of the "old" route of Dandridge Avenue could be swapped with the gas station/market property owner to lower acquisition costs since the "new" route would cross their property. Once the Dandridge Avenue northwestbound leg could be removed, alternative traffic control at the intersection with Brooks Avenue and Wilder Place, such as a roundabout, could be considered instead of its current all-way stop conditions.

Delrose Drive at Riverside Drive: This intersection is projected to operate with reasonable vehicle delays per vehicle and minimal vehicle queues for all movements. From a transportation engineering perspective, the Cardinal Place development will have minimal impact on this intersection. No specific recommendations are provided based on these findings. The thru movements on Delrose Drive and Riverside Drive will be increased once the development comes to fruition. Still, this will only slightly increase the vehicle delay for vehicles attempting to turn westbound onto Riverside Drive or eastbound onto Delrose Drive.

This intersection's current layout is less than desirable due to the acute angle at which the southeast approach of Riverside Drive intersects Delrose Drive and combines with the Vulcans Material Driveway. The crash data from the past three years did not indicate any specific patterns or occurrences that would lend indicators to needed improvements.

However, once again, similar to the 5-legged intersection, the City of Knoxville should consider rerouting the southeast approach of Riverside Drive to intersect Delrose Drive further to the east and away from the Vulcan Materials Driveway. Shifting and separating this approach further to the east would allow greater separation of heavy trucks and passenger cars, increase safety, and eliminate the less-than-desirable combined approach of Riverside Drive and the Vulcan Materials Driveway. The corner property that would allow for this relocation is currently unoccupied, and the City should consider correcting this before this property becomes developed or occupied.

Delrose Drive and Brooks Avenue at Riverside Road: These intersections are projected to operate with reasonable vehicle delays per vehicle and minimal vehicle queues for all movements. From a transportation engineering perspective, the Cardinal Place development will have minimal impact on these intersections. No specific recommendations are provided based on these findings. However, due to the projected increased traffic volumes on Riverside Road, it is recommended that this roadway be widened to have a minimum width of 20 feet its entire length. This road was recently repaved and slightly widened in spots but still has sections less than 18 feet wide. Details regarding the particulars of this road widening should be discussed further with the City of Knoxville Engineering Department.

Riverside Road at Proposed East Entrance: The 2027 projected level of service calculations for this proposed intersection resulted in very short vehicle delays and good LOS.

4a) The construction of separate turn lanes on Riverside Road for entering traffic at the Proposed East Entrance will not be needed due to the projected low volumes in the 2027 conditions.

4b) It is recommended that a Stop Sign (R1-1) be installed and a 24" white stop bar be applied to the Proposed East Entrance approach at Riverside Road. The stop bar should be applied a minimum of 4 feet away from the edge of Riverside Road and placed at the desired stopping point that maximizes the sight distance.

4c) A single exiting lane for the Proposed East Entrance at Riverside Road will be sufficient. The 95th percentile vehicle queue lengths were calculated at this intersection for the 2027 projected conditions with the project, and the calculated vehicle queues are reasonable. The longest exiting queue in the projected 2027 conditions is calculated to be 45 feet in the AM peak hour and 45 feet in the PM peak hour. These queue lengths translate to just under two passenger cars, assuming a length of 25 feet per vehicle.

4d) Intersection sight distance at the Proposed East Entrance at Riverside Road must not be impacted by existing vegetation or future landscaping or signage. The existing utility pole on the west side of Riverside Road near the proposed entrance

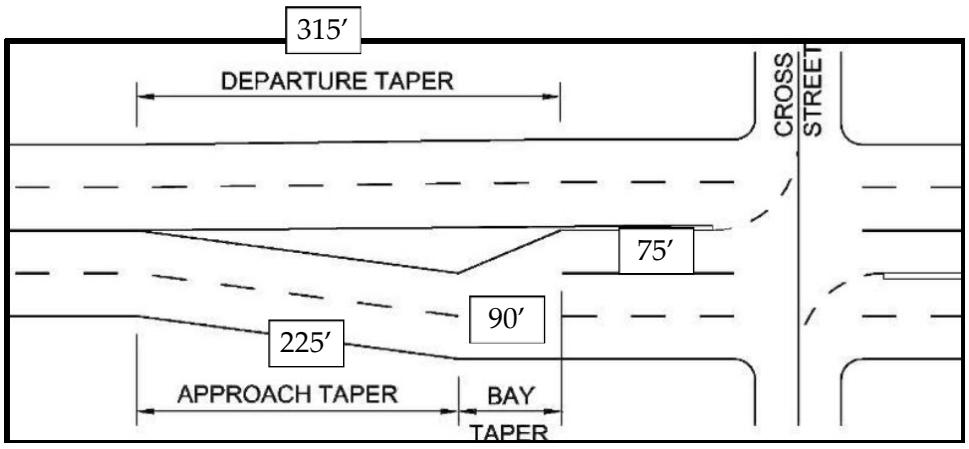
location will need to be relocated. Based on a posted speed limit of 25 mph on Riverside Road, the required ISD is 280 feet for exiting left-turning vehicles at the Proposed East Entrance and 240 feet for exiting right-turning vehicles. The site designer must verify that these distances will be available.

Delrose Drive at Proposed Southwest Entrance: The 2027 projected level of service calculations for this proposed intersection resulted in very short vehicle delays and good LOS.

5a) The construction of separate turn lanes on Delrose Drive for entering traffic at the Proposed Southwest Entrance is not expected to meet warrants based on the projected 2027 traffic volumes. However, a warrant for a left-turn lane at the Proposed Southwest Entrance is nearly met during the PM peak hour. This result is a "borderline" situation. It should be understood that the analysis and this nearly satisfied warrant result are based on several assumptions in the study. Thus, the actual, realized traffic conditions could vary from the projections.

Serious consideration should be given to providing a separate left-turn lane on Delrose Drive at the Proposed Southwest Entrance. If provided, the recommended lengths for this proposed eastbound left-turn lane were based on TDOT standards and include an approach taper of 225 feet, a bay taper of 90 feet (8:1), and a vehicle storage length of 75 feet lane. Seventy-five feet of storage will allow a vehicle queue of up to three passenger cars. A storage length of 75 feet will be appropriate since the longest vehicle queue for this left turning movement without a turn lane at the Proposed Southwest Entrance was calculated to be 26 feet in the AM peak hour and 53 feet in the PM peak hour. (This queue length would be reduced with a provided turn lane.) An approach taper will be required to allow for a transition to create space to add an eastbound left-turn lane on Delrose Drive.

The recommended lengths are shown in the following TDOT diagram from their Highway System Access Manual (Figure 3-21):



To provide this lane with these lengths on Delrose Drive at the Proposed Southwest Entrance, further engineering review and design will be required to determine the most appropriate means of modifying the roadway to incorporate this additional lane within the ROW constraints and the presence of a utility entrance driveway to Williams Creek Golf Course further to the southwest.

5b) It is recommended that a Stop Sign (R1-1) be installed and a 24" white stop bar be applied to the Proposed Southwest Entrance approach at Delrose Drive. The stop bar should be applied a minimum of 4 feet away from the edge of Delrose Drive and placed at the desired stopping point that maximizes the sight distance.

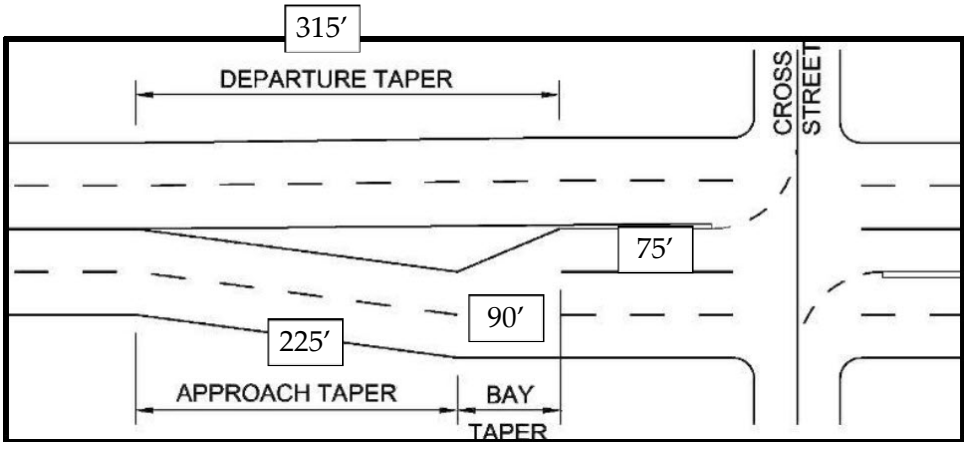
5c) A single exiting lane for the Proposed Southwest Entrance at Delrose Drive will be sufficient. The 95th percentile vehicle queue lengths were calculated at this intersection for the 2027 projected conditions with the project, and the calculated vehicle queues are reasonable. The longest exiting queue in the projected 2027 conditions is calculated to be 46 feet in the AM peak hour and PM peak hour. These queue lengths translate to just under two passenger cars, assuming a length of 25 feet per vehicle.

5d) Intersection sight distance at the Proposed Southwest Entrance at Delrose Drive must not be impacted by existing vegetation or future landscaping or signage. Based on a posted speed limit of 35 mph on Delrose Drive, the required ISD is 390 feet for exiting left-turning vehicles at the Proposed Southwest Entrance and 335 feet for exiting right-turning vehicles. The site designer must verify that these distances will be available.

6 **Delrose Drive at Proposed Southeast Entrance**: The 2027 projected level of service calculations for this proposed intersection resulted in very short vehicle delays and good LOS.

6a) The construction of a separate right-turn lane on Delrose Drive for entering traffic at the Proposed Southeast Entrance is not warranted based on the projected 2027 PM peak hour traffic volumes. However, a separate left-turn lane on Delrose Drive at this proposed main entrance is warranted based on the projected 2027 traffic volumes and Knox County thresholds. The recommended lengths for this proposed eastbound left-turn lane were based on TDOT standards and include an approach taper of 225 feet, a bay taper of 90 feet (8:1), and a vehicle storage length of 75 feet lane. Seventy-five feet of storage will allow a vehicle queue of up to three passenger cars. A storage length of 75 feet will be appropriate since the longest vehicle queue for this left turning movement without a turn lane at the Proposed Southeast Entrance was calculated to be 32 feet in the AM peak hour and 63 feet in the PM peak hour. (This queue length would be reduced with a turn lane.) An approach taper will be required to allow for a transition to create space to add an eastbound left-turn lane on Delrose Drive.

The recommended lengths are shown in the following TDOT diagram from their Highway System Access Manual (Figure 3-21):



To provide this lane with these lengths on Delrose Drive at the Proposed Southeast Entrance, further engineering review and design will be required to determine the most appropriate means of modifying the roadway to incorporate this additional

lane within the ROW constraints and complicated by the presence of the nearby historic cemetery.

6b) It is recommended that a Stop Sign (R1-1) be installed and a 24" white stop bar be applied to the Proposed Southeast Entrance approach at Delrose Drive. The stop bar should be applied a minimum of 4 feet away from the edge of Delrose Drive and placed at the desired stopping point that maximizes the sight distance.

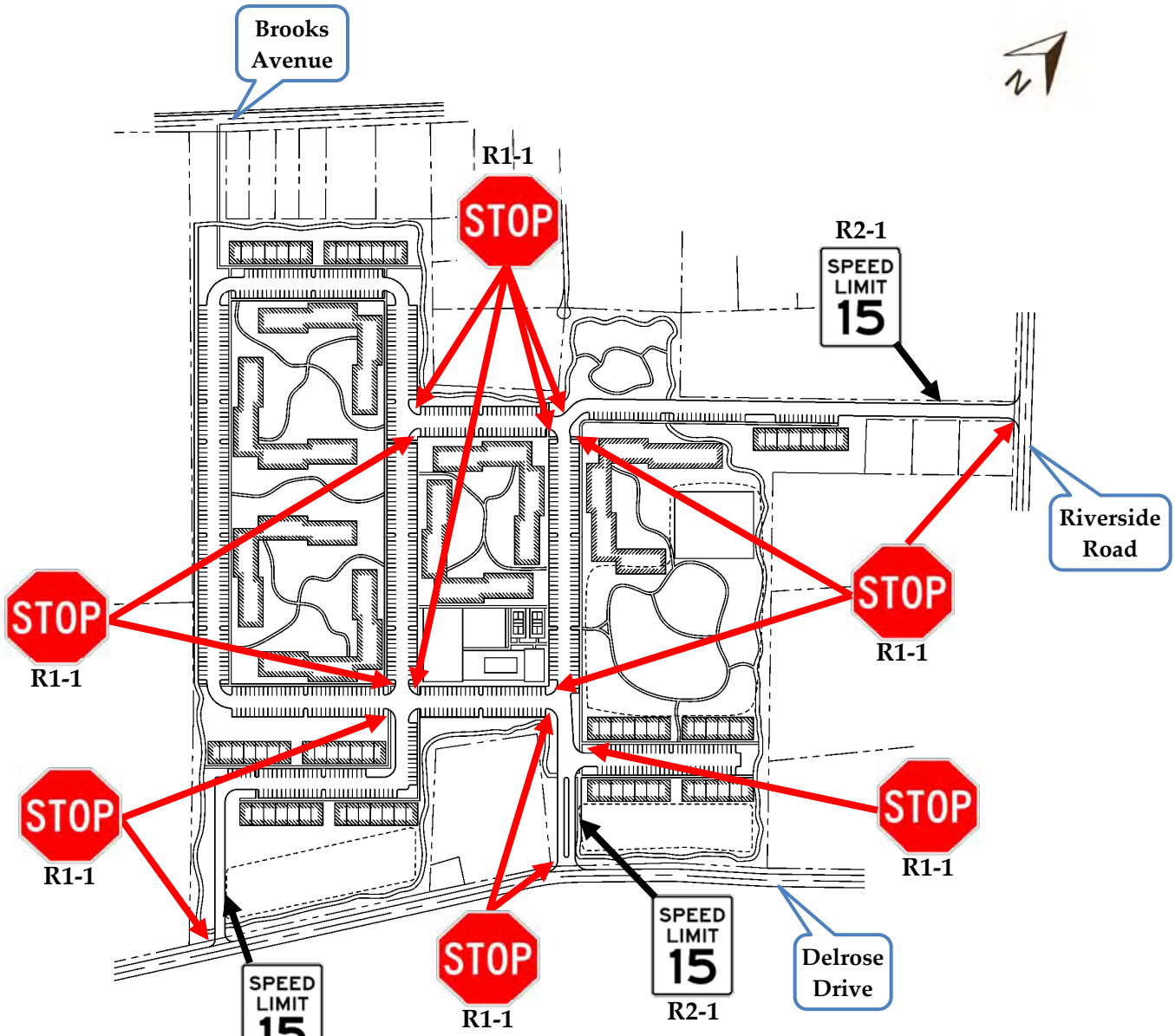
6c) A single exiting lane for the Proposed Southeast Entrance at Delrose Drive will be sufficient. The 95th percentile vehicle queue lengths were calculated at this intersection for the 2027 projected conditions with the project, and the calculated vehicle queues are reasonable. The longest exiting queue in the projected 2027 conditions is calculated to be 66 feet in the AM peak hour and PM peak hour. These queue lengths translate to just under three passenger cars, assuming a length of 25 feet per vehicle.

6d) Intersection sight distance at the Proposed Southeast Entrance at Delrose Drive must not be impacted by existing vegetation or future landscaping or signage. Based on a posted speed limit of 35 mph on Delrose Drive, the required ISD is 390 feet for exiting left-turning vehicles at the Proposed Southeast Entrance and 335 feet for exiting right-turning vehicles. The site designer must verify that these distances will be available.

7 **Cardinal Place Internal Drives/Parking Lot Aisleways:** The layout plan shows several internal drives, as shown in Figure 4.

7a) A 15 mph Speed Limit Sign (R2-1) is recommended to be posted near the beginning of the development entrance driveways off Riverside Road and Delrose Drive. Since this will be a private development, a posted speed limit of less than 25 mph (minimum posted speed in the City of Knoxville) is allowable.

7b) Stop Signs (R1-1) and 24" white stop bars are recommended on the new internal drives and parking lot aisleways, as shown in the image below.



Internal Traffic Sign Locations

7c) Sight distance at the new internal intersections must not be impacted by new signage, parked cars, or future landscaping. With a speed limit of 15 mph in the development, the internal intersection sight distance is 170 feet. The site designer should ensure that internal sight distance lengths are met.

7d) With long and straight parking lot aisleways proposed internally, it is recommended that speed humps or tables be considered to reduce internal traffic speeds in the development. Alternatively, parking lot islands could be extended toward the aisleways. Extending the parking lot islands a few feet would narrow the aisleway widths and reduce the available driving surface. A narrower aisleway design would reduce driver comfort and internal vehicle speeds.

7e) All drainage grates and covers for the residential development must be pedestrian and bicycle-safe.

7f) Internal sidewalks are proposed throughout the development and will include an internal perimeter walking trail. Concrete sidewalks should have appropriate ADA-compliant ramps at intersection corners with detectable surfaces, and the internal sidewalks are recommended to be 5 feet minimum in width to meet the City of Knoxville regulations. White-painted crosswalks should be applied to the internal road pavement internally where pedestrians are expected to cross the parking aisleways. Internal crosswalks should include Pedestrian Warning (W11-2) signs with a downward arrow plaque (W16-7p) where appropriate. The internal crosswalks should have a white transverse marking as shown in TDOT Standard Drawing T-M-4.

7g) The internal sidewalk system for the proposed development should connect to the existing external sidewalk system on Brooks Avenue. It is recommended that this connection be constructed where the development property has a narrow strip of land up to Brooks Avenue. It is recommended that a crosswalk and pedestrian warning signs be applied on Brooks Avenue to connect to the sidewalk on the northern side of Brooks Avenue.

A Rectangular Rapid Flashing Beacon (RRFP) system could be a potential candidate for inclusion at this mid-block pedestrian crossing on Brooks Avenue. Further engineering regarding this crossing should be investigated, and sight

distance requirements should be included since the proposed crossing location will be at the bottom of a sag vertical curve on Brooks Avenue, with vegetation on the south side of Brooks Avenue potentially restricting sight distance.

The details regarding the mid-block pedestrian crossing must be coordinated with the City of Knoxville. It is recommended that the mid-block pedestrian crossing on Brooks Avenue include the following features:

i. The existing roadway lighting on Brooks Avenue must be supplemented at the crossing location for night-time and low-light visibility. An additional roadway light may need to be installed on the south side of Brooks Avenue, where the development's sidewalk intersects the road corridor.
ii. The marked crosswalk on Brooks Avenue must be a white high-visibility patterned crosswalk. A continental or ladder design would be an appropriate high-visibility pattern on the pavement.
iii. Pedestrian warning signage should be placed at the appropriate distances on each approach of Brooks Avenue.

7h) All internal and external road and intersection elements should be designed to AASHTO and the City of Knoxville specifications and guidelines to ensure proper operation.

APPENDIX A

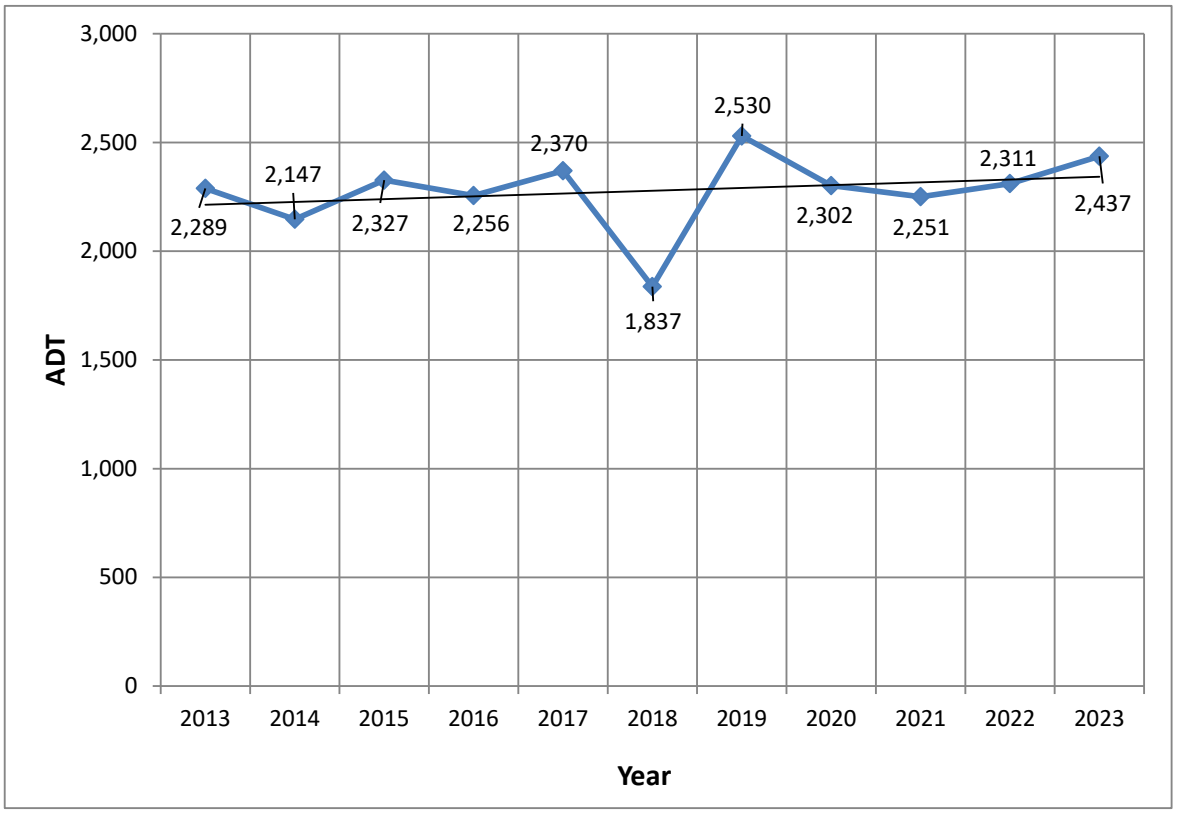
HISTORICAL TRAFFIC COUNT DATA

Historical Traffic Counts

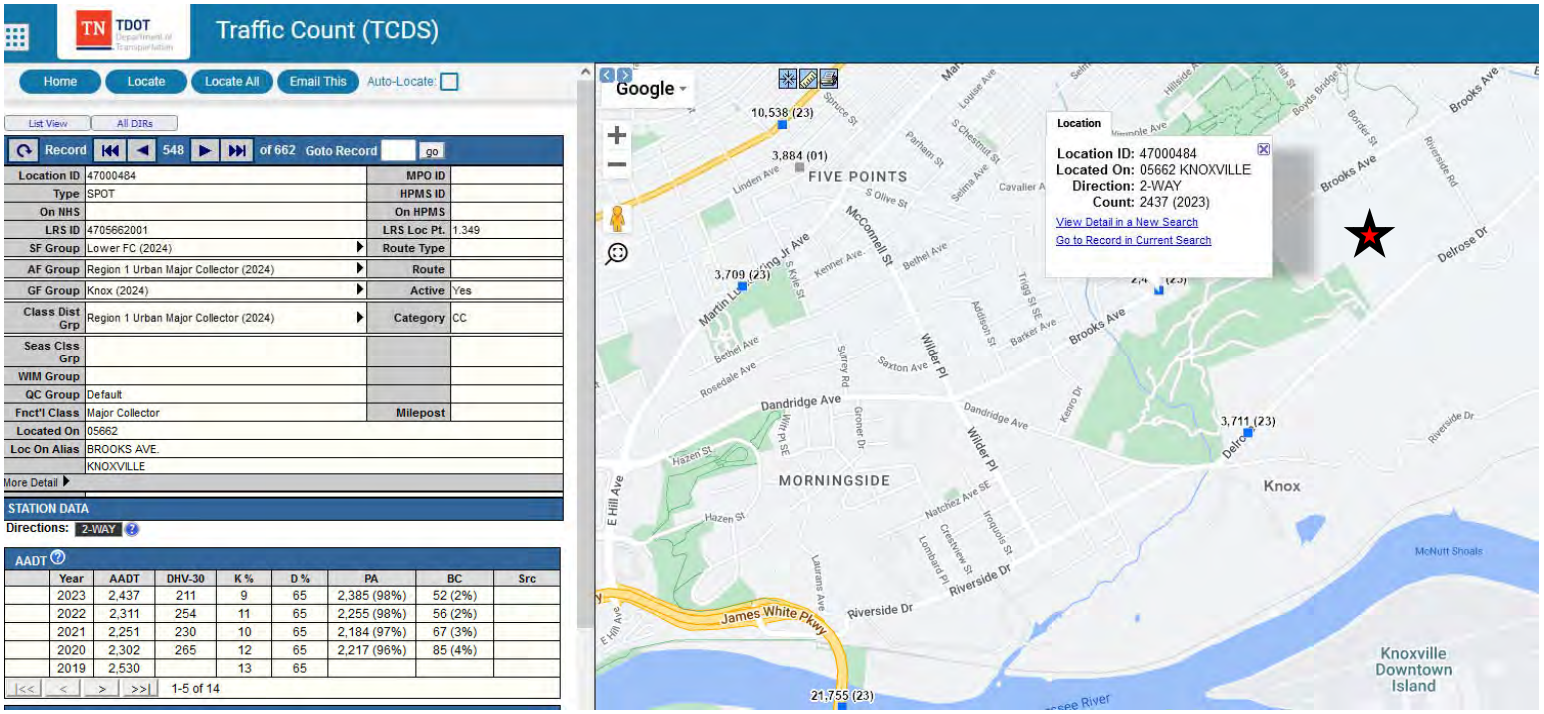
Organization: TDOT
Station ID #: 47000484
Location: Brooks Avenue, east of Wilder Place

YEAR	AADT
2013	2,289
2014	2,147
2015	2,327
2016	2,256
2017	2,370
2018	1,837
2019	2,530
2020	2,302
2021	2,251
2022	2,311
2023	2,437

Trendline



2013 - 2023 Growth Rate = 6.5%
Average Annual Growth Rate = 0.6%

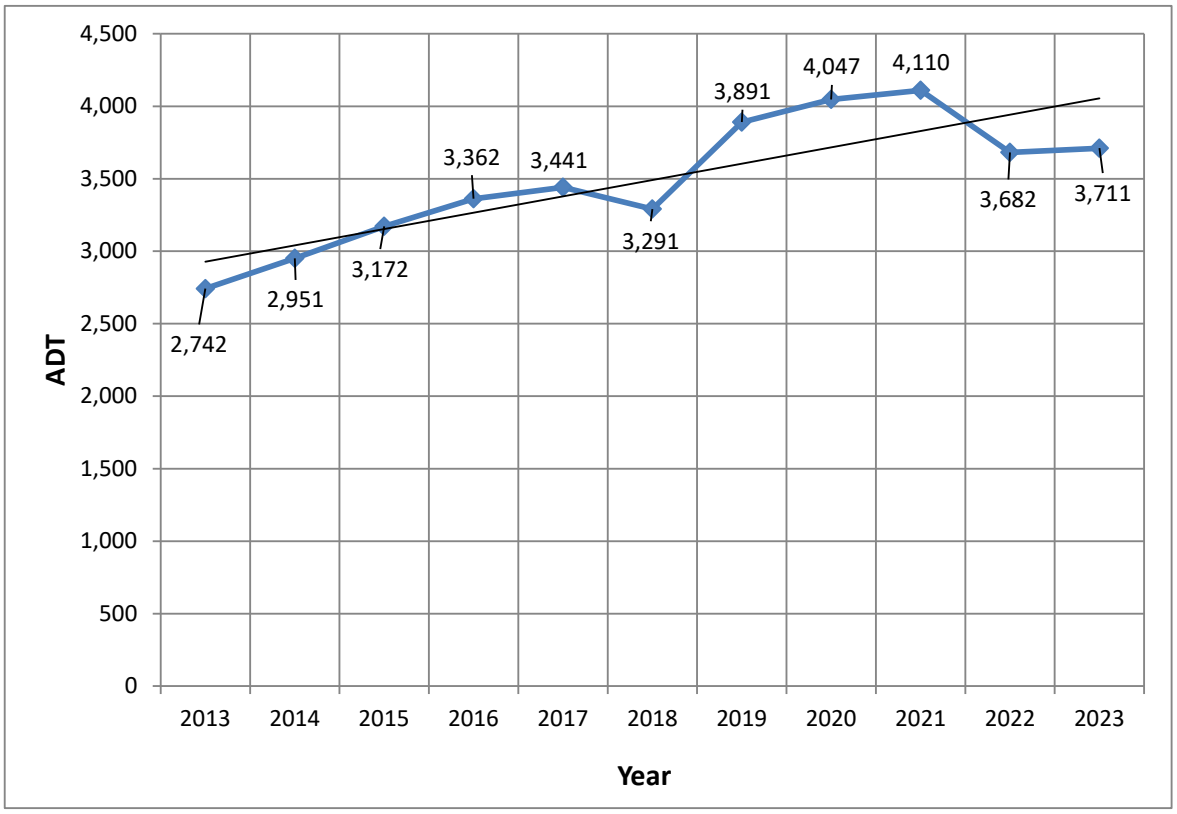

TN TDOT
Traffic Count (TCDS)
Home
Locate
Locate All
Email This
Auto-Locate:
List View
All DIRs
Record 548 of 662 Goto Record go
Location ID 47000484
Type SPOT
On NHS
LRS ID 4705662001
SF Group Lower FC (2024)
AF Group Region 1 Urban Major Collector (2024)
GF Group Knox (2024)
Class Dist Grp Region 1 Urban Major Collector (2024)
Seas Clss Grp
WIM Group
QC Group Default
Fnct'l Class Major Collector
Located On 05662
Loc On Alias BROOKS AVE.
KNOXVILLE
More Detail
MPO ID
HPMS ID
On HPMS
LRS Loc Pt. 1.349
Route Type
Route
Active Yes
Category CC
Milepost
STATION DATA
Directions: 2-WAY
AADT
Year AADT DHV-30 K % D % PA BC Src
2023 2,437 211 9 65 2,385 (98%) 52 (2%)
2022 2,311 254 11 65 2,255 (98%) 56 (2%)
2021 2,251 230 10 65 2,184 (97%) 67 (3%)
2020 2,302 265 12 65 2,217 (96%) 85 (4%)
2019 2,530 13 65
1-5 of 14
Google
Location
Location ID: 47000484
Located On: 05662 KNOXVILLE
Direction: 2-WAY
Count: 2437 (2023)
View Detail in a New Search
Go to Record in Current Search
10,538 (23)
3,884 (01)
3,709 (23)
3,711 (23)
21,755 (23)
FIVE POINTS
MORNINGSIDE
Knox
Knoxville Downtown Island
McNutt Shoals
Brooks Ave
Dandridge Ave
Riverside Dr
James White Pkwy
Wilder Pl
McConnell St
Delrose Dr
E Hill Ave
Hazen St
Bethel Ave

Historical Traffic Counts

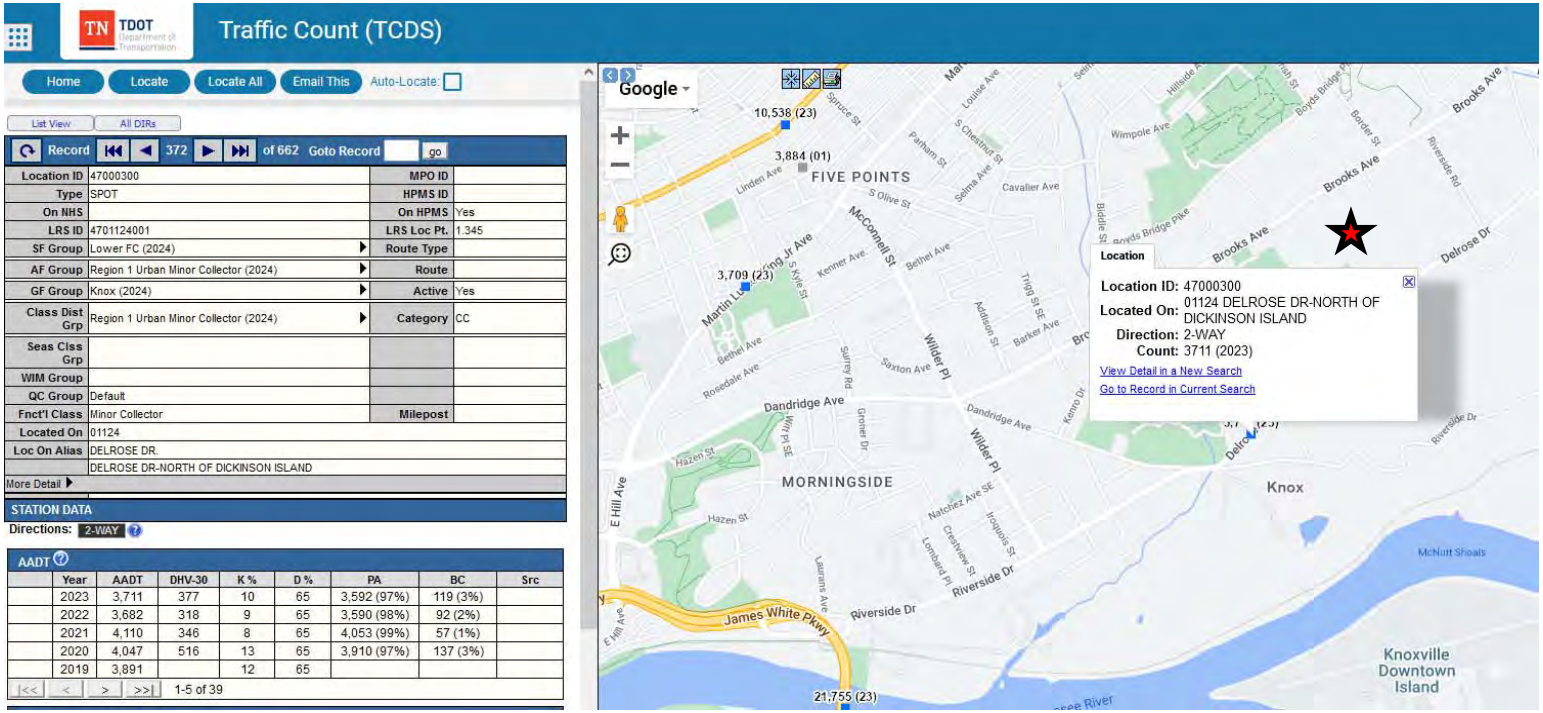
Organization: TDOT
Station ID #: 47000300
Location: Delrose Drive, east of Riverside Drive

YEAR	AADT
2013	2,742
2014	2,951
2015	3,172
2016	3,362
2017	3,441
2018	3,291
2019	3,891
2020	4,047
2021	4,110
2022	3,682
2023	3,711

Trendline



2013 - 2023 Growth Rate = 35.3%
Average Annual Growth Rate = 3.1%


TN TDOT
Traffic Count (TCDS)
Home
Locate
Locate All
Email This
Auto-Locate:
List View
All DIRs
Record 372 of 662 Goto Record go
Location ID 47000300
Type SPOT
On NHS
LRS ID 4701124001
SF Group Lower FC (2024)
AF Group Region 1 Urban Minor Collector (2024)
GF Group Knox (2024)
Class Dist Grp Region 1 Urban Minor Collector (2024)
Seas Clss Grp
WIM Group
QC Group Default
Fnct'l Class Minor Collector
Located On 01124
Loc On Alias DELROSE DR.
DELROSE DR-NORTH OF DICKINSON ISLAND
More Detail
MPO ID
HPMS ID
On HPMS Yes
LRS Loc Pt. 1.345
Route Type
Route
Active Yes
Category CC
Milepost
STATION DATA
Directions: 2-WAY
AADT
Year AADT DHV-30 K % D % PA BC Src
2023 3,711 377 10 65 3,592 (97%) 119 (3%)
2022 3,682 318 9 65 3,590 (98%) 92 (2%)
2021 4,110 346 8 65 4,053 (99%) 57 (1%)
2020 4,047 516 13 65 3,910 (97%) 137 (3%)
2019 3,891 12 65
1-5 of 39
Google
10,538 (23)
3,884 (01)
FIVE POINTS
3,709 (23)
MORNINGSIDE
Knox
21,755 (23)
Knoxville Downtown Island
McNutt Shoals
James White Pkwy
Riverside Dr
Dandridge Ave
Brooks Ave
Delrose Dr
Location
Location ID: 47000300
Located On: 01124 DELROSE DR-NORTH OF DICKINSON ISLAND
Direction: 2-WAY
Count: 3711 (2023)
View Detail in a New Search
Go to Record in Current Search

APPENDIX B

KNOXVILLE AREA TRANSIT MAP AND INFORMATION

Rider Tools and Tips

Fare Information

Fare Type	Regular Fare	Discounted Fare
1-Ride pass	$1.00	$.50
1-Day pass	$2.00	$1.00
20-Ride pass	$15.00	$7.50
30-Day Pass	$30.00	$15.00

Discounted fare for seniors 65+, Medicare cardholders, and persons with disabilities. KAT ID or Medicare card required.

Children 4 and under ride free.

Knox County School Students also ride free with the Youth Freedom Pass.

To learn more about our fares, the Youth Freedom Pass, and how to buy tickets, visit katbus.com.

Riding Tips

- Plan your trip using this map, the free Transit app, or our homepage trip planner on katbus.com.
- Always arrive at your bus stop 5 minutes early.
- When you see your bus coming, wave to the operator so they know you want to board.
- Have your fare ready when the bus arrives.
- When nearing your destination, pull the cord next to the windows to alert the operator that you want to get off at the next stop.
- View our Passenger Ride Guide at katbus.com.

KAT Holidays

KAT Services do not operate on the following holidays: New Year's Day, Independence Day, Thanksgiving & Christmas.

KAT buses run on a Sunday schedule on the following holidays: Martin Luther King, Jr. Day, Memorial Day, Juneteenth, Labor Day, day after Thanksgiving, day before Christmas.

KAT's administrative offices are closed on all of the holidays listed above.

Go paperless!

PLAN your trip, PAY your fare, and SCAN your ticket, all in our FREE official app:

transit

Scan QR code to download Transit

App Store Google Play

Herramientas y consejos para los pasajeros

Información sobre tarifas

Tipo de tarifa	Tarifa regular	Tarifa con descuento
Pase de 1 viaje	$1.00	$.50
Pase de 1 día	$2.00	$1.00
Pase de 20 viajes	$15.00	$7.50
Pase de 30 días	$30.00	$15.00

Tarifa descontada para mayores de 65 años, personas con tarjeta de Medicare y personas con discapacidades. Se necesita el ID de KAT o tarjeta de Medicare.

Los niños menores de 4 años viajan gratis.

Los estudiantes de las escuelas públicas del Condado de Knox también viajan gratis con el pase Youth Freedom Pass.

Visite katbus.com para averiguar más sobre nuestras tarifas, el pase para jóvenes y para comprar boletos.

Consejos para viajar

- Planifique su trayecto con este mapa, la aplicación gratuita Transit o el planificador en katbus.com.
- Siempre llegue a la parada del autobús 5 minutos antes.
- Cuando vea que llega el autobús, haga una seña al operador para que sepa que quiere subir.
- Tenga su pago listo cuando llega el autobús.
- Cuando se acerque a su destino, jale del cordón cercano a la ventana para alertar al operador de que quiere bajarse en la siguiente parada.
- Repase nuestra Guía del Pasajero en katbus.com.

Los servicios de KAT no funcionan en los siguientes días feriados: Año Nuevo, Día de la Independencia, Acción de Gracias y Navidad.

Los autobuses de KAT siguen los horarios de los domingos en los siguientes feriados: día de Martin Luther King Jr., Día de los Caídos (Memorial Day), Juneteenth, Día del Trabajador, día después del Día de Acción de Gracias, día antes de Navidad.

Las oficinas de KAT estarán cerradas en todos esos días feriados.

¡Haga todo sin papel!

PLANIFIQUE su viaje, PAGUE la tarifa y ESCANEE su boleto, todo en Transit, ¡nuestra aplicación oficial gratuita! La aplicación se configura en el mismo idioma de su teléfono. Escanee el código QR para descargar Transit.

Accesibilidad

Todos los autobuses de KAT van equipados con un elevador. También existe servicio de paratránsito para quienes cualifiquen. Para más información, visite katbus.com o llame a KAT al 865-637-3000.

32 Dandridge Avenue

(Weekdays & Weekends)

Información en español en el interior

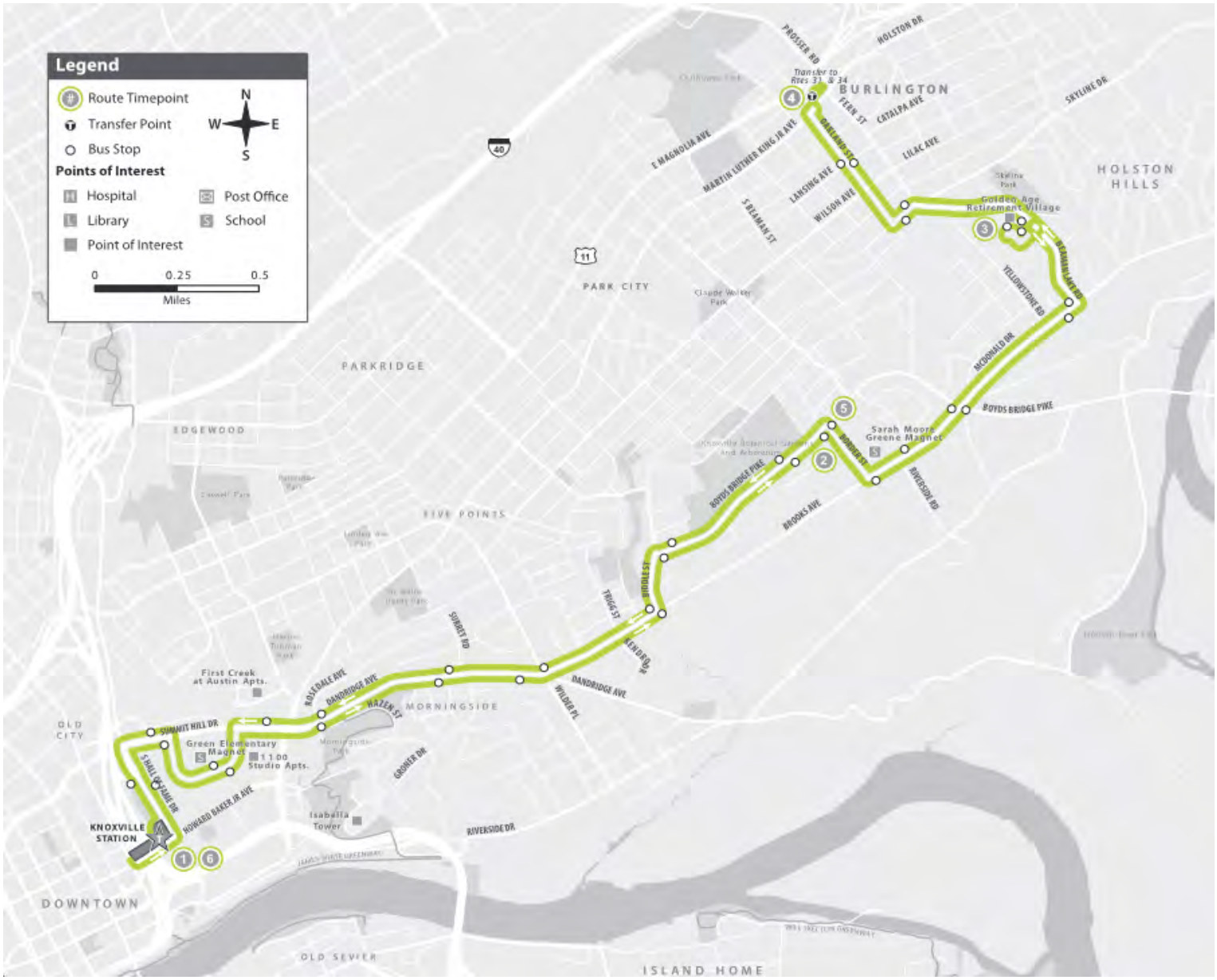
Serves/ Servir:

- 1100 Studio Apartments
- Alex Haley Heritage Square Statue
- Beck Cultural Exchange Center
- Brooks Rd
- Golden Age Retirement Village
- Green Magnet Academy
- Knoxville Botanical Garden
- Knoxville Station/ Downtown
- Mabry-Hazen House
- Sarah Moore Greene Magnet School

KAT Reimagined

Effective Date: August 26, 2024

kat KNOXVILLE AREA TRANSIT


Legend
Route Timepoint
Transfer Point
Bus Stop
Points of Interest
Hospital
Library
Point of Interest
Post Office
School
0
0.25
0.5
Miles
N
W
E
S
Transfer to Routes 31 & 34
BURLINGTON
HOLSTON HILLS
PARK CITY
PARKRIDGE
EDGEWOOD
FIVE POINTS
MORNINGSIDE
OLD CITY
DOWNTOWN
OLD SEVIER
ISLAND HOME
PROSSER RD
HOLSTON DR
SKYLINE DR
FERN ST
CATALPA AVE
LILAC AVE
E MAGNOLIA AVE
MARTIN LUTHER KING JR AVE
OAKLAND ST
LARSING AVE
WILSON AVE
S BEAMAN ST
Golden Age Retirement Village
BONNIELAKE RD
YELLOWSTONE RD
MCDONALD DR
BOYDS BRIDGE PIKE
Sarah Moore Greene Magnet
RIVERSIDE RD
BROOKS AVE
SUTHERLAND AVE
TRIGG ST
KENESAW AVE
DANDRIDGE AVE
WILDER PL
SUMMIT HILL DR
ROSEDALE AVE
HAZEN ST
First Creek at Austin Apts.
Green Elementary Magnet
1100 Studio Apts.
GROMER DR
SMALLMAN PARK DR
HOWARD BAKER JR AVE
KNOXVILLE STATION
Isabella Tower
RIVERSIDE DR
SUMMER PL
1
2
3
4
5
6

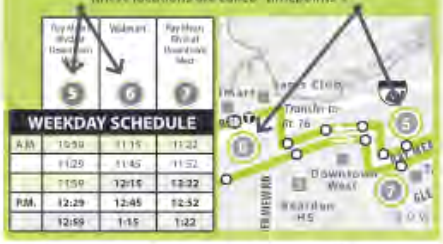
Route 32: Dandridge Avenue

How to Read this Schedule

SATURDAY					
Going away from downtown			*Going toward downtown*		
Knoxville Station Bay I	**Boyds Bridge Pike EB and Border St**	**Golden Age Retirement Village**	**Kirkwood St Superstop WB Arrival**	**Border St NB and Boyds Bridge Pike**	**Knoxville Station Bay I**
			Transfer to Rts. 31 & 34		
1	2	3	4	5	6
			6:43 AM	6:55 AM	7:10 AM
7:15 AM	7:23 AM	7:32 AM	7:43 AM	7:55 AM	8:10 AM
8:15 AM	8:23 AM	8:32 AM	8:43 AM	8:55 AM	9:10 AM
9:15 AM	9:23 AM	9:32 AM	9:43 AM	9:55 AM	10:10 AM
10:15 AM	10:23 AM	10:32 AM	10:43 AM	10:55 AM	11:10 AM
11:15 AM	11:23 AM	11:32 AM	11:43 AM	11:55 AM	12:10 PM
12:15 PM	12:23 PM	12:32 PM	12:43 PM	12:55 PM	1:10 PM
1:15 PM	1:23 PM	1:32 PM	1:43 PM	1:55 PM	2:10 PM
2:15 PM	2:23 PM	2:32 PM	2:43 PM	2:55 PM	3:10 PM
3:15 PM	3:23 PM	3:32 PM	3:43 PM	3:55 PM	4:10 PM
4:15 PM	4:23 PM	4:32 PM	4:43 PM	4:55 PM	5:10 PM
5:15 PM	5:23 PM	5:32 PM	5:43 PM	5:55 PM	6:10 PM
6:15 PM	6:23 PM	6:32 PM	6:43 PM	6:55 PM	7:10 PM
7:15 PM	7:23 PM	7:32 PM	7:43 PM	7:55 PM	8:10 PM
8:15 PM	8:23 PM	8:32 PM	8:38 PM		

SUNDAY					
8:15 AM	8:23 AM	8:32 AM	8:43 AM	8:55 AM	9:10 AM
9:15 AM	9:23 AM	9:32 AM	9:43 AM	9:55 AM	10:10 AM
10:15 AM	10:23 AM	10:32 AM	10:43 AM	10:55 AM	11:10 AM
11:15 AM	11:23 AM	11:32 AM	11:43 AM	11:55 AM	12:10 PM
12:15 PM	12:23 PM	12:32 PM	12:43 PM	12:55 PM	1:10 PM
1:15 PM	1:23 PM	1:32 PM	1:43 PM	1:55 PM	2:10 PM
2:15 PM	2:23 PM	2:32 PM	2:43 PM	2:55 PM	3:10 PM
3:15 PM	3:23 PM	3:32 PM	3:43 PM	3:55 PM	4:10 PM
4:15 PM	4:23 PM	4:32 PM	4:43 PM	4:55 PM	5:10 PM
5:15 PM	5:23 PM	5:32 PM	5:43 PM	5:55 PM	6:10 PM
6:15 PM	6:23 PM	6:32 PM	6:43 PM	6:55 PM	7:10 PM
7:15 PM	7:23 PM	7:32 PM	7:43 PM	7:55 PM	8:10 PM
8:15 PM	8:23 PM	8:32 PM	8:38 PM		

*To determine when the bus serves a location, **match the numbers on the timetable to the numbers on the map** (these locations are called "timepoints").*



To determine when the bus serves a stop in between timepoints, look at when it is due at the timepoint before your stop and the timepoint after your stop, and you can estimate when it will arrive. Always be at your stop 5 minutes early!

T SS These symbols indicate transfer points or Superstops, which are specific stops where you can transfer to a different route. Routes serving a transfer point or Superstop are indicated at the top of the times schedule, just above the name of the stop.

Cómo leer este horario

Conecte el número dentro del círculo en el mapa con la columna del horario con el mismo número para ver cuándo el bus para en ese lugar (esos lugares se llaman "timepoints").

Para determinar cuándo un bus atiende una parada entre timepoints, mire a qué hora debería llegar al timepoint antes de su parada y el timepoint después de su parada, y podrá estimar la hora de llegada. ¡Siempre llegue a su parada con 5 minutos de antelación!

T SS Estos símbolos indican puntos de trasbordo Superstops que son paradas específicas donde puedes trasbordar a una ruta diferente. Las rutas que atienden un punto de trasbordo o Superstop están indicadas en la parte superior del horario, justo encima del nombre de la parada.

ACCESSIBILITY
All KAT buses are lift-equipped. Paratransit service is also available to those who qualify. For more information, visit katbus.com or call 865-637-3000.

Bike racks are available on all KAT buses. Bikes ride free.

FREE Wi-Fi All buses have FREE Wi-Fi.

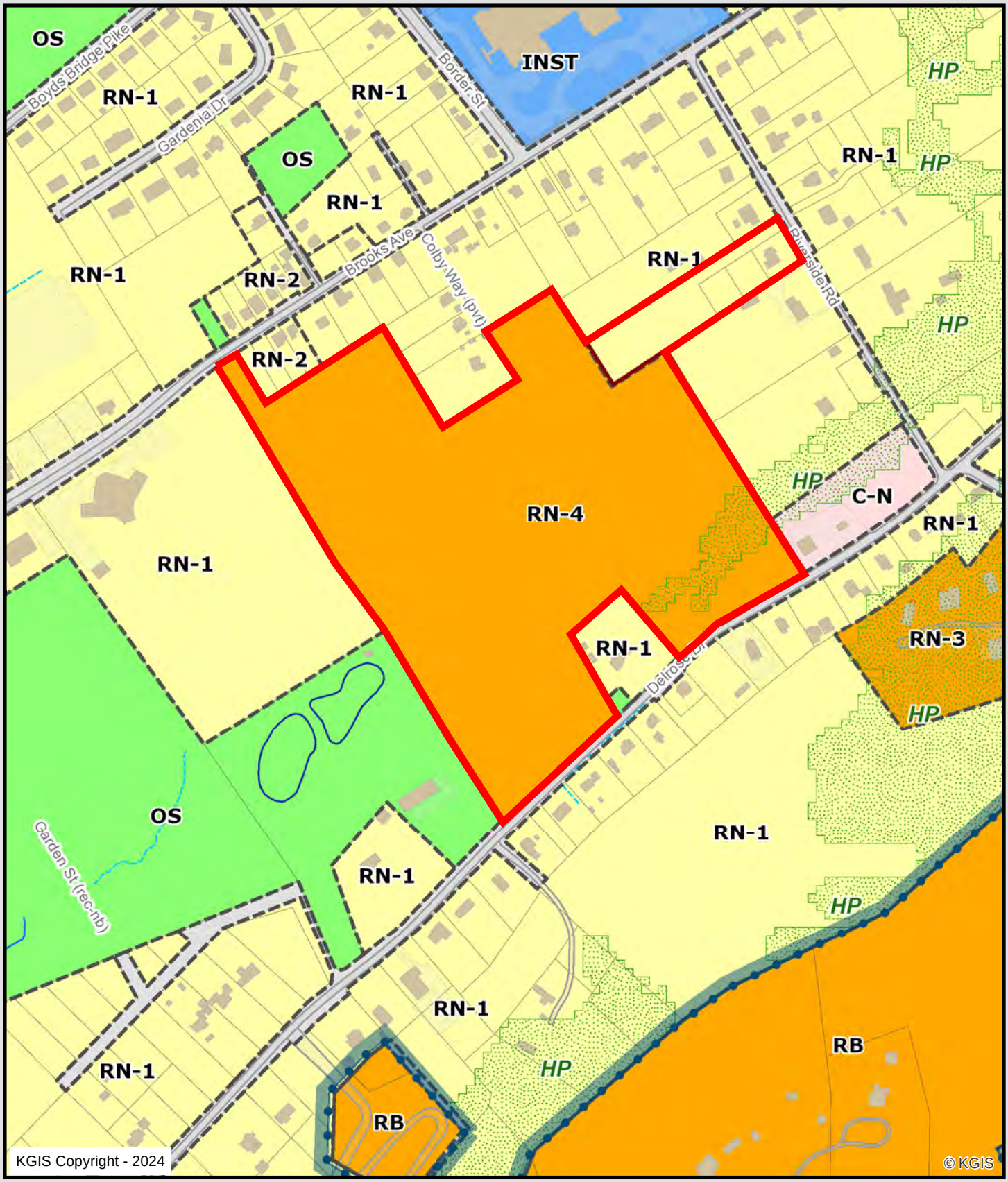
katbus.com • Customer Service: 865-637-3000

Route 32: Dandridge Avenue

WEEKDAY					
Going away from downtown			*Going toward downtown*		
Knoxville Station Bay I	**Boyds Bridge Pike EB and Border St**	**Golden Age Retirement Village**	**Kirkwood St Superstop WB Arrival**	**Border St NB and Boyds Bridge Pike**	**Knoxville Station Bay I**
			Transfer to Rts. 31 & 34		
1	2	3	4	5	6
			5:43 AM	5:55 AM	6:10 AM
6:15 AM	6:23 AM	6:32 AM	6:43 AM	6:55 AM	7:10 AM
7:15 AM	7:23 AM	7:32 AM	7:43 AM	7:55 AM	8:10 AM
8:15 AM	8:23 AM	8:32 AM	8:43 AM	8:55 AM	9:10 AM
9:15 AM	9:23 AM	9:32 AM	9:43 AM	9:55 AM	10:10 AM
10:15 AM	10:23 AM	10:32 AM	10:43 AM	10:55 AM	11:10 AM
11:15 AM	11:23 AM	11:32 AM	11:43 AM	11:55 AM	**12:10 PM**
12:15 PM	**12:23 PM**	**12:32 PM**	**12:43 PM**	**12:55 PM**	**1:10 PM**
1:15 PM	**1:23 PM**	**1:32 PM**	**1:43 PM**	**1:55 PM**	**2:10 PM**
2:15 PM	**2:23 PM**	**2:32 PM**	**2:43 PM**	**2:55 PM**	**3:10 PM**
3:15 PM	**3:23 PM**	**3:32 PM**	**3:43 PM**	**3:55 PM**	**4:10 PM**
4:15 PM	**4:23 PM**	**4:32 PM**	**4:43 PM**	**4:55 PM**	**5:10 PM**
5:15 PM	**5:23 PM**	**5:32 PM**	**5:43 PM**	**5:55 PM**	**6:10 PM**
6:15 PM	**6:23 PM**	**6:32 PM**	**6:43 PM**	**6:55 PM**	**7:10 PM**
7:15 PM	**7:23 PM**	**7:32 PM**	**7:43 PM**	**7:55 PM**	**8:10 PM**
8:15 PM	**8:23 PM**	**8:32 PM**	**8:38 PM**		

APPENDIX C

ZONING MAP



Zoning Map

10.10.24

Knoxville - Knox County - KUB Geographic Information System

Printed: 10/10/2024 at 4:45:45 PM

0 200 400 800

ft

APPENDIX D

MANUAL TRAFFIC COUNT DATA

TRAFFIC COUNT DATA

Major Street: Brooks Avenue (WB) and Dandridge Avenue (EB)
Minor Street: Wilder Place (SB and NB) and Dandridge Avenue (NWB)
Traffic Control: All-Way Stop Control

10/3/2024 (Thursday)
Morning: Fog / Afternoon: Mostly Sunny
Conducted by: Ajax Engineering

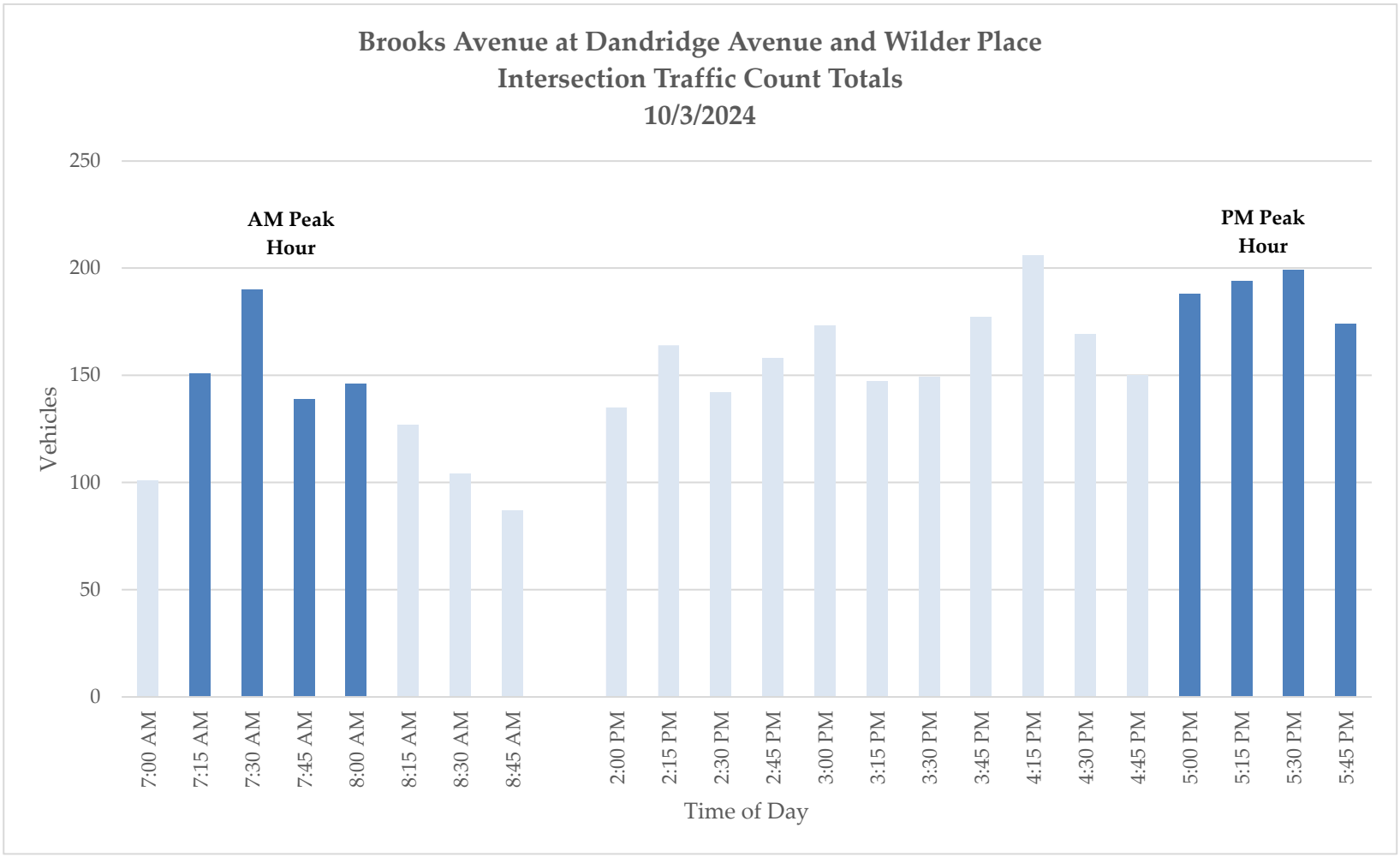
	Wilder Place				Brooks Avenue				Wilder Place				Dandridge Avenue				Dandridge Avenue					
TIME	SOUTHBOUND				WESTBOUND				NORTHBOUND				EASTBOUND				NORTHWESTBOUND				VEHICLE	PEAK
BEGIN	LT	LT-THRU	THRU	RT	LT-LT	LT	THRU	RT	LT	THRU	RT	RT-RT	LT	THRU	THRU-RT	RT	LT	THRU	THRU-RT	RT	TOTAL	HOUR
7:00 AM	2	0	6	6	0	8	16	2	1	5	3	2	5	35	4	1	1	3	1	0	101	
7:15 AM	6	0	2	12	0	12	50	4	3	5	6	1	5	33	1	0	2	8	1	0	151	**7:15 AM - 8:15 AM**
7:30 AM	2	1	11	14	0	18	47	2	5	12	11	0	2	35	5	3	3	18	1	0	190	
7:45 AM	4	0	6	6	0	11	51	3	0	9	2	0	3	27	5	4	2	6	0	0	139	
8:00 AM	5	3	10	5	0	9	44	1	5	8	8	2	6	17	7	2	1	10	3	0	146	
8:15 AM	4	1	7	2	0	7	48	0	2	5	4	0	11	17	8	1	2	8	0	0	127	
8:30 AM	3	1	8	12	0	5	29	2	1	2	3	2	4	16	3	2	4	7	0	0	104	
8:45 AM	1	0	3	5	0	10	28	2	0	6	1	1	2	18	2	1	1	5	1	0	87	
TOTAL	27	6	53	62	0	80	313	16	17	52	38	8	38	198	35	14	16	65	7	0	1045	
2:00 PM	5	1	11	9	0	8	20	4	6	8	9	5	4	23	6	5	0	10	1	0	135	
2:15 PM	6	1	17	6	0	20	19	9	4	13	6	4	4	31	7	1	3	9	4	0	164	
2:30 PM	3	3	13	3	0	9	30	1	4	10	12	4	5	26	4	6	5	3	1	0	142	
2:45 PM	9	3	12	2	0	10	24	8	1	11	15	4	5	30	9	4	2	7	2	0	158	
3:00 PM	1	0	12	11	0	10	41	5	4	11	13	2	10	30	10	6	2	4	1	0	173	
3:15 PM	6	1	8	2	0	13	27	4	3	10	14	4	5	29	5	4	4	7	1	0	147	
3:30 PM	4	0	12	6	0	11	25	4	5	12	7	1	7	34	5	8	0	6	2	0	149	
3:45 PM	12	0	19	9	0	14	26	6	2	11	17	4	9	25	8	7	3	3	2	0	177	
4:00 PM	2	3	20	12	0	15	24	1	1	15	4	2	12	34	10	1	2	3	4	0	165	
4:15 PM	5	2	8	10	1	15	48	10	2	14	10	3	7	50	7	2	3	5	3	1	206	
4:30 PM	4	1	15	6	0	10	35	4	2	9	8	3	1	42	14	3	2	5	5	0	169	
4:45 PM	4	3	14	6	0	4	31	4	2	6	6	3	9	38	9	5	3	2	1	0	150	
5:00 PM	5	0	23	9	0	13	34	3	4	15	10	2	8	33	6	9	0	10	3	1	188	**5:00 PM - 6:00 PM**
5:15 PM	2	3	14	3	0	17	29	6	1	10	15	10	6	57	10	3	3	4	1	0	194	
5:30 PM	8	1	14	5	0	13	30	6	4	14	15	5	8	46	9	2	3	12	3	1	199	
5:45 PM	7	3	14	7	0	18	34	3	3	12	14	2	5	31	8	5	2	3	3	0	174	
TOTAL	83	25	226	106	1	200	477	78	48	181	175	58	105	559	127	71	37	93	37	3	2690	

2024 AM Peak Hour **7:15 AM - 8:15 AM**

	Wilder Place				Brooks Avenue				Wilder Place				Dandridge Avenue				Dandridge Avenue			
TIME	SOUTHBOUND				WESTBOUND				NORTHBOUND				EASTBOUND				NORTHWESTBOUND			
BEGIN	LT	LT-THRU	THRU	RT	LT-LT	LT	THRU	RT	LT	THRU	RT	RT-RT	LT	THRU	THRU-RT	RT	LT	THRU	THRU-RT	RT
7:15 AM	6	0	2	12	0	12	50	4	3	5	6	1	5	33	1	0	2	8	1	0
7:30 AM	2	1	11	14	0	18	47	2	5	12	11	0	2	35	5	3	3	18	1	0
7:45 AM	4	0	6	6	0	11	51	3	0	9	2	0	3	27	5	4	2	6	0	0
8:00 AM	5	3	10	5	0	9	44	1	5	8	8	2	6	17	7	2	1	10	3	0
TOTAL	**17**	**4**	**29**	**37**	**0**	**50**	**192**	**10**	**13**	**34**	**27**	**3**	**16**	**112**	**18**	**9**	**8**	**42**	**5**	**0**
TRUCK %	**5.9%**	**0.0%**	**0.0%**	**2.7%**	**0.0%**	**0.0%**	**0.5%**	**0.0%**	**0.0%**	**2.9%**	**0.0%**	**0.0%**	**0.0%**	**2.7%**	**5.5%**	**0.0%**	**0.0%**	**0.0%**	**4.8%**	**0.0%**
PHF $_{mvmt}$	**0.71**	**0.33**	**0.66**	**0.66**	**-**	**0.69**	**0.94**	**0.63**	**0.65**	**0.71**	**0.61**	**0.38**	**0.67**	**0.80**	**0.64**	**0.56**	**0.67**	**0.58**	**0.42**	**-**
PHF $_{app}$	**0.78**				**0.94**				**0.69**				**0.86**				**0.63**			
PHF $_{int}$	**0.82**																			

2024 PM Peak Hour **5:00 PM - 6:00 PM**

	Wilder Place				Brooks Avenue				Wilder Place				Dandridge Avenue				Dandridge Avenue			
TIME	SOUTHBOUND				WESTBOUND				NORTHBOUND				EASTBOUND				NORTHWESTBOUND			
BEGIN	LT	LT-THRU	THRU	RT	LT-LT	LT	THRU	RT	LT	THRU	RT	RT-RT	LT	THRU	THRU-RT	RT	LT	THRU	THRU-RT	RT
5:00 PM	5	0	23	9	0	13	34	3	4	15	10	2	8	33	6	9	0	10	3	1
5:15 PM	2	3	14	3	0	17	29	6	1	10	15	10	6	57	10	3	3	4	1	0
5:30 PM	8	1	14	5	0	13	30	6	4	14	15	5	8	46	9	2	3	12	3	1
5:45 PM	7	3	14	7	0	18	34	3	3	12	14	2	5	31	8	5	2	3	3	0
TOTAL	**22**	**7**	**65**	**24**	**0**	**61**	**127**	**18**	**12**	**51**	**54**	**19**	**27**	**167**	**33**	**19**	**8**	**29**	**10**	**2**
TRUCK %	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.8%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.6%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**
PHF $_{mvmt}$	**0.69**	**0.58**	**0.71**	**0.67**	**-**	**0.85**	**0.93**	**0.75**	**0.75**	**0.85**	**0.90**	**0.48**	**0.84**	**0.73**	**0.83**	**0.53**	**0.67**	**0.60**	**0.83**	**0.50**
PHF $_{app}$	**0.80**				**0.94**				**0.89**				**0.81**				**0.64**			
PHF $_{int}$	**0.95**																			


Brooks Avenue at Dandridge Avenue and Wilder Place
Intersection Traffic Count Totals
10/3/2024
AM Peak Hour
PM Peak Hour
Vehicles
250
200
150
100
50
0
7:00 AM
7:15 AM
7:30 AM
7:45 AM
8:00 AM
8:15 AM
8:30 AM
8:45 AM
2:00 PM
2:15 PM
2:30 PM
2:45 PM
3:00 PM
3:15 PM
3:30 PM
3:45 PM
4:15 PM
4:30 PM
4:45 PM
5:00 PM
5:15 PM
5:30 PM
5:45 PM
Time of Day

TRAFFIC COUNT DATA

Major Street: Brooks Avenue (EB and WB)
Minor Street: Riverside Road (NB)
Traffic Control: Stop Sign on Minor Street

10/3/2024 (Thursday)
Morning: Fog / Afternoon: Mostly Sunny
Conducted by: Ajax Engineering

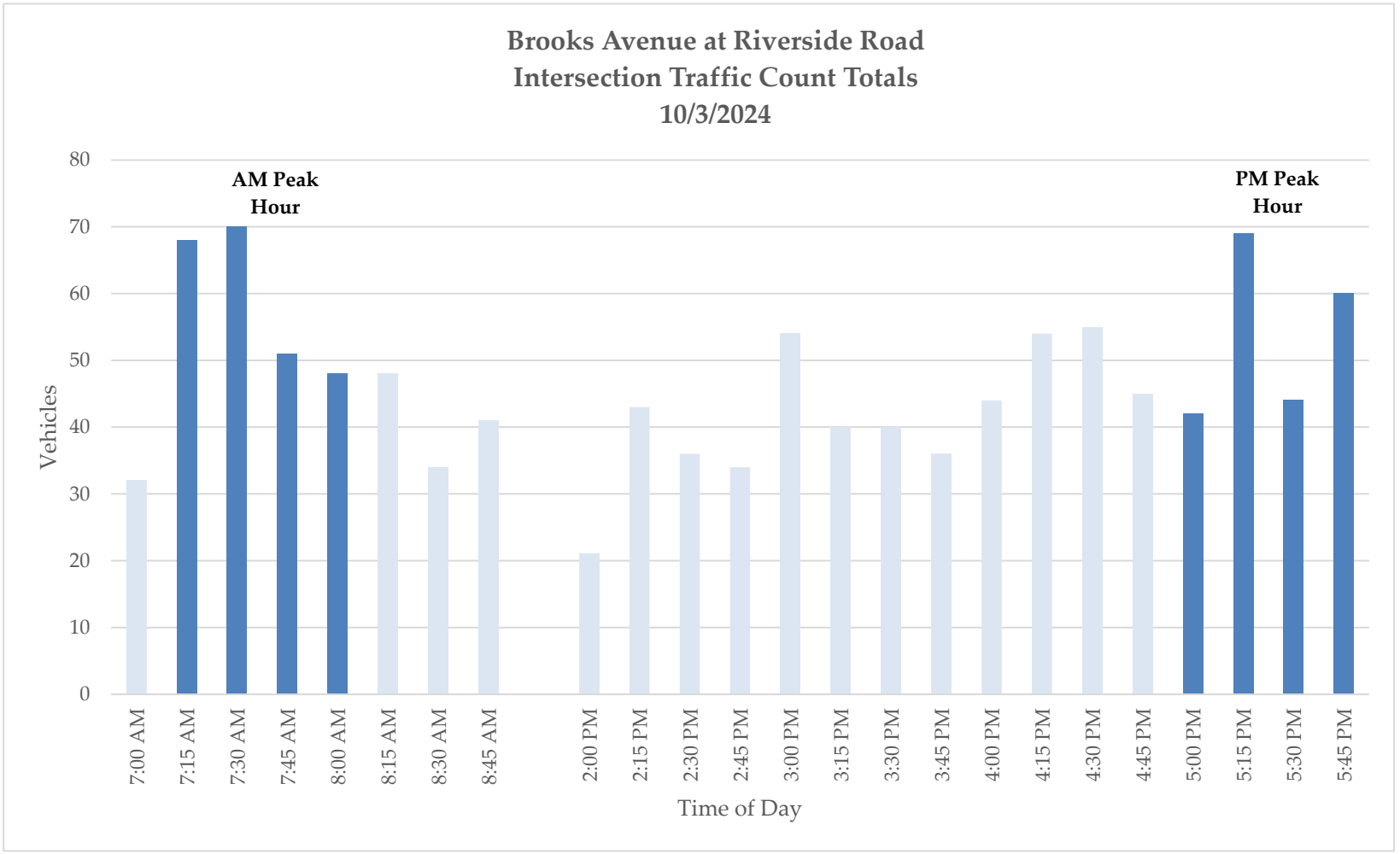
	Brooks Avenue		Riverside Road		Brooks Avenue			
TIME	WESTBOUND		NORTHBOUND		EASTBOUND		VEHICLE	PEAK
BEGIN	LT	THRU	LT	RT	THRU	RT	TOTAL	HOUR
7:00 AM	3	19	1	0	9	0	32	
7:15 AM	6	42	2	1	14	3	68	**7:15 AM - 8:15 AM**
7:30 AM	8	38	3	2	16	3	70	
7:45 AM	3	26	4	2	15	1	51	
8:00 AM	9	23	0	2	14	0	48	
8:15 AM	2	28	2	5	10	1	48	
8:30 AM	4	17	0	1	12	0	34	
8:45 AM	3	20	0	1	16	1	41	
TOTAL	38	213	12	14	106	9	392	
2:00 PM	0	12	0	1	8	0	21	
2:15 PM	3	16	0	3	20	1	43	
2:30 PM	4	11	2	3	14	2	36	
2:45 PM	2	15	3	1	11	2	34	
3:00 PM	1	28	1	3	15	6	54	
3:15 PM	3	11	2	5	15	4	40	
3:30 PM	4	14	1	2	18	1	40	
3:45 PM	2	15	2	5	10	2	36	
4:00 PM	1	20	2	5	15	1	44	
4:15 PM	3	15	0	6	27	3	54	
4:30 PM	2	15	4	1	31	2	55	
4:45 PM	5	13	2	3	18	4	45	
5:00 PM	4	13	2	2	19	2	42	**5:00 PM - 6:00 PM**
5:15 PM	1	23	3	6	33	3	69	
5:30 PM	6	12	1	0	21	4	44	
5:45 PM	4	20	2	6	25	3	60	
TOTAL	45	253	27	52	300	40	717	

2024 AM Peak Hour **7:15 AM - 8:15 AM**

	Brooks Avenue		Riverside Road		Brooks Avenue	
TIME	WESTBOUND		NORTHBOUND		EASTBOUND	
BEGIN	LT	THRU	LT	RT	THRU	RT
7:15 AM	6	42	2	1	14	3
7:30 AM	8	38	3	2	16	3
7:45 AM	3	26	4	2	15	1
8:00 AM	9	23	0	2	14	0
TOTAL	**26**	**129**	**9**	**7**	**59**	**7**
PHF	**0.72**	**0.77**	**0.56**	**0.88**	**0.92**	**0.58**
Truck %	**0.0%**	**0.8%**	**0.0%**	**14.3%**	**6.8%**	**0.0%**

2024 PM Peak Hour **5:00 PM - 6:00 PM**

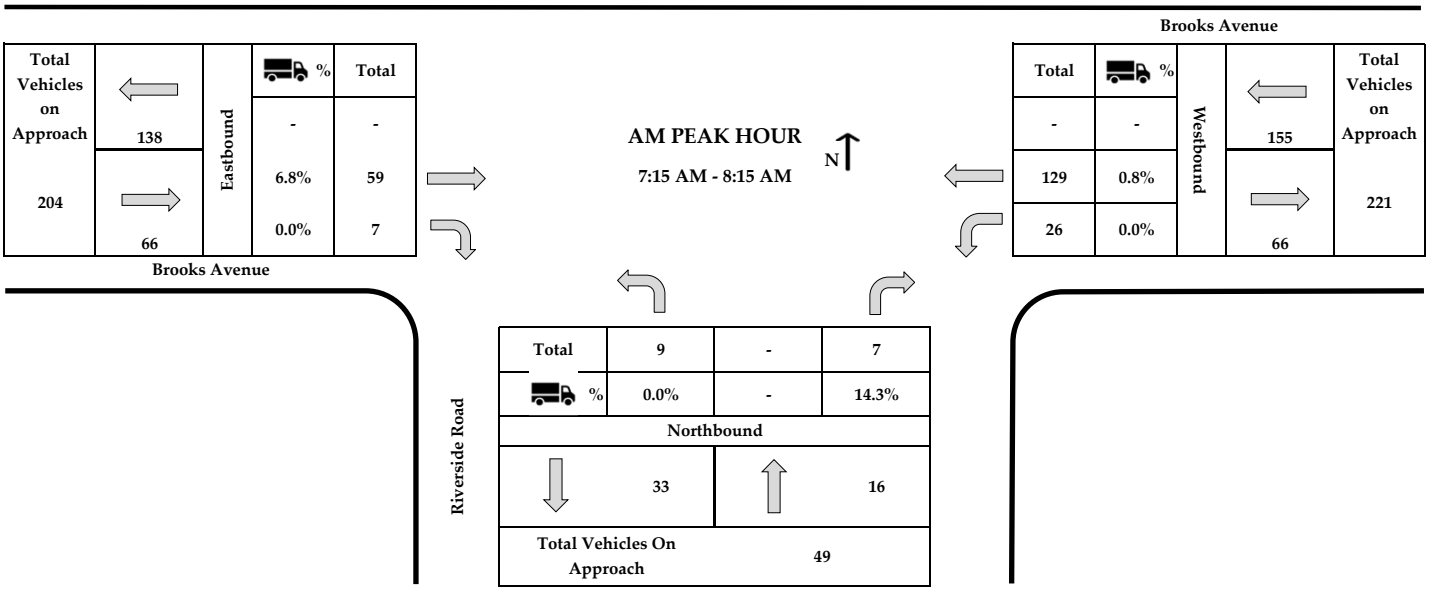
	Brooks Avenue		Riverside Road		Brooks Avenue	
TIME	WESTBOUND		NORTHBOUND		EASTBOUND	
BEGIN	LT	THRU	LT	RT	THRU	RT
5:00 PM	4	13	2	2	19	2
5:15 PM	1	23	3	6	33	3
5:30 PM	6	12	1	0	21	4
5:45 PM	4	20	2	6	25	3
TOTAL	**15**	**68**	**8**	**14**	**98**	**12**
PHF	**0.63**	**0.74**	**0.67**	**0.58**	**0.74**	**0.75**
Truck %	**0.0%**	**1.5%**	**0.0%**	**0.0%**	**1.0%**	**0.0%**

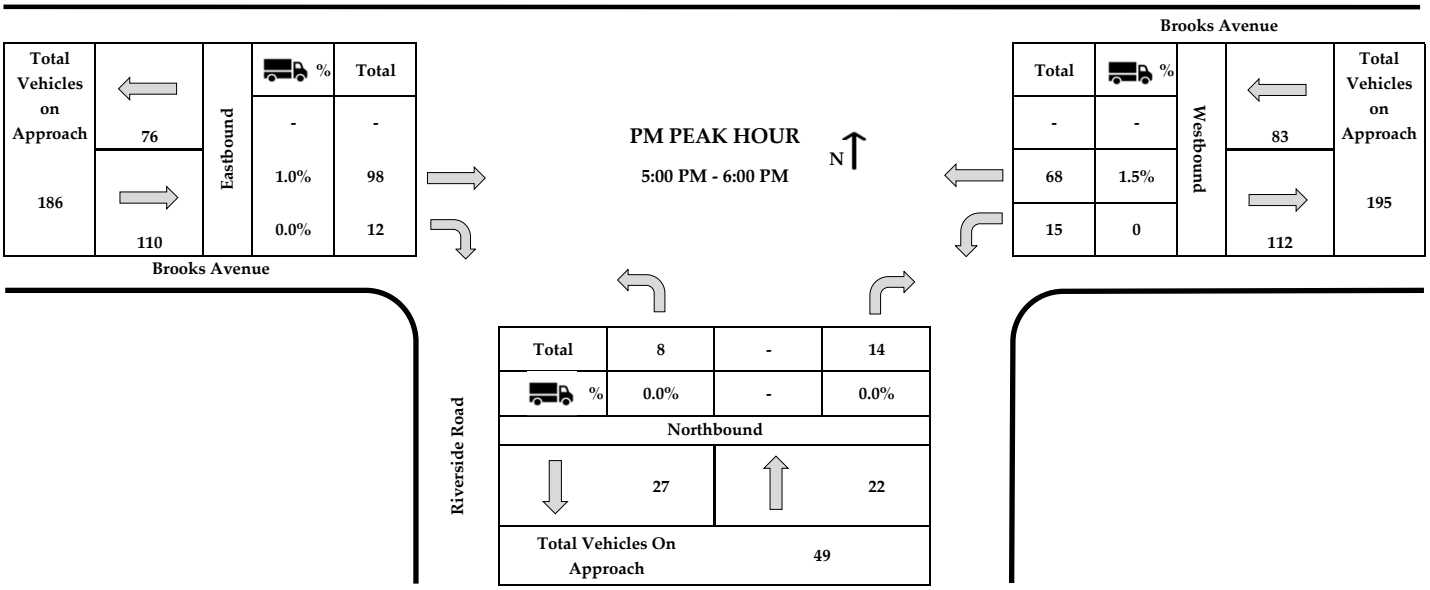

Brooks Avenue at Riverside Road
Intersection Traffic Count Totals
10/3/2024
AM Peak Hour
PM Peak Hour
Vehicles
80
70
60
50
40
30
20
10
0
7:00 AM
7:15 AM
7:30 AM
7:45 AM
8:00 AM
8:15 AM
8:30 AM
8:45 AM
2:00 PM
2:15 PM
2:30 PM
2:45 PM
3:00 PM
3:15 PM
3:30 PM
3:45 PM
4:00 PM
4:15 PM
4:30 PM
4:45 PM
5:00 PM
5:15 PM
5:30 PM
5:45 PM
Time of Day

PEAK HOUR DATA

Major Street: Brooks Avenue (EB and WB)
Minor Street: Riverside Road (NB)
Traffic Control: Stop Sign on Minor Street

10/3/2024 (Thursday)
Morning: Fog / Afternoon: Mostly Sunny
Conducted by: Ajax Engineering





TRAFFIC COUNT DATA

Major Street: Delrose Drive (WB and EB)
Minor Street: Riverside Road (SB)
Traffic Control: Stop Conditions on Minor Street

10/3/2024 (Thursday)
Morning: Fog / Afternoon: Mostly Sunny
Conducted by: Ajax Engineering

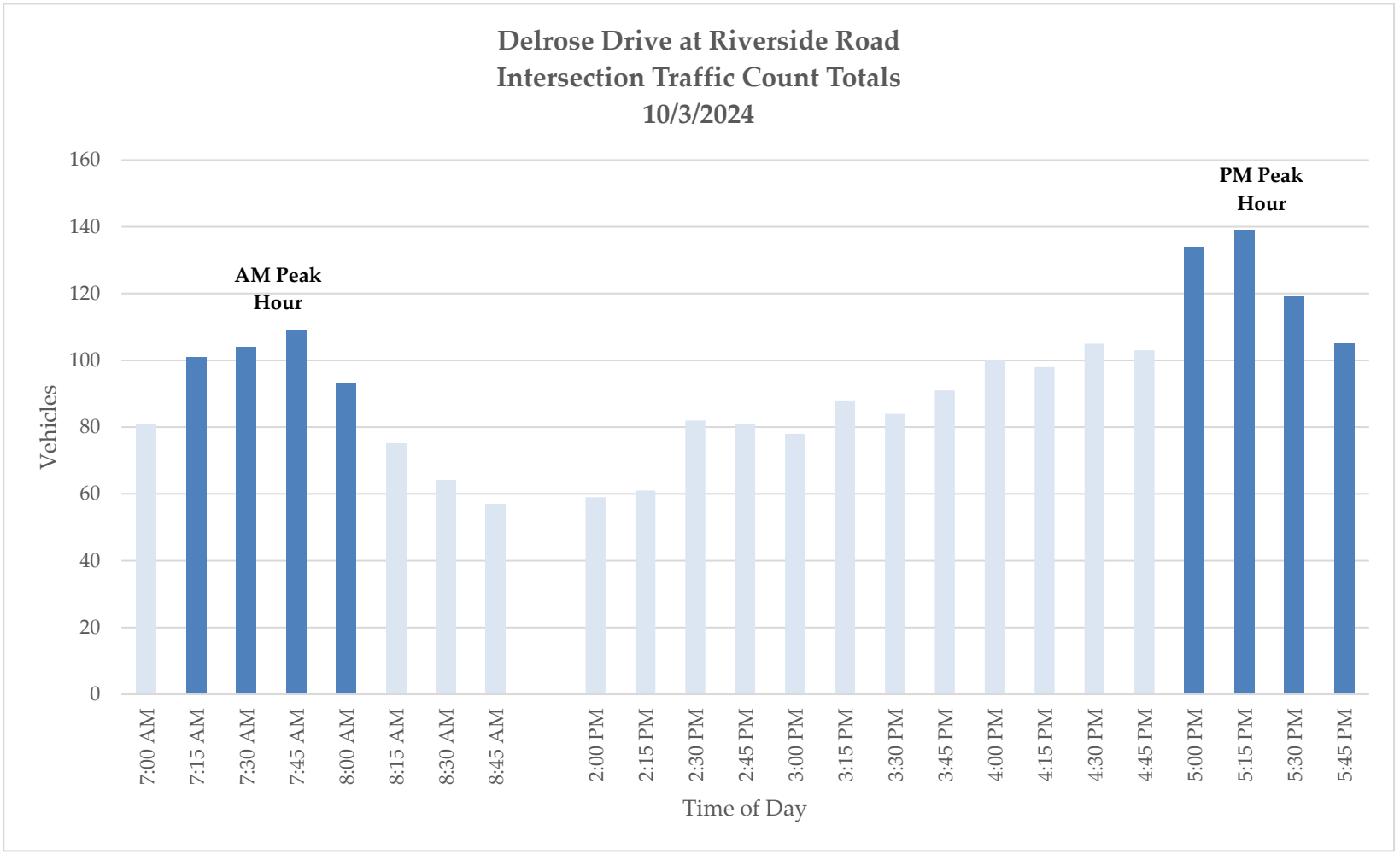
	Riverside Road		Delrose Drive		Delrose Drive			
TIME	SOUTHBOUND		WESTBOUND		EASTBOUND		VEHICLE	PEAK
BEGIN	LT	RT	THRU	RT	LT	THRU	TOTAL	HOUR
7:00 AM	0	4	53	0	0	24	81	
7:15 AM	0	10	67	0	2	22	101	**7:15 AM - 8:15 AM**
7:30 AM	1	10	62	3	3	25	104	
7:45 AM	1	3	73	1	4	27	109	
8:00 AM	0	8	56	1	0	28	93	
8:15 AM	0	3	41	1	6	24	75	
8:30 AM	0	5	44	0	1	14	64	
8:45 AM	0	4	32	0	1	20	57	
TOTAL	2	47	428	6	17	184	684	
2:00 PM	0	0	35	0	0	24	59	
2:15 PM	0	4	28	2	1	26	61	
2:30 PM	1	4	37	0	4	36	82	
2:45 PM	1	3	45	0	3	29	81	
3:00 PM	1	3	34	1	3	36	78	
3:15 PM	1	5	29	1	4	48	88	
3:30 PM	1	4	38	1	2	38	84	
3:45 PM	0	4	22	0	8	57	91	
4:00 PM	1	2	33	0	6	58	100	
4:15 PM	0	5	39	0	6	48	98	
4:30 PM	1	4	48	1	4	47	105	
4:45 PM	1	8	32	1	5	56	103	
5:00 PM	0	6	42	0	4	82	134	**5:00 PM - 6:00 PM**
5:15 PM	1	1	57	1	5	74	139	
5:30 PM	0	8	46	0	1	64	119	
5:45 PM	0	6	43	0	8	48	105	
TOTAL	9	67	608	8	64	771	1527	

2024 AM Peak Hour **7:15 AM - 8:15 AM**

	Riverside Road		Delrose Drive		Delrose Drive	
TIME	SOUTHBOUND		WESTBOUND		EASTBOUND	
BEGIN	LT	RT	THRU	RT	LT	THRU
7:15 AM	0	10	67	0	2	22
7:30 AM	1	10	62	3	3	25
7:45 AM	1	3	73	1	4	27
8:00 AM	0	8	56	1	0	28
TOTAL	**2**	**31**	**258**	**5**	**9**	**102**
PHF	**0.50**	**0.78**	**0.88**	**0.42**	**0.56**	**0.91**
TRUCK %	**0.0%**	**0.0%**	**5.4%**	**0.0%**	**11.1%**	**2.9%**

2024 PM Peak Hour **5:00 PM - 6:00 PM**

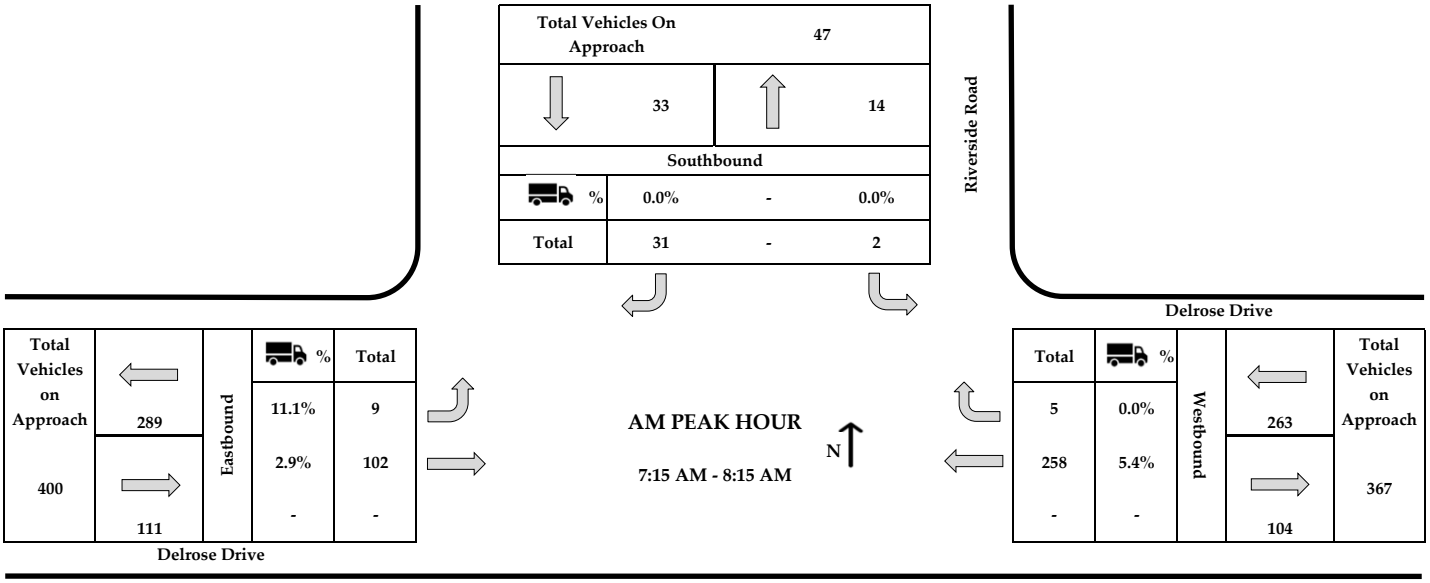
	Riverside Road		Delrose Drive		Delrose Drive	
TIME	SOUTHBOUND		WESTBOUND		EASTBOUND	
BEGIN	LT	RT	THRU	RT	LT	THRU
5:00 PM	0	6	42	0	4	82
5:15 PM	1	1	57	1	5	74
5:30 PM	0	8	46	0	1	64
5:45 PM	0	6	43	0	8	48
TOTAL	**1**	**21**	**188**	**1**	**18**	**268**
PHF	**0.25**	**0.66**	**0.82**	**0.25**	**0.56**	**0.82**
TRUCK %	**0.0%**	**0.0%**	**0.5%**	**0.0%**	**0.0%**	**0.4%**

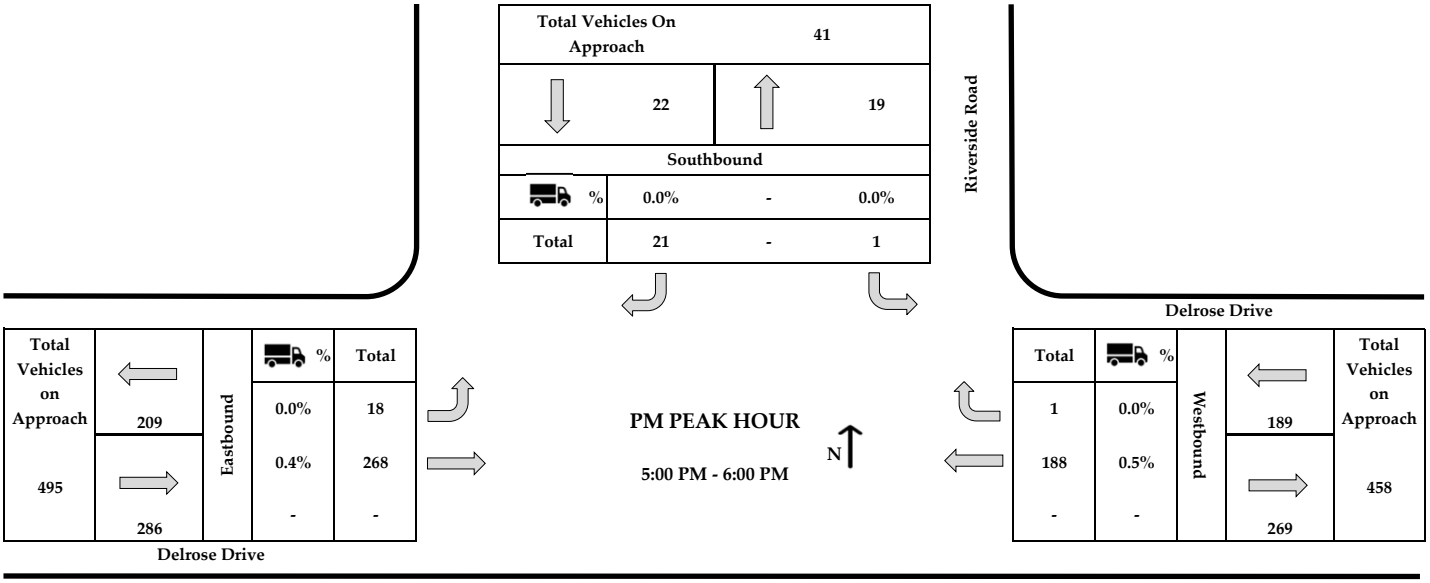

Delrose Drive at Riverside Road
Intersection Traffic Count Totals
10/3/2024
160
140
120
100
80
60
40
20
0
Vehicles
AM Peak Hour
PM Peak Hour
7:00 AM
7:15 AM
7:30 AM
7:45 AM
8:00 AM
8:15 AM
8:30 AM
8:45 AM
2:00 PM
2:15 PM
2:30 PM
2:45 PM
3:00 PM
3:15 PM
3:30 PM
3:45 PM
4:00 PM
4:15 PM
4:30 PM
4:45 PM
5:00 PM
5:15 PM
5:30 PM
5:45 PM
Time of Day

PEAK HOUR DATA

Major Street: Delrose Drive (WB and EB)
Minor Street: Riverside Road (SB)
Traffic Control: Stop Conditions on Minor Street

10/3/2024 (Thursday)
Morning: Fog / Afternoon: Mostly Sunny
Conducted by: Ajax Engineering





TRAFFIC COUNT DATA

Major Street: Delrose Drive (WB) and Riverside Drive (EB)
Minor Street: Riverside Drive & Vulcan Materials Driveway (NWB)
Traffic Control: Stop Sign on Minor Street

10/3/2024 (Thursday)
Morning: Fog / Afternoon: Mostly Sunny
Conducted by: Ajax Engineering

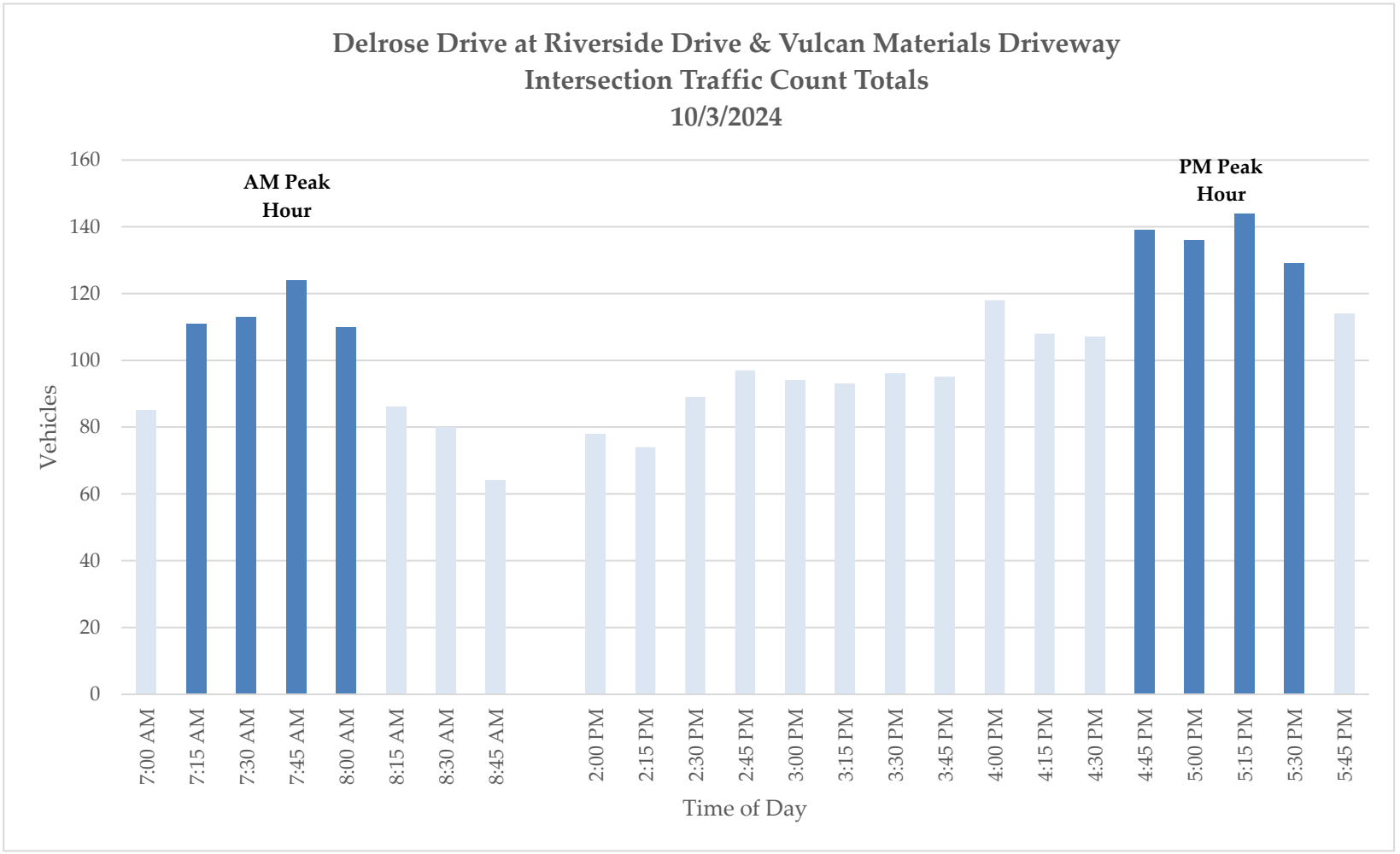
	Delrose Drive		Riverside Drive & Vulcan Materials Driveway		Riverside Drive			
TIME	WESTBOUND		NORTHWESTBOUND		EASTBOUND		VEHICLE	PEAK
BEGIN	LT	THRU	LT	RT	THRU	RT	TOTAL	HOUR
7:00 AM	0	49	6	0	23	7	85	
7:15 AM	0	79	5	0	25	2	111	**7:15 AM - 8:15 AM**
7:30 AM	0	69	9	0	29	6	113	
7:45 AM	1	82	9	0	29	3	124	
8:00 AM	0	64	12	0	29	5	110	
8:15 AM	0	50	6	1	25	4	86	
8:30 AM	0	55	5	0	15	5	80	
8:45 AM	0	35	5	0	21	3	64	
TOTAL	1	483	57	1	196	35	773	
2:00 PM	0	34	7	0	28	9	78	
2:15 PM	1	35	7	0	26	5	74	
2:30 PM	0	35	7	0	43	4	89	
2:45 PM	0	47	9	1	36	4	97	
3:00 PM	0	45	6	1	34	8	94	
3:15 PM	1	29	6	1	48	8	93	
3:30 PM	0	38	7	1	48	2	96	
3:45 PM	1	26	7	0	57	4	95	
4:00 PM	0	36	6	0	65	11	118	
4:15 PM	1	44	4	3	50	6	108	
4:30 PM	0	46	6	0	52	3	107	
4:45 PM	0	45	14	1	66	13	139	**4:45 PM - 5:45 PM**
5:00 PM	0	45	5	0	85	1	136	
5:15 PM	0	61	7	0	72	4	144	
5:30 PM	0	52	6	3	63	5	129	
5:45 PM	0	47	6	1	55	5	114	
TOTAL	4	665	110	12	828	92	1711	

2024 AM Peak Hour **7:15 AM - 8:15 AM**

	Delrose Drive		Riverside Drive & Vulcan Materials Driveway		Riverside Drive	
TIME	WESTBOUND		NORTHWESTBOUND		EASTBOUND	
BEGIN	LT	THRU	LT	RT	THRU	RT
7:15 AM	0	79	5	0	25	2
7:30 AM	0	69	9	0	29	6
7:45 AM	1	82	9	0	29	3
8:00 AM	0	64	12	0	29	5
TOTAL	**1**	**294**	**35**	**0**	**112**	**16**
PHF	**0.25**	**0.90**	**0.73**	**-**	**0.97**	**0.67**
Truck %	**100.0%**	**5.4%**	**14.3%**	**0.0%**	**3.6%**	**18.8%**

2024 PM Peak Hour **4:45 PM - 5:45 PM**

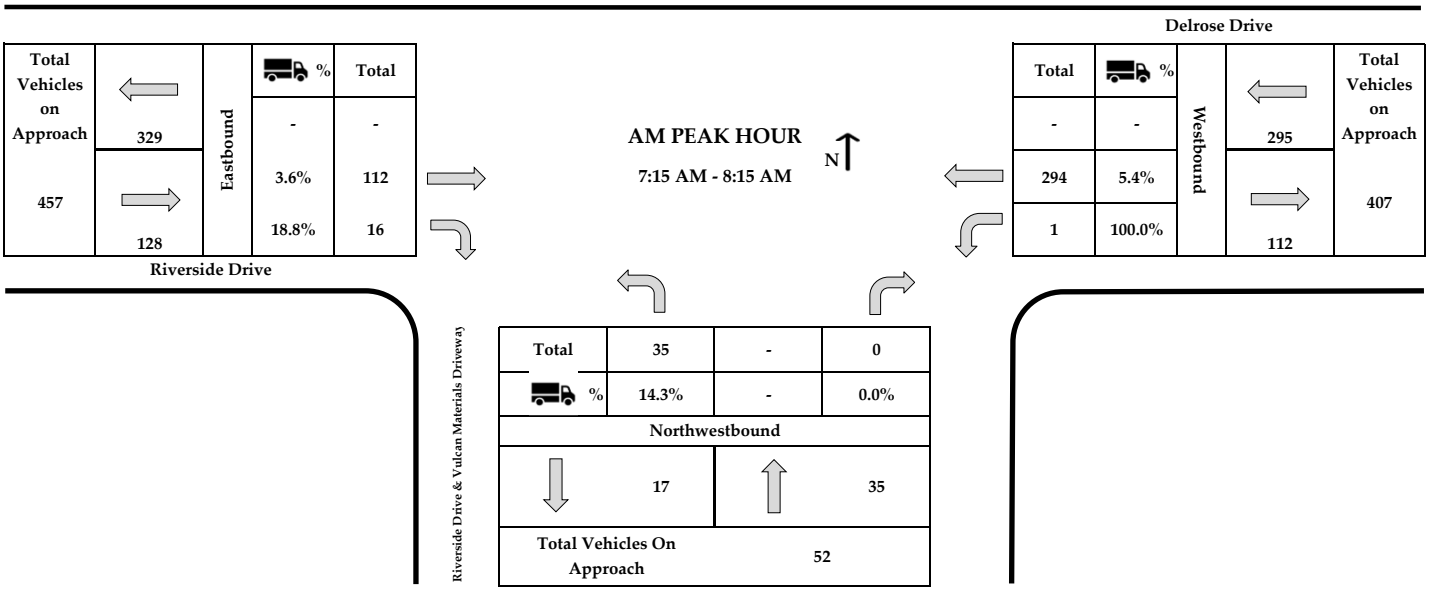
	Delrose Drive		Riverside Drive & Vulcan Materials Driveway		Riverside Drive	
TIME	WESTBOUND		NORTHWESTBOUND		EASTBOUND	
BEGIN	LT	THRU	LT	RT	THRU	RT
4:45 PM	0	45	14	1	66	13
5:00 PM	0	45	5	0	85	1
5:15 PM	0	61	7	0	72	4
5:30 PM	0	52	6	3	63	5
TOTAL	**0**	**203**	**32**	**4**	**286**	**23**
PHF	**-**	**0.83**	**0.57**	**0.33**	**0.84**	**0.44**
Truck %	**0.0%**	**1.0%**	**0.0%**	**0.0%**	**0.7%**	**0.0%**

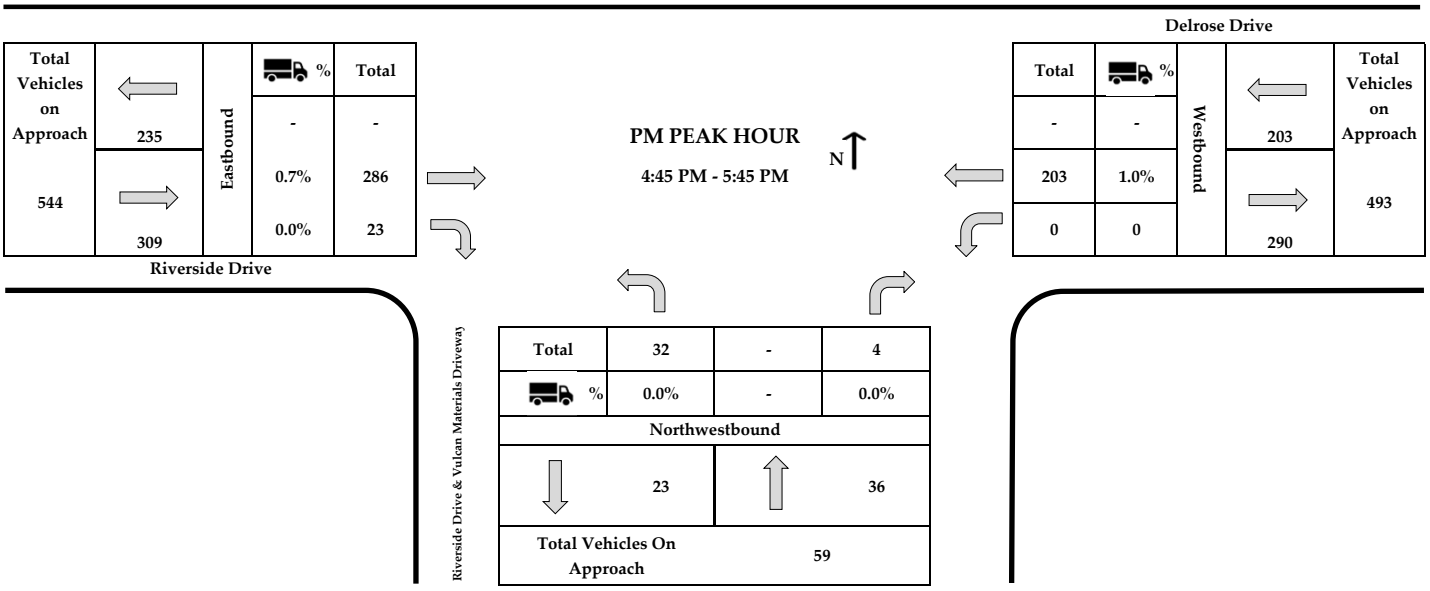

Delrose Drive at Riverside Drive & Vulcan Materials Driveway
Intersection Traffic Count Totals
10/3/2024
AM Peak Hour
PM Peak Hour
Vehicles
Time of Day
0
20
40
60
80
100
120
140
160
7:00 AM
7:15 AM
7:30 AM
7:45 AM
8:00 AM
8:15 AM
8:30 AM
8:45 AM
2:00 PM
2:15 PM
2:30 PM
2:45 PM
3:00 PM
3:15 PM
3:30 PM
3:45 PM
4:00 PM
4:15 PM
4:30 PM
4:45 PM
5:00 PM
5:15 PM
5:30 PM
5:45 PM

PEAK HOUR DATA

Major Street: Delrose Drive (WB) and Riverside Drive (EB)
Minor Street: Riverside Drive & Vulcan Materials Driveway (NWB)
Traffic Control: Stop Sign on Minor Street

10/3/2024 (Thursday)
Morning: Fog / Afternoon: Mostly Sunny
Conducted by: Ajax Engineering





APPENDIX E

CAPACITY ANALYSES – HCM WORKSHEETS (SYNCHRO AND SIMTRAFFIC 12)

EXISTING CONDITIONS

2: Wilder Place & Dandridge Avenue & Brooks Avenue Performance by lane

Lane	EB	WB	NB	SB	NW	All
Movements Served	LTR>	LTR	LTR>	<LTR	<LR	
Denied Del/Veh (s)						0.2
Total Del/Veh (s)	6.6	7.7	4.8	4.9	5.0	6.4

Intersection	
Int Delay, s/veh	1.2

Movement	EBT	EBR	WBL	WBT	NWL	NWR
Lane Configurations						
Traffic Vol, veh/h	112	16	1	294	35	0
Future Vol, veh/h	112	16	1	294	35	0
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	-	-	-2	-2	-
Peak Hour Factor	97	67	25	90	73	90
Heavy Vehicles, %	4	19	100	5	14	0
Mvmt Flow	115	24	4	327	48	0

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	139	0	462	127
Stage 1	-	-	-	-	127	-
Stage 2	-	-	-	-	335	-
Critical Hdwy	-	-	5.1	-	6.14	6
Critical Hdwy Stg 1	-	-	-	-	5.14	-
Critical Hdwy Stg 2	-	-	-	-	5.14	-
Follow-up Hdwy	-	-	3.1	-	3.626	3.3
Pot Cap-1 Maneuver	-	-	1012	-	565	935
Stage 1	-	-	-	-	882	-
Stage 2	-	-	-	-	725	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1012	-	562	935
Mov Cap-2 Maneuver	-	-	-	-	562	-
Stage 1	-	-	-	-	882	-
Stage 2	-	-	-	-	722	-

Approach	EB	WB	NW
HCM Control Delay, s/v	0	0.1	12
HCM LOS			B

Minor Lane/Major Mvmt	NWLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	562	-	-	22	-
HCM Lane V/C Ratio	0.085	-	-	0.004	-
HCM Control Delay (s/veh)	12	-	-	8.6	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.3	-	-	0	-

Intersection	
Int Delay, s/veh	1.2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	9	102	258	5	2	31
Future Vol, veh/h	9	102	258	5	2	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, %	-	3	3	-	-3	-
Peak Hour Factor	56	91	88	42	50	78
Heavy Vehicles, %	11	3	5	0	0	0
Mvmt Flow	16	112	293	12	4	40

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	305	0	-	0	443	299
Stage 1	-	-	-	-	299	-
Stage 2	-	-	-	-	144	-
Critical Hdwy	4.21	-	-	-	5.8	5.9
Critical Hdwy Stg 1	-	-	-	-	4.8	-
Critical Hdwy Stg 2	-	-	-	-	4.8	-
Follow-up Hdwy	2.299	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	1206	-	-	-	620	764
Stage 1	-	-	-	-	796	-
Stage 2	-	-	-	-	910	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1206	-	-	-	611	764
Mov Cap-2 Maneuver	-	-	-	-	611	-
Stage 1	-	-	-	-	784	-
Stage 2	-	-	-	-	910	-

Approach	EB	WB	SB
HCM Control Delay, s/v	1.01	0	10.12
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	226	-	-	-	747
HCM Lane V/C Ratio	0.013	-	-	-	0.059
HCM Control Delay (s/veh)	8	0	-	-	10.1
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.2

Intersection	
Int Delay, s/veh	1.7

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	59	7	26	129	9	7
Future Vol, veh/h	59	7	26	129	9	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, %	1	-	-	-1	-3	-
Peak Hour Factor	92	58	72	77	56	88
Heavy Vehicles, %	7	0	0	1	0	14
Mvmt Flow	64	12	36	168	16	8

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	76	0	310	70
Stage 1	-	-	-	-	70	-
Stage 2	-	-	-	-	240	-
Critical Hdwy	-	-	4.1	-	5.8	6.04
Critical Hdwy Stg 1	-	-	-	-	4.8	-
Critical Hdwy Stg 2	-	-	-	-	4.8	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.426
Pot Cap-1 Maneuver	-	-	1536	-	723	966
Stage 1	-	-	-	-	969	-
Stage 2	-	-	-	-	838	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1536	-	704	966
Mov Cap-2 Maneuver	-	-	-	-	704	-
Stage 1	-	-	-	-	969	-
Stage 2	-	-	-	-	816	-

Approach	EB	WB	NB
HCM Control Delay, s/v	0	1.31	9.8
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	774	-	-	319	-
HCM Lane V/C Ratio	0.031	-	-	0.024	-
HCM Control Delay (s/veh)	9.8	-	-	7.4	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.1	-	-	0.1	-

2: Wilder Place & Dandridge Avenue & Brooks Avenue Performance by lane

Lane	EB	WB	NB	SB	NW	All
Movements Served	LTR>	LTR	LTR>	<LTR	<LR>	
Denied Del/Veh (s)						0.2
Total Del/Veh (s)	8.0	7.6	5.7	6.3	5.4	7.0

Intersection	
Int Delay, s/veh	1.3

Movement	EBT	EBR	WBL	WBT	NWL	NWR
Lane Configurations						
Traffic Vol, veh/h	286	23	0	203	32	4
Future Vol, veh/h	286	23	0	203	32	4
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	-	-	-2	-2	-
Peak Hour Factor	84	44	90	83	57	33
Heavy Vehicles, %	1	0	0	1	0	0
Mvmt Flow	340	52	0	245	56	12

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	393	0	611	367
Stage 1	-	-	-	-	367	-
Stage 2	-	-	-	-	245	-
Critical Hdwy	-	-	4.1	-	6	6
Critical Hdwy Stg 1	-	-	-	-	5	-
Critical Hdwy Stg 2	-	-	-	-	5	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1177	-	493	697
Stage 1	-	-	-	-	735	-
Stage 2	-	-	-	-	823	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1177	-	493	697
Mov Cap-2 Maneuver	-	-	-	-	493	-
Stage 1	-	-	-	-	735	-
Stage 2	-	-	-	-	823	-

Approach	EB	WB	NW
HCM Control Delay, s/v	0	0	12.97
HCM LOS			B

Minor Lane/Major Mvmt	NWLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	520	-	-	1177	-
HCM Lane V/C Ratio	0.131	-	-	-	-
HCM Control Delay (s/veh)	13	-	-	0	-
HCM Lane LOS	B	-	-	A	-
HCM 95th %tile Q(veh)	0.5	-	-	0	-

Intersection	
Int Delay, s/veh	1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	18	268	188	1	1	21
Future Vol, veh/h	18	268	188	1	1	21
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, %	-	3	3	-	-3	-
Peak Hour Factor	56	82	82	25	25	66
Heavy Vehicles, %	0	0	1	0	0	0
Mvmt Flow	32	327	229	4	4	32

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	233	0	-	0	622	231
Stage 1	-	-	-	-	231	-
Stage 2	-	-	-	-	391	-
Critical Hdwy	4.1	-	-	-	5.8	5.9
Critical Hdwy Stg 1	-	-	-	-	4.8	-
Critical Hdwy Stg 2	-	-	-	-	4.8	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	1346	-	-	-	503	829
Stage 1	-	-	-	-	844	-
Stage 2	-	-	-	-	734	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1346	-	-	-	488	829
Mov Cap-2 Maneuver	-	-	-	-	488	-
Stage 1	-	-	-	-	819	-
Stage 2	-	-	-	-	734	-

Approach	EB	WB	SB
HCM Control Delay, s/v	0.69	0	9.91
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	161	-	-	-	769
HCM Lane V/C Ratio	0.024	-	-	-	0.047
HCM Control Delay (s/veh)	7.7	0	-	-	9.9
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0.1	-	-	-	0.1

Intersection	
Int Delay, s/veh	1.7

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	98	12	15	68	8	14
Future Vol, veh/h	98	12	15	68	8	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, %	1	-	-	-1	-3	-
Peak Hour Factor	74	75	63	74	67	58
Heavy Vehicles, %	1	0	0	2	0	0
Mvmt Flow	132	16	24	92	12	24

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	148	0	280	140
Stage 1	-	-	-	-	140	-
Stage 2	-	-	-	-	140	-
Critical Hdwy	-	-	4.1	-	5.8	5.9
Critical Hdwy Stg 1	-	-	-	-	4.8	-
Critical Hdwy Stg 2	-	-	-	-	4.8	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1445	-	748	924
Stage 1	-	-	-	-	912	-
Stage 2	-	-	-	-	913	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1445	-	735	924
Mov Cap-2 Maneuver	-	-	-	-	735	-
Stage 1	-	-	-	-	912	-
Stage 2	-	-	-	-	897	-

Approach	EB	WB	NB
HCM Control Delay, s/v	0	1.55	9.41
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	851	-	-	370	-
HCM Lane V/C Ratio	0.042	-	-	0.016	-
HCM Control Delay (s/veh)	9.4	-	-	7.5	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.1	-	-	0.1	-

PROJECTED CONDITIONS WITHOUT THE PROJECT

2: Wilder Place & Dandridge Avenue & Brooks Avenue Performance by lane

Lane	EB	WB	NB	SB	NW	All
Movements Served	LTR>	LTR	LTR>	<LTR	<LR	
Denied Del/Veh (s)						0.2
Total Del/Veh (s)	6.7	8.0	5.0	5.1	5.0	6.6

Intersection	
Int Delay, s/veh	1.2

Movement	EBT	EBR	WBL	WBT	NWL	NWR
Lane Configurations						
Traffic Vol, veh/h	122	17	1	320	38	0
Future Vol, veh/h	122	17	1	320	38	0
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	-	-	-2	-2	-
Peak Hour Factor	97	67	25	90	73	90
Heavy Vehicles, %	4	19	100	5	14	0
Mvmt Flow	126	25	4	356	52	0

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	151	0	502	138
Stage 1	-	-	-	-	138	-
Stage 2	-	-	-	-	364	-
Critical Hdwy	-	-	5.1	-	6.14	6
Critical Hdwy Stg 1	-	-	-	-	5.14	-
Critical Hdwy Stg 2	-	-	-	-	5.14	-
Follow-up Hdwy	-	-	3.1	-	3.626	3.3
Pot Cap-1 Maneuver	-	-	1000	-	537	922
Stage 1	-	-	-	-	873	-
Stage 2	-	-	-	-	706	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1000	-	535	922
Mov Cap-2 Maneuver	-	-	-	-	535	-
Stage 1	-	-	-	-	873	-
Stage 2	-	-	-	-	702	-

Approach	EB	WB	NW
HCM Control Delay, s/v	0	0.1	12.46
HCM LOS			B

Minor Lane/Major Mvmt	NWLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	535	-	-	20	-
HCM Lane V/C Ratio	0.097	-	-	0.004	-
HCM Control Delay (s/veh)	12.5	-	-	8.6	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.3	-	-	0	-

Intersection	
Int Delay, s/veh	1.2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	10	111	281	5	2	33
Future Vol, veh/h	10	111	281	5	2	33
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, %	-	3	3	-	-3	-
Peak Hour Factor	56	91	88	42	50	78
Heavy Vehicles, %	11	3	5	0	0	0
Mvmt Flow	18	122	319	12	4	42

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	331	0	-	0	483	325
Stage 1	-	-	-	-	325	-
Stage 2	-	-	-	-	158	-
Critical Hdwy	4.21	-	-	-	5.8	5.9
Critical Hdwy Stg 1	-	-	-	-	4.8	-
Critical Hdwy Stg 2	-	-	-	-	4.8	-
Follow-up Hdwy	2.299	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	1179	-	-	-	592	740
Stage 1	-	-	-	-	778	-
Stage 2	-	-	-	-	899	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1179	-	-	-	582	740
Mov Cap-2 Maneuver	-	-	-	-	582	-
Stage 1	-	-	-	-	765	-
Stage 2	-	-	-	-	899	-

Approach	EB	WB	SB
HCM Control Delay, s/v	1.03	0	10.32
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	230	-	-	-	723
HCM Lane V/C Ratio	0.015	-	-	-	0.064
HCM Control Delay (s/veh)	8.1	0	-	-	10.3
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.2

Intersection	
Int Delay, s/veh	1.7

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	63	7	28	137	10	7
Future Vol, veh/h	63	7	28	137	10	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, %	1	-	-	-1	-3	-
Peak Hour Factor	92	58	72	77	56	88
Heavy Vehicles, %	7	0	0	1	0	14
Mvmt Flow	68	12	39	178	18	8

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	81	0	330	75
Stage 1	-	-	-	-	75	-
Stage 2	-	-	-	-	256	-
Critical Hdwy	-	-	4.1	-	5.8	6.04
Critical Hdwy Stg 1	-	-	-	-	4.8	-
Critical Hdwy Stg 2	-	-	-	-	4.8	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.426
Pot Cap-1 Maneuver	-	-	1530	-	706	961
Stage 1	-	-	-	-	965	-
Stage 2	-	-	-	-	826	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1530	-	686	961
Mov Cap-2 Maneuver	-	-	-	-	686	-
Stage 1	-	-	-	-	965	-
Stage 2	-	-	-	-	803	-

Approach	EB	WB	NB
HCM Control Delay, s/v	0	1.33	9.95
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	753	-	-	323	-
HCM Lane V/C Ratio	0.034	-	-	0.025	-
HCM Control Delay (s/veh)	10	-	-	7.4	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.1	-	-	0.1	-

2: Wilder Place & Dandridge Avenue & Brooks Avenue Performance by lane

Lane	EB	WB	NB	SB	NW	All
Movements Served	LTR>	LTR	LTR>	<LTR	<LR>	
Denied Del/Veh (s)						0.2
Total Del/Veh (s)	8.5	7.9	5.8	6.2	5.4	7.3

Intersection	
Int Delay, s/veh	1.3

Movement	EBT	EBR	WBL	WBT	NWL	NWR
Lane Configurations						
Traffic Vol, veh/h	312	25	0	221	35	4
Future Vol, veh/h	312	25	0	221	35	4
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	-	-	-2	-2	-
Peak Hour Factor	84	44	90	83	57	33
Heavy Vehicles, %	1	0	0	1	0	0
Mvmt Flow	371	57	0	266	61	12

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	428	0	666	400
Stage 1	-	-	-	-	400	-
Stage 2	-	-	-	-	266	-
Critical Hdwy	-	-	4.1	-	6	6
Critical Hdwy Stg 1	-	-	-	-	5	-
Critical Hdwy Stg 2	-	-	-	-	5	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1142	-	460	669
Stage 1	-	-	-	-	712	-
Stage 2	-	-	-	-	807	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1142	-	460	669
Mov Cap-2 Maneuver	-	-	-	-	460	-
Stage 1	-	-	-	-	712	-
Stage 2	-	-	-	-	807	-

Approach	EB	WB	NW
HCM Control Delay, s/v	0	0	13.74
HCM LOS			B

Minor Lane/Major Mvmt	NWLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	485	-	-	1142	-
HCM Lane V/C Ratio	0.151	-	-	-	-
HCM Control Delay (s/veh)	13.7	-	-	0	-
HCM Lane LOS	B	-	-	A	-
HCM 95th %tile Q(veh)	0.5	-	-	0	-

Intersection	
Int Delay, s/veh	0.9

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	19	292	205	1	1	22
Future Vol, veh/h	19	292	205	1	1	22
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, %	-	3	3	-	-3	-
Peak Hour Factor	56	82	82	25	25	66
Heavy Vehicles, %	0	0	1	0	0	0
Mvmt Flow	34	356	250	4	4	33

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	254	0	-	0	676	252
Stage 1	-	-	-	-	252	-
Stage 2	-	-	-	-	424	-
Critical Hdwy	4.1	-	-	-	5.8	5.9
Critical Hdwy Stg 1	-	-	-	-	4.8	-
Critical Hdwy Stg 2	-	-	-	-	4.8	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	1323	-	-	-	472	808
Stage 1	-	-	-	-	829	-
Stage 2	-	-	-	-	713	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1323	-	-	-	457	808
Mov Cap-2 Maneuver	-	-	-	-	457	-
Stage 1	-	-	-	-	802	-
Stage 2	-	-	-	-	713	-

Approach	EB	WB	SB
HCM Control Delay, s/v	0.68	0	10.07
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	157	-	-	-	747
HCM Lane V/C Ratio	0.026	-	-	-	0.05
HCM Control Delay (s/veh)	7.8	0	-	-	10.1
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0.1	-	-	-	0.2

Intersection	
Int Delay, s/veh	1.7

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	104	13	16	72	8	15
Future Vol, veh/h	104	13	16	72	8	15
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, %	1	-	-	-1	-3	-
Peak Hour Factor	74	75	63	74	67	58
Heavy Vehicles, %	1	0	0	2	0	0
Mvmt Flow	141	17	25	97	12	26

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	158	0	297	149
Stage 1	-	-	-	-	149	-
Stage 2	-	-	-	-	148	-
Critical Hdwy	-	-	4.1	-	5.8	5.9
Critical Hdwy Stg 1	-	-	-	-	4.8	-
Critical Hdwy Stg 2	-	-	-	-	4.8	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1434	-	734	914
Stage 1	-	-	-	-	906	-
Stage 2	-	-	-	-	907	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1434	-	720	914
Mov Cap-2 Maneuver	-	-	-	-	720	-
Stage 1	-	-	-	-	906	-
Stage 2	-	-	-	-	890	-

Approach	EB	WB	NB
HCM Control Delay, s/v	0	1.56	9.47
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	842	-	-	373	-
HCM Lane V/C Ratio	0.045	-	-	0.018	-
HCM Control Delay (s/veh)	9.5	-	-	7.6	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.1	-	-	0.1	-

PROJECTED CONDITIONS WITH THE PROJECT

2: Wilder Place & Dandridge Avenue & Brooks Avenue Performance by lane

Lane	EB	WB	NB	SB	NW	All
Movements Served	LTR>	LTR	LTR>	<LTR	<LR	
Denied Del/Veh (s)						0.2
Total Del/Veh (s)	7.2	8.9	5.3	5.4	5.7	7.3

Intersection	
Int Delay, s/veh	1.1

Movement	EBT	EBR	WBL	WBT	NWL	NWR
Lane Configurations						
Traffic Vol, veh/h	164	17	1	474	38	0
Future Vol, veh/h	164	17	1	474	38	0
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	-	-	-2	-2	-
Peak Hour Factor	97	67	25	90	73	90
Heavy Vehicles, %	4	19	100	5	14	0
Mvmt Flow	169	25	4	527	52	0

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	194	0	716	182
Stage 1	-	-	-	-	182	-
Stage 2	-	-	-	-	535	-
Critical Hdwy	-	-	5.1	-	6.14	6
Critical Hdwy Stg 1	-	-	-	-	5.14	-
Critical Hdwy Stg 2	-	-	-	-	5.14	-
Follow-up Hdwy	-	-	3.1	-	3.626	3.3
Pot Cap-1 Maneuver	-	-	958	-	411	875
Stage 1	-	-	-	-	838	-
Stage 2	-	-	-	-	598	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	958	-	408	875
Mov Cap-2 Maneuver	-	-	-	-	408	-
Stage 1	-	-	-	-	838	-
Stage 2	-	-	-	-	595	-

Approach	EB	WB	NW
HCM Ctrl Dly, s/v	0	0.07	15.1
HCM LOS			C

Minor Lane/Major Mvmt	NWLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	408	-	-	14	-
HCM Lane V/C Ratio	0.128	-	-	0.004	-
HCM Ctrl Dly (s/v)	15.1	-	-	8.8	0
HCM Lane LOS	C	-	-	A	A
HCM 95th %tile Q(veh)	0.4	-	-	0	-

Intersection	
Int Delay, s/veh	1.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	14	151	293	7	9	34
Future Vol, veh/h	14	151	293	7	9	34
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, %	-	3	3	-	-3	-
Peak Hour Factor	56	91	88	42	50	78
Heavy Vehicles, %	11	3	5	0	0	0
Mvmt Flow	25	166	333	17	18	44

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	350	0	-	0	557	341
Stage 1	-	-	-	-	341	-
Stage 2	-	-	-	-	216	-
Critical Hdwy	4.21	-	-	-	5.8	5.9
Critical Hdwy Stg 1	-	-	-	-	4.8	-
Critical Hdwy Stg 2	-	-	-	-	4.8	-
Follow-up Hdwy	2.299	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	1161	-	-	-	543	726
Stage 1	-	-	-	-	767	-
Stage 2	-	-	-	-	855	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1161	-	-	-	530	726
Mov Cap-2 Maneuver	-	-	-	-	530	-
Stage 1	-	-	-	-	749	-
Stage 2	-	-	-	-	855	-

Approach	EB	WB	SB
HCM Ctrl Dly, s/v	1.07	0	11.06
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	236	-	-	-	655
HCM Lane V/C Ratio	0.022	-	-	-	0.094
HCM Ctrl Dly (s/v)	8.2	0	-	-	11.1
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0.1	-	-	-	0.3

Intersection	
Int Delay, s/veh	2.9

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	63	10	34	137	22	31
Future Vol, veh/h	63	10	34	137	22	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, %	1	-	-	-1	-3	-
Peak Hour Factor	92	58	72	77	56	88
Heavy Vehicles, %	7	0	0	1	0	14
Mvmt Flow	68	17	47	178	39	35

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	86	0	349	77
Stage 1	-	-	-	-	77	-
Stage 2	-	-	-	-	272	-
Critical Hdwy	-	-	4.1	-	5.8	6.04
Critical Hdwy Stg 1	-	-	-	-	4.8	-
Critical Hdwy Stg 2	-	-	-	-	4.8	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.426
Pot Cap-1 Maneuver	-	-	1523	-	691	958
Stage 1	-	-	-	-	963	-
Stage 2	-	-	-	-	814	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1523	-	667	958
Mov Cap-2 Maneuver	-	-	-	-	667	-
Stage 1	-	-	-	-	963	-
Stage 2	-	-	-	-	786	-

Approach	EB	WB	NB
HCM Ctrl Dly, s/v	0	1.56	10.11
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	779	-	-	378	-
HCM Lane V/C Ratio	0.096	-	-	0.031	-
HCM Ctrl Dly (s/v)	10.1	-	-	7.4	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.3	-	-	0.1	-

Intersection	
Int Delay, s/veh	3.4

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	32	7	2	23	36	8
Future Vol, veh/h	32	7	2	23	36	8
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	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	36	8	2	26	40	9

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	74	44	49	0	-	0
Stage 1	44	-	-	-	-	-
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	934	1031	1571	-	-	-
Stage 1	983	-	-	-	-	-
Stage 2	998	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	933	1031	1571	-	-	-
Mov Cap-2 Maneuver	933	-	-	-	-	-
Stage 1	982	-	-	-	-	-
Stage 2	998	-	-	-	-	-

Approach	EB	NB	SB
HCM Ctrl Dly, s/v	8.97	0.58	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	144	-	949	-	-
HCM Lane V/C Ratio	0.001	-	0.046	-	-
HCM Ctrl Dly (s/v)	7.3	0	9	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-

Intersection	
Int Delay, s/veh	1.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	15	148	413	2	6	55
Future Vol, veh/h	15	148	413	2	6	55
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	-	0	-
Peak Hour Factor	90	91	88	90	90	90
Heavy Vehicles, %	0	3	5	0	0	0
Mvmt Flow	17	163	469	2	7	61

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	472	0	-	0	666	470
Stage 1	-	-	-	-	470	-
Stage 2	-	-	-	-	196	-
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	1101	-	-	-	427	597
Stage 1	-	-	-	-	633	-
Stage 2	-	-	-	-	842	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1101	-	-	-	420	597
Mov Cap-2 Maneuver	-	-	-	-	420	-
Stage 1	-	-	-	-	622	-
Stage 2	-	-	-	-	842	-

Approach	EB	WB	SB
HCM Ctrl Dly, s/v	0.77	0	12.12
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	167	-	-	-	574
HCM Lane V/C Ratio	0.015	-	-	-	0.118
HCM Ctrl Dly (s/v)	8.3	0	-	-	12.1
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.4

Intersection	
Int Delay, s/veh	3.2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	27	127	316	11	38	99
Future Vol, veh/h	27	127	316	11	38	99
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	-	0	-
Peak Hour Factor	90	91	88	90	90	90
Heavy Vehicles, %	0	3	5	0	0	0
Mvmt Flow	30	140	359	12	42	110

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	371	0	-	0	565	365
Stage 1	-	-	-	-	365	-
Stage 2	-	-	-	-	200	-
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	1198	-	-	-	490	684
Stage 1	-	-	-	-	707	-
Stage 2	-	-	-	-	839	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1198	-	-	-	476	684
Mov Cap-2 Maneuver	-	-	-	-	476	-
Stage 1	-	-	-	-	687	-
Stage 2	-	-	-	-	839	-

Approach	EB	WB	SB
HCM Ctrl Dly, s/v	1.43	0	12.84
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	318	-	-	-	610
HCM Lane V/C Ratio	0.025	-	-	-	0.249
HCM Ctrl Dly (s/v)	8.1	0	-	-	12.8
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0.1	-	-	-	1

2: Wilder Place & Dandridge Avenue & Brooks Avenue Performance by lane

Lane	EB	WB	NB	SB	NW	All
Movements Served	LTR>	LTR	LTR>	<LTR	<LR>	
Denied Del/Veh (s)						0.2
Total Del/Veh (s)	10.1	8.8	6.3	7.3	6.6	8.4

Intersection	
Int Delay, s/veh	1.3

Movement	EBT	EBR	WBL	WBT	NWL	NWR
Lane Configurations						
Traffic Vol, veh/h	462	25	0	348	35	4
Future Vol, veh/h	462	25	0	348	35	4
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	-	-	-2	-2	-
Peak Hour Factor	84	44	90	83	57	33
Heavy Vehicles, %	1	0	0	1	0	0
Mvmt Flow	550	57	0	419	61	12

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	607	0	998	578
Stage 1	-	-	-	-	578	-
Stage 2	-	-	-	-	419	-
Critical Hdwy	-	-	4.1	-	6	6
Critical Hdwy Stg 1	-	-	-	-	5	-
Critical Hdwy Stg 2	-	-	-	-	5	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	981	-	305	536
Stage 1	-	-	-	-	602	-
Stage 2	-	-	-	-	700	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	981	-	305	536
Mov Cap-2 Maneuver	-	-	-	-	305	-
Stage 1	-	-	-	-	602	-
Stage 2	-	-	-	-	700	-

Approach	EB	WB	NW
HCM Ctrl Dly, s/v	0	0	19.12
HCM LOS			C

Minor Lane/Major Mvmt	NWLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	328	-	-	981	-
HCM Lane V/C Ratio	0.224	-	-	-	-
HCM Ctrl Dly (s/v)	19.1	-	-	0	-
HCM Lane LOS	C	-	-	A	-
HCM 95th %tile Q(veh)	0.8	-	-	0	-

Intersection	
Int Delay, s/veh	1.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	22	325	244	8	7	25
Future Vol, veh/h	22	325	244	8	7	25
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, %	-	3	3	-	-3	-
Peak Hour Factor	56	82	82	25	25	66
Heavy Vehicles, %	0	0	1	0	0	0
Mvmt Flow	39	396	298	32	28	38

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	330	0	-	0	788	314
Stage 1	-	-	-	-	314	-
Stage 2	-	-	-	-	475	-
Critical Hdwy	4.1	-	-	-	5.8	5.9
Critical Hdwy Stg 1	-	-	-	-	4.8	-
Critical Hdwy Stg 2	-	-	-	-	4.8	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	1241	-	-	-	413	751
Stage 1	-	-	-	-	786	-
Stage 2	-	-	-	-	682	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1241	-	-	-	397	751
Mov Cap-2 Maneuver	-	-	-	-	397	-
Stage 1	-	-	-	-	754	-
Stage 2	-	-	-	-	682	-

Approach	EB	WB	SB
HCM Ctrl Dly, s/v	0.72	0	12.52
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	162	-	-	-	544
HCM Lane V/C Ratio	0.032	-	-	-	0.121
HCM Ctrl Dly (s/v)	8	0	-	-	12.5
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0.1	-	-	-	0.4

Intersection	
Int Delay, s/veh	3.2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	104	24	39	72	17	35
Future Vol, veh/h	104	24	39	72	17	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, %	1	-	-	-1	-3	-
Peak Hour Factor	74	75	63	74	67	58
Heavy Vehicles, %	1	0	0	2	0	0
Mvmt Flow	141	32	62	97	25	60

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	173	0	378	157
Stage 1	-	-	-	-	157	-
Stage 2	-	-	-	-	221	-
Critical Hdwy	-	-	4.1	-	5.8	5.9
Critical Hdwy Stg 1	-	-	-	-	4.8	-
Critical Hdwy Stg 2	-	-	-	-	4.8	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1417	-	669	906
Stage 1	-	-	-	-	900	-
Stage 2	-	-	-	-	851	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1417	-	638	906
Mov Cap-2 Maneuver	-	-	-	-	638	-
Stage 1	-	-	-	-	900	-
Stage 2	-	-	-	-	812	-

Approach	EB	WB	NB
HCM Ctrl Dly, s/v	0	2.98	10
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	806	-	-	700	-
HCM Lane V/C Ratio	0.106	-	-	0.044	-
HCM Ctrl Dly (s/v)	10	-	-	7.7	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.4	-	-	0.1	-

Intersection	
Int Delay, s/veh	2.9

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	26	6	7	19	27	31
Future Vol, veh/h	26	6	7	19	27	31
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	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	29	7	8	21	30	34

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	84	47	64	0	-	0
Stage 1	47	-	-	-	-	-
Stage 2	37	-	-	-	-	-
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	923	1028	1551	-	-	-
Stage 1	980	-	-	-	-	-
Stage 2	991	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	918	1028	1551	-	-	-
Mov Cap-2 Maneuver	918	-	-	-	-	-
Stage 1	975	-	-	-	-	-
Stage 2	991	-	-	-	-	-

Approach	EB	NB	SB
HCM Ctrl Dly, s/v	8.99	1.97	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	485	-	937	-	-
HCM Lane V/C Ratio	0.005	-	0.038	-	-
HCM Ctrl Dly (s/v)	7.3	0	9	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-

Intersection	
Int Delay, s/veh	1.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	53	408	309	6	5	45
Future Vol, veh/h	53	408	309	6	5	45
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	-	0	-
Peak Hour Factor	90	82	82	90	90	90
Heavy Vehicles, %	0	0	1	0	0	0
Mvmt Flow	59	498	377	7	6	50

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	383	0	-	0	996	380
Stage 1	-	-	-	-	380	-
Stage 2	-	-	-	-	615	-
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	1186	-	-	-	274	671
Stage 1	-	-	-	-	696	-
Stage 2	-	-	-	-	543	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1186	-	-	-	255	671
Mov Cap-2 Maneuver	-	-	-	-	255	-
Stage 1	-	-	-	-	648	-
Stage 2	-	-	-	-	543	-

Approach	EB	WB	SB
HCM Ctrl Dly, s/v	0.87	0	11.9
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	190	-	-	-	577
HCM Lane V/C Ratio	0.05	-	-	-	0.096
HCM Ctrl Dly (s/v)	8.2	0	-	-	11.9
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0.2	-	-	-	0.3

Intersection	
Int Delay, s/veh	2.9

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	97	316	234	36	31	82
Future Vol, veh/h	97	316	234	36	31	82
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	-	0	-
Peak Hour Factor	90	82	82	90	90	90
Heavy Vehicles, %	0	0	1	0	0	0
Mvmt Flow	108	385	285	40	34	91

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	325	0	-	0	906	305
Stage 1	-	-	-	-	305	-
Stage 2	-	-	-	-	601	-
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	1246	-	-	-	309	739
Stage 1	-	-	-	-	752	-
Stage 2	-	-	-	-	551	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1246	-	-	-	275	739
Mov Cap-2 Maneuver	-	-	-	-	275	-
Stage 1	-	-	-	-	669	-
Stage 2	-	-	-	-	551	-

Approach	EB	WB	SB
HCM Ctrl Dly, s/v	1.78	0	14.47
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	393	-	-	-	505
HCM Lane V/C Ratio	0.087	-	-	-	0.249
HCM Ctrl Dly (s/v)	8.2	0	-	-	14.5
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0.3	-	-	-	1

APPENDIX F

TRIP GENERATION DATA

Local Apartment
Trip Generation Study

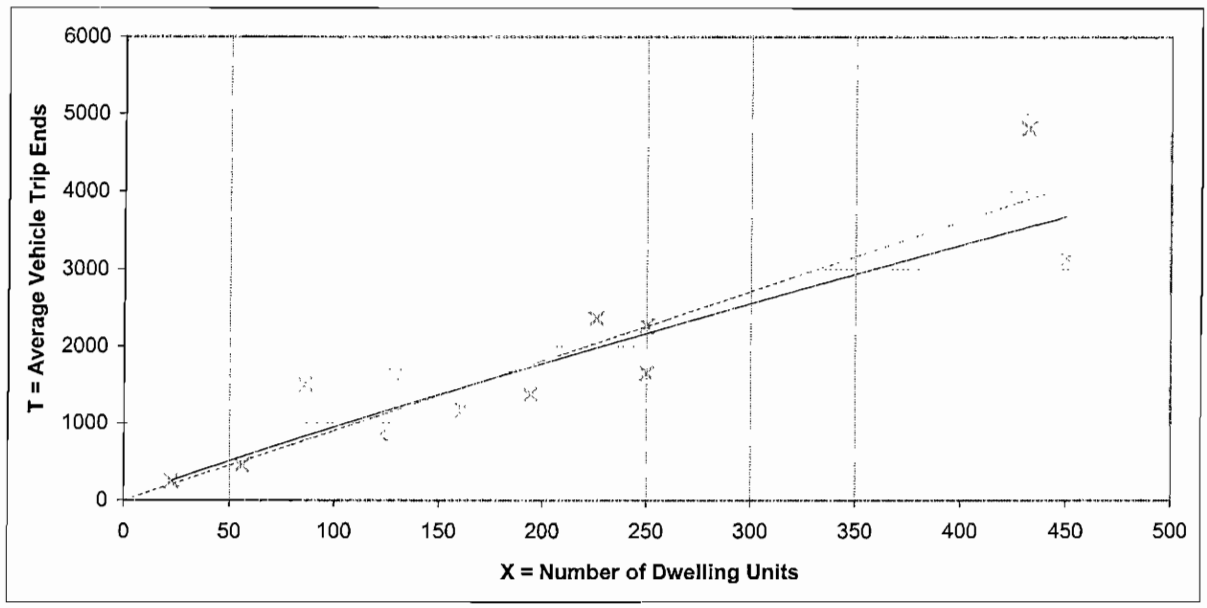
Average Vehicle Trip Ends vs: **Dwelling Units**
On a: **Weekday**

Number of Studies: 13
Average Number of Dwelling Units: 193
Directional Distribution: 50% entering, 50% exiting

Trip Generation Per Dwelling Unit

Average Rate	Ranges of Rates	Standard Deviation
9.03	6.59 - 17.41	2.47

Data Plot and Equation



X Actual Data Points ——— Fitted Curve Average Rate

Fitted Curve Equation: $T = 15.193(X)^{0.899}$ $R^2 = 0.88$

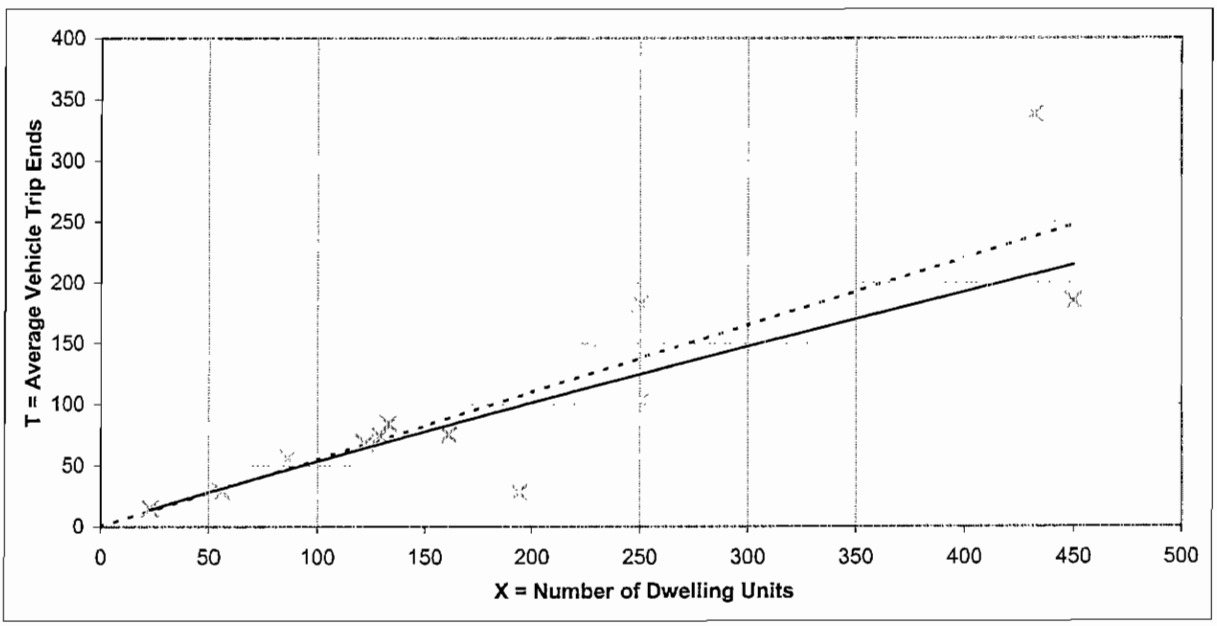
Local Apartment
Trip Generation Study

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:	13
Average Number of Dwelling Units:	193
Directional Distribution:	22% entering, 78% exiting

Trip Generation Per Dwelling Unit

Average Rate	Ranges of Rates	Standard Deviation
0.55	0.14 - 0.78	0.18

Data Plot and Equation



X Actual Data Points ——— Fitted Curve Average Rate

Fitted Curve Equation: $T = 0.758(X)^{0.924}$ $R^2 = 0.75$

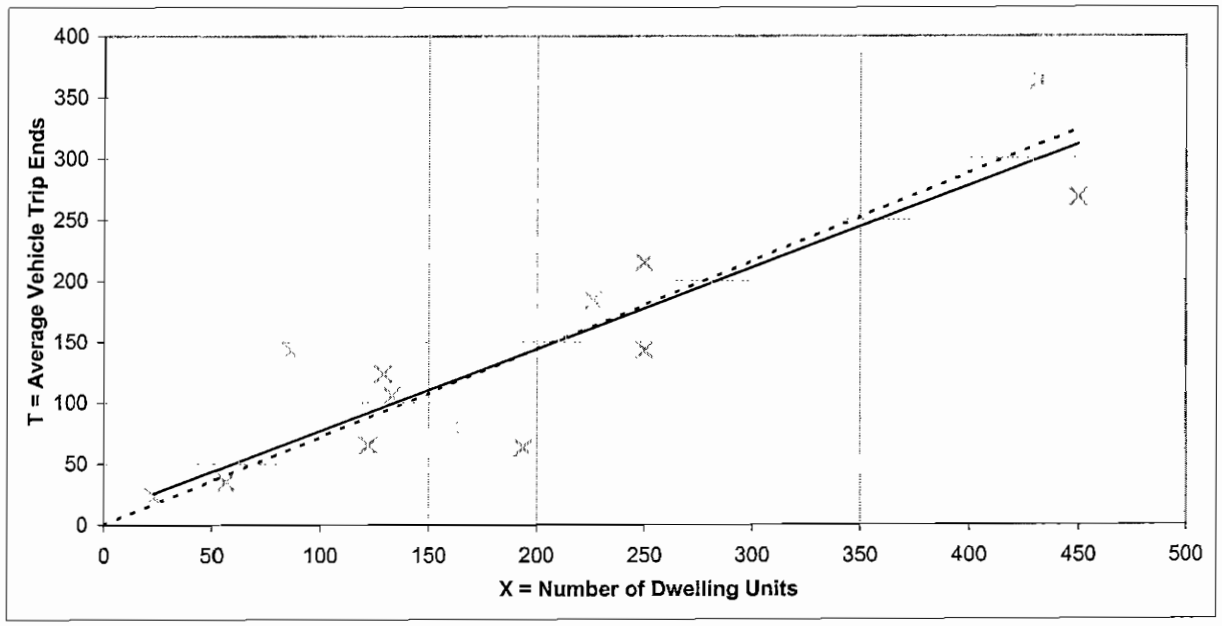
Local Apartment
Trip Generation Study

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:	13
Average Number of Dwelling Units:	193
Directional Distribution:	55% entering, 45% exiting

Trip Generation Per Dwelling Unit

Average Rate	Ranges of Rates	Standard Deviation
0.72	0.32 - 1.66	0.25

Data Plot and Equation



X Actual Data Points ——— Fitted Curve Average Rate

Fitted Curve Equation: T = 0.669(X) + 10.069 **R^2 = 0.79**

TRIP GENERATION FOR CARDINAL PLACE

570 Apartments and 80 Townhouses

ITE LAND USE CODE	LAND USE DESCRIPTION	# OF UNITS	GENERATED DAILY TRAFFIC	GENERATED TRAFFIC AM PEAK HOUR			GENERATED TRAFFIC PM PEAK HOUR		
				ENTER	EXIT	TOTAL	ENTER	EXIT	TOTAL
Local Trip Rate	Apartments	570	4,562	22%	78%		55%	45%	
				59	208	267	215	176	391
Local Trip Rate	Multi-Family Attached Townhouses	80	781	22%	78%		55%	45%	
				9	34	43	35	29	64
New Volume Site Trips			5,343	68	242	310	250	205	455
Vehicle Trip Reduction due to Transit Activity (5%)			-267	-3	-12		-13	-10	
Total New Volume Site Trips			**5,076**	**65**	**230**	**295**	**237**	**195**	**432**

Local Trip Rates calculated by using Fitted Curve Equations

TRIP GENERATION FOR CARDINAL PLACE

570 Apartments

570 Units = X

Weekday:

Fitted Curve Equation: $T = 15.193(X)^{0.899}$

T = 15 * 300.28

T = 4,562 trips

Peak Hour of Adjacent Traffic between 7 and 9 am:

Fitted Curve Equation: $T = 0.758(X)^{0.924}$

T = 0.758 * 352

T = 267 trips

Peak Hour of Adjacent Traffic between 4 and 6 pm:

Fitted Curve Equation: $T = 0.669(X)+10.069$

T = 0.669 * 570 + 10.07

T = 391 trips

TRIP GENERATION FOR CARDINAL PLACE

80 Townhouses

80 Units = X

Weekday:

Fitted Curve Equation: $T = 15.193(X)^{0.899}$

T = 15 * 51.39

T = 781 trips

Peak Hour of Adjacent Traffic between 7 and 9 am:

Fitted Curve Equation: $T = 0.758(X)^{0.924}$

T = 0.758 * 57

T = 43 trips

Peak Hour of Adjacent Traffic between 4 and 6 pm:

Fitted Curve Equation: $T = 0.669(X)+10.069$

T = 0.669 * 80 + 10.07

T = 64 trips

APPENDIX G

2021 CENSUS BUREAU DATA

OnTheMap

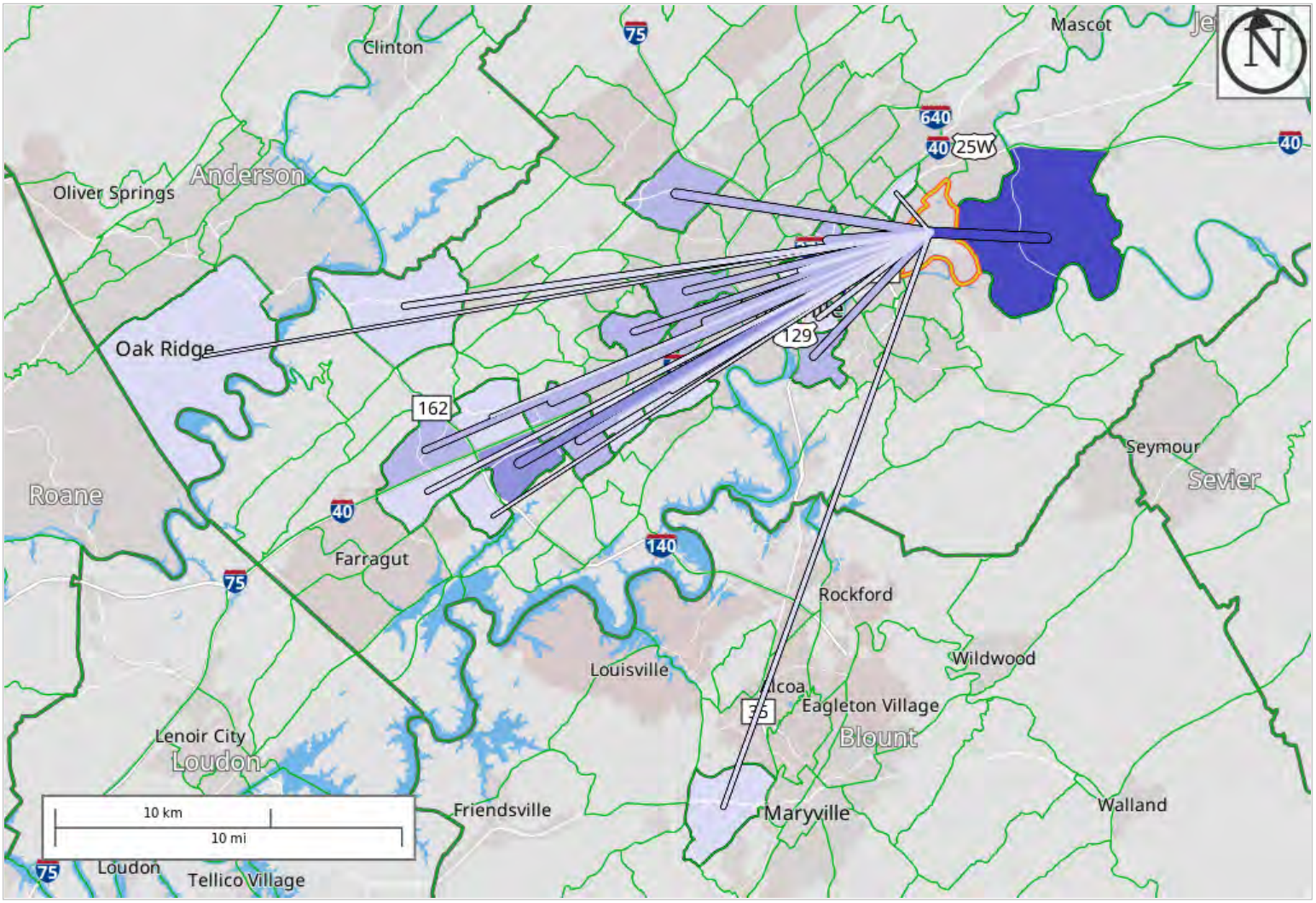
Destination Analysis

Workers: *Living in 21 (Knox, TN)*
Showing: *Employment locations grouped by Census Tracts*

Created by the U.S. Census Bureau's OnTheMap `https://onthemap.ces.census.gov` on 10/10/2024

Counts of All Jobs from Home Selection Area to Work Census Tracts in 2021

All Workers



Map Legend

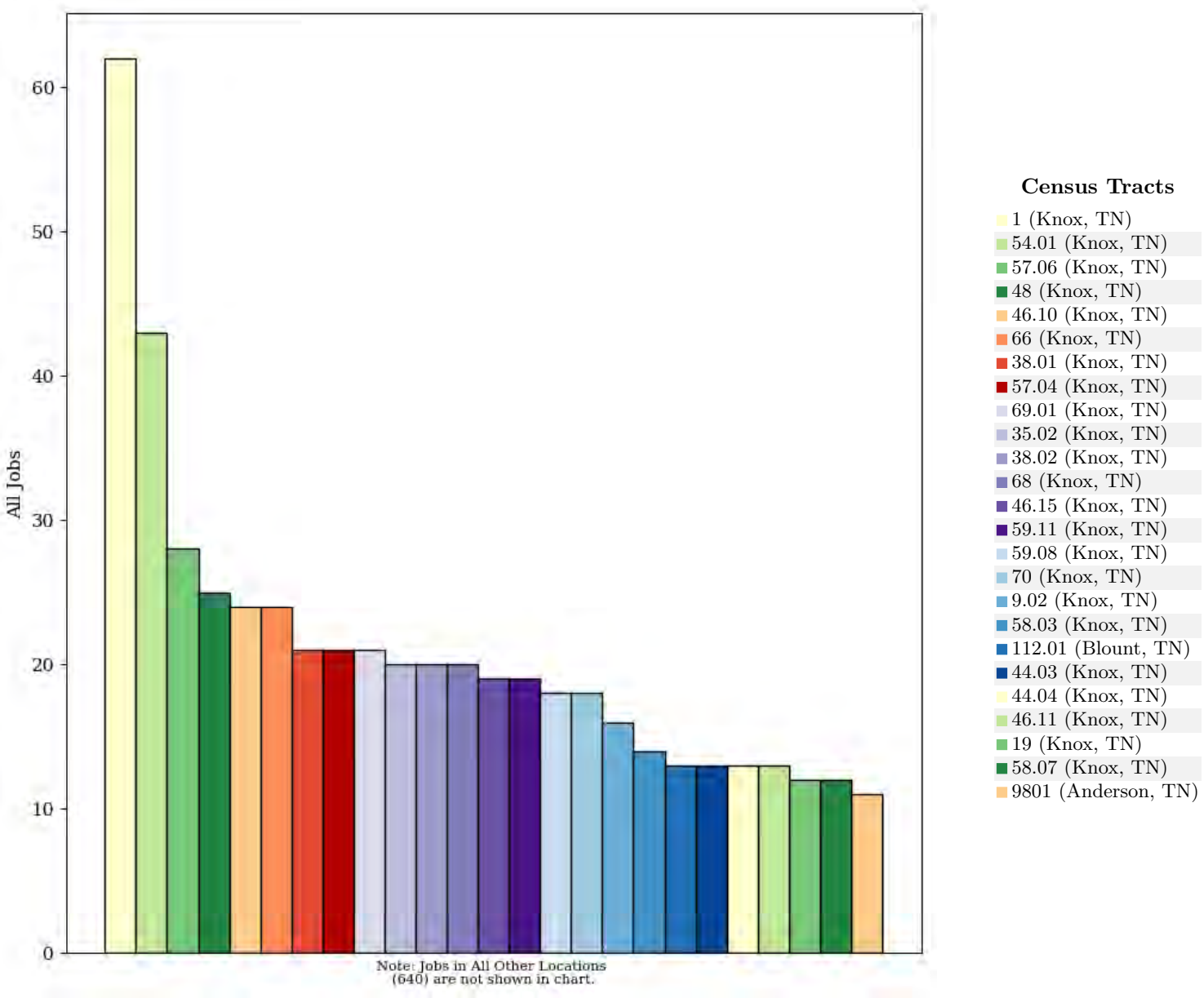
Job Count
- 55 - 62
- 48 - 54
- 41 - 47
- 33 - 40
- 26 - 32
- 19 - 25
- 11 - 18

Selection Areas
- Home Area

Job Count
- 55 - 62
- 48 - 54
- 41 - 47
- 33 - 40
- 26 - 32
- 19 - 25
- 11 - 18

All Jobs from Home Selection Area to Work Census Tracts in 2021

All Workers



All Jobs from Home Selection Area to Work Census Tracts in 2021

All Workers

Census Tracts as Work Destination Area	2021 Count	2021 Share
All Census Tracts	1,160	100.0%
1 (Knox, TN)	62	5.3%
54.01 (Knox, TN)	43	3.7%
57.06 (Knox, TN)	28	2.4%
48 (Knox, TN)	25	2.2%
46.10 (Knox, TN)	24	2.1%
66 (Knox, TN)	24	2.1%
38.01 (Knox, TN)	21	1.8%
57.04 (Knox, TN)	21	1.8%
69.01 (Knox, TN)	21	1.8%

Census Tracts as Work Destination Area	2021 Count	2021 Share
35.02 (Knox, TN)	20	1.7%
38.02 (Knox, TN)	20	1.7%
68 (Knox, TN)	20	1.7%
46.15 (Knox, TN)	19	1.6%
59.11 (Knox, TN)	19	1.6%
59.08 (Knox, TN)	18	1.6%
70 (Knox, TN)	18	1.6%
9.02 (Knox, TN)	16	1.4%
58.03 (Knox, TN)	14	1.2%
112.01 (Blount, TN)	13	1.1%
44.03 (Knox, TN)	13	1.1%
44.04 (Knox, TN)	13	1.1%
46.11 (Knox, TN)	13	1.1%
19 (Knox, TN)	12	1.0%
58.07 (Knox, TN)	12	1.0%
9801 (Anderson, TN)	11	0.9%
All Other Locations	640	55.2%

Additional Information

Analysis Settings

Analysis Type	Destination
Destination Type	Census Tracts
Selection area as	Home
Year(s)	2021
Job Type	All Jobs
Selection Area	21 (Knox, TN) from Census Tracts
Selected Census Blocks	58
Analysis Generation Date	10/10/2024 17:02 - OnTheMap 6.24.1
Code Revision	bc639735180b6b7ade65403c2bedfe53b70b1e56
LODES Data Vintage	20231016_1512

Data Sources

Source: U.S. Census Bureau, OnTheMap Application and LEHD Origin-Destination Employment Statistics (Beginning of Quarter Employment, 2nd Quarter of 2002-2021).

Notes

1. Race, Ethnicity, Educational Attainment, and Sex statistics are beta release results and are not available before 2009.
2. Educational Attainment is only produced for workers aged 30 and over.
3. Firm Age and Firm Size statistics are beta release results for All Private jobs and are not available before 2011.

APPENDIX H

KNOX COUNTY TURN LANE VOLUME THRESHOLD WORKSHEETS

TABLE 4A

LEFT-TURN LANE VOLUME THRESHOLDS FOR TWO-LANE ROADWAYS WITH A PREVAILING SPEED OF 35 MPH OR LESS

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

127

OPPOSING VOLUME	THROUGH VOLUME PLUS RIGHT-TURN VOLUME *					
	100 - 149	150 - 199	200 - 249	250 - 299	300 - 349	350 - 399
100 - 149 150 - 199	300 245	235 200	185 160	145 130	120 110	100 90
200 - 249 250 - 299	205 175			115 105	100 90	80 70
300 - 349 350 - 399	155 135			95 85	80 70	65 60
400 - 449 450 - 499	120 105			75 70	65 60	55 50
500 - 549 550 - 599	95 85			65 60	55 50	50 45
600 - 649 650 - 699	75 70	65 60	60 55	55 50	45 40	40 35
700 - 749 750 or More	65 60	55 50	50 45	45 40	35 35	30 30

Delrose Drive at Proposed SE Entrance

2027 Projected AM EB Left Turns = 27

Left Turn Lane NOT Warranted

11 + 316 = 327

OPPOSING VOLUME	THROUGH VOLUME PLUS RIGHT-TURN VOLUME *					
	350 - 399	400 - 449	450 - 499	500 - 549	550 - 599	= / > 600
100 - 149 150 - 199	100 90	80 75	70 65	60 55	55 50	50 45
200 - 249 250 - 299	80 70	72 65	460 55	55 50	50 45	45 40
300 - 349 350 - 399	65 60	60 55	50 50	50 45	45 40	40 40
400 - 449 450 - 499	55 50	50 45	45 45	45 40	40 35	35 35
500 - 549 550 - 599	50 45	45 40	40 40	40 35	35 35	35 35
600 - 649 650 - 699	40 35	35 35	35 35	35 30	35 30	30 30
700 - 749 750 or More	30 30	30 30	30 30	30 30	30 30	30 30

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

TABLE 4B
RIGHT-TURN LANE VOLUME THRESHOLDS
FOR TWO-LANE ROADWAYS WITH A PREVAILING SPEED OF 35 MPH OR LESS

316

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

Delrose Drive at Proposed SE Entrance

2027 Projected AM WB Right Turns = 11

Right Turn Lane NOT Warranted

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	Yes Yes
200 - 249 250 - 299	 Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
300 - 349 350 - 399	Yes Yes	Yes 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.

TABLE 4A

LEFT-TURN LANE VOLUME THRESHOLDS FOR TWO-LANE ROADWAYS WITH A PREVAILING SPEED OF 35 MPH OR LESS

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

316

36 + 234 = 270

OPPOSING VOLUME	THROUGH VOLUME PLUS RIGHT-TURN VOLUME *					
	100 - 149	150 - 199	200 - 249	250 - 299	300 - 349	350 - 399
100 - 149	300	235	185	145	120	100
150 - 199	245	200	160	130	110	90
200 - 249	205	170	140	115	[illegible]	80
250 - 299	175	150	125	105	90	70
300 - 349	155	135	110	95	80	65
350 - 399	135	120	100	85	70	60
400 - 449	120			75	65	55
450 - 499	105			70	60	50
500 - 549	95			65	55	50
550 - 599	85			60	50	45
600 - 649	75			55	45	40
650 - 699	70			50	40	35
700 - 749	65			45	35	30
750 or More	60			40	35	30

Delrose Drive at Proposed SE Entrance

2027 Projected PM EB Left Turns = 97

Left Turn Lane Warranted

OPPOSING VOLUME	THROUGH VOLUME PLUS RIGHT-TURN VOLUME *					
	350 - 399	400 - 449	450 - 499	500 - 549	550 - 599	= / > 600
100 - 149	100	80	70	60	55	50
150 - 199	90	75	65	55	50	45
200 - 249	80	72	460	55	50	45
250 - 299	70	65	55	50	45	40
300 - 349	65	60	50	50	45	40
350 - 399	60	55	50	45	40	40
400 - 449	55	50	45	45	40	35
450 - 499	50	45	45	40	35	35
500 - 549	50	45	40	40	35	35
550 - 599	45	40	40	35	35	35
600 - 649	40	35	35	35	35	30
650 - 699	35	35	35	30	30	30
700 - 749	30	30	30	30	30	30
750 or More	30	30	30	30	30	30

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

TABLE 4B

RIGHT-TURN LANE VOLUME THRESHOLDS

FOR TWO-LANE ROADWAYS WITH A PREVAILING SPEED OF 35 MPH OR LESS

234

RIGHT-TURN VOLUME	THROUGH VOLUME PLUS LEFT-TURN VOLUME *					
	<100	100 - 199	200 - 249	250 - 299	300 - 349	350 - 399
Fewer Than 25						
36 → 25 - 49						
50 - 99						
100 - 149						
150 - 199						
200 - 249						
250 - 299						Yes
300 - 349					Yes	Yes
350 - 399				Yes	Yes	Yes
400 - 449				Yes	Yes	Yes
450 - 499				Yes	Yes	Yes
500 - 549		Yes	Yes	Yes	Yes	Yes
550 - 599		Yes	Yes	Yes	Yes	Yes
600 or More	Yes	Yes	Yes	Yes	Yes	Yes

Delrose Drive at Proposed SE Entrance

2027 Projected PM WB Right Turns = 36

Right Turn Lane NOT Warranted

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						Yes
50 - 99					Yes	Yes
100 - 149				Yes	Yes	Yes
150 - 199			Yes	Yes	Yes	Yes
200 - 249		Yes	Yes	Yes	Yes	Yes
250 - 299	Yes	Yes	Yes	Yes	Yes	Yes
300 - 349	Yes	Yes	Yes	Yes	Yes	Yes
350 - 399	Yes	Yes	Yes	Yes	Yes	Yes
400 - 449	Yes	Yes	Yes	Yes	Yes	Yes
450 - 499	Yes	Yes	Yes	Yes	Yes	Yes
500 - 549	Yes	Yes	Yes	Yes	Yes	Yes
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.

TABLE 4A

LEFT-TURN LANE VOLUME THRESHOLDS FOR TWO-LANE ROADWAYS WITH A PREVAILING SPEED OF 35 MPH OR LESS

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

148

OPPOSING VOLUME	THROUGH VOLUME PLUS RIGHT-TURN VOLUME *					
	100 - 149	150 - 199	200 - 249	250 - 299	300 - 349	350 - 399
100 - 149 150 - 199	300 245	235 200	185 160	145 130	120 110	100 90
200 - 249 250 - 299	205 175	170 150	140 125	115 105	100 90	80 70
300 - 349 350 - 399	155 135	135 120	110 100	95 85	80 70	65 60
400 - 449 450 - 499	120 105	105 90	90 80	75 70	65 60	55 50
500 - 549 550 - 599	95 85	85 75	75 65	65 60	55 50	50 45
600 - 649 650 - 699	75 70	70 60	60 55	55 50	45 40	40 35
700 - 749 750 or More	65 60	60 55	55 50	45 40	35 35	30 30

2 + 413 = 415

Delrose Drive at Proposed SW Entrance

2027 Projected AM EB Left Turns = 15

Left Turn Lane NOT Warranted

OPPOSING VOLUME	THROUGH VOLUME PLUS RIGHT-TURN VOLUME *					
	350 - 399	400 - 449	450 - 499	500 - 549	550 - 599	= / > 600
100 - 149 150 - 199	100 90	80 75	70 65	60 55	55 50	50 45
200 - 249 250 - 299	80 70	72 65	460 55	55 50	50 45	45 40
300 - 349 350 - 399	65 60	60 55	50 50	50 45	45 40	40 40
400 - 449 450 - 499	55 50	50 45	45 45	45 40	40 35	35 35
500 - 549 550 - 599	50 45	45 40	40 40	40 35	35 35	35 35
600 - 649 650 - 699	40 35	35 35	35 35	35 30	35 30	30 30
700 - 749 750 or More	30 30	30 30	30 30	30 30	30 30	30 30

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

TABLE 4B

RIGHT-TURN LANE VOLUME THRESHOLDS

FOR TWO-LANE ROADWAYS WITH A PREVAILING SPEED OF 35 MPH OR LESS

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
300 - 349 350 - 399				Yes	Yes Yes	Yes Yes
400 - 449 450 - 499			Yes Yes	Yes Yes	Yes Yes	Yes Yes
500 - 549 550 - 599		Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
600 or More	Yes	Yes	Yes	Yes	Yes	Yes

413

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

Delrose Drive at Proposed SW Entrance

2027 Projected AM WB Right Turns = 2

Right Turn Lane NOT Warranted

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

TABLE 4A

LEFT-TURN LANE VOLUME THRESHOLDS FOR TWO-LANE ROADWAYS WITH A PREVAILING SPEED OF 35 MPH OR LESS

(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 - 149 150 - 199	300 245	235 200	185 160	145 130	120 110	100 90
200 - 249 250 - 299	205 175	170 150	140 125	115 105	100 90	80 70
300 - 349 350 - 399	155 135	135 120	110 100	95 85	80 70	65 60
400 - 449 450 - 499	120 105	105 90	90 80	75 70	65 60	55 50
500 - 549 550 - 599	95 85	80 70	70 65	65 60	55 50	50 45
600 - 649 650 - 699	75 70	65 60	60 55	55 50	45 40	40 35
700 - 749 750 or More	65 60	55 50	50 45	45 40	35 35	30 30

408

OPPOSING VOLUME	THROUGH VOLUME PLUS RIGHT-TURN VOLUME *					
	350 - 399	400 - 449	450 - 499	500 - 549	550 - 599	= / > 600
100 - 149 150 - 199	100 90	80 75	70 65	60 55	55 50	50 45
200 - 249 250 - 299	80 70	72 65	460 55	55 50	50 45	45 40
300 - 349 350 - 399	65 60	60 55	50 50	50 45	45 40	40 40
400 - 449 450 - 499	55 50	50 45	[illegible]	[illegible]	40 35	35 35
500 - 549 550 - 599	50 45	45 40	[illegible]	[illegible]	35 35	35 35
600 - 649 650 - 699	40 35	35 35	[illegible]	[illegible]	35 30	30 30
700 - 749 750 or More	30 30	30 30	[illegible]	[illegible]	30 30	30 30

6 + 309 = 315

Delrose Drive at Proposed SW Entrance

2027 Projected PM EB Left Turns = 53

Left Turn Lane NOT Warranted

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

TABLE 4B
RIGHT-TURN LANE VOLUME THRESHOLDS
FOR TWO-LANE ROADWAYS WITH A PREVAILING SPEED OF 35 MPH OR LESS

309

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

Delrose Drive at
Proposed SW Entrance

2027 Projected PM
WB Right Turns = 6

Right Turn Lane NOT
Warranted

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						Yes
50 - 99					Yes	Yes
100 - 149				Yes	Yes	Yes
150 - 199			Yes	Yes	Yes	Yes
200 - 249		Yes	Yes	Yes	Yes	Yes
250 - 299	Yes	Yes	Yes	Yes	Yes	Yes
300 - 349	Yes	Yes	Yes	Yes	Yes	Yes
350 - 399	Yes	Yes	Yes	Yes	Yes	Yes
400 - 449	Yes	Yes	Yes	Yes	Yes	Yes
450 - 499	Yes	Yes	Yes	Yes	Yes	Yes
500 - 549	Yes	Yes	Yes	Yes	Yes	Yes
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.

APPENDIX I

SIMTRAFFIC 12 VEHICLE QUEUE WORKSHEETS

Intersection: 2: Wilder Place & Dandridge Avenue & Brooks Avenue

Movement	EB	WB	NB	SB	NW
Directions Served	LTR>	LTR	LTR>	<LTR	<LR
Maximum Queue (ft)	75	122	57	68	52
Average Queue (ft)	34	55	25	33	19
95th Queue (ft)	63	92	47	58	40
Link Distance (ft)	379	505	355	555	446
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 10: Riverside Drive & Delrose Drive

Movement	WB	NW
Directions Served	LT	LR
Maximum Queue (ft)	12	72
Average Queue (ft)	0	26
95th Queue (ft)	9	60
Link Distance (ft)	236	232
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 14: Delrose Drive & Riverside Road

Movement	EB	SB
Directions Served	LT	LR
Maximum Queue (ft)	38	44
Average Queue (ft)	3	21
95th Queue (ft)	20	43
Link Distance (ft)	234	342
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 18: Riverside Road & Brooks Avenue

Movement	WB	NB
Directions Served	LT	LR
Maximum Queue (ft)	32	68
Average Queue (ft)	2	29
95th Queue (ft)	17	57
Link Distance (ft)	273	220
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 22: Riverside Road & Proposed East Entrance

Movement	EB	NB
Directions Served	LR	LT
Maximum Queue (ft)	42	3
Average Queue (ft)	23	0
95th Queue (ft)	45	3
Link Distance (ft)	157	215
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 25: Delrose Drive & Proposed SW Entrance

Movement	EB	SB
Directions Served	LT	LR
Maximum Queue (ft)	35	50
Average Queue (ft)	6	26
95th Queue (ft)	26	46
Link Distance (ft)	264	380
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 27: Delrose Drive & Proposed SE Entrance

Movement	EB	SB
Directions Served	LT	LR
Maximum Queue (ft)	39	78
Average Queue (ft)	9	41
95th Queue (ft)	32	66
Link Distance (ft)	662	312
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 0

Intersection: 2: Wilder Place & Dandridge Avenue & Brooks Avenue

Movement	EB	WB	NB	SB	NW
Directions Served	LTR>	LTR	LTR>	<LTR	<LR>
Maximum Queue (ft)	126	86	74	78	56
Average Queue (ft)	56	41	34	40	22
95th Queue (ft)	103	71	58	66	43
Link Distance (ft)	379	493	355	555	450
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 10: Riverside Drive & Delrose Drive

Movement	NW
Directions Served	LR
Maximum Queue (ft)	51
Average Queue (ft)	24
95th Queue (ft)	47
Link Distance (ft)	232
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 14: Delrose Drive & Riverside Road

Movement	EB	SB
Directions Served	LT	LR
Maximum Queue (ft)	45	42
Average Queue (ft)	6	19
95th Queue (ft)	29	41
Link Distance (ft)	234	342
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 18: Riverside Road & Brooks Avenue

Movement	WB	NB
Directions Served	LT	LR
Maximum Queue (ft)	40	47
Average Queue (ft)	5	27
95th Queue (ft)	24	46
Link Distance (ft)	273	380
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 20: Riverside Road & Proposed East Entrance

Movement	EB	NB
Directions Served	LR	LT
Maximum Queue (ft)	38	6
Average Queue (ft)	19	0
95th Queue (ft)	44	4
Link Distance (ft)	156	205
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 23: Delrose Drive & Proposed SW Entrance

Movement	EB	SB
Directions Served	LT	LR
Maximum Queue (ft)	78	46
Average Queue (ft)	15	23
95th Queue (ft)	53	46
Link Distance (ft)	261	347
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 26: Delrose Drive & Proposed SE Entrance

Movement	EB	WB	SB
Directions Served	LT	TR	LR
Maximum Queue (ft)	85	2	83
Average Queue (ft)	24	0	40
95th Queue (ft)	63	2	66
Link Distance (ft)	651	268	329
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Network Summary

Network wide Queuing Penalty: 0

APPENDIX J

LETTER RESPONSE TO ADDRESS COMMENTS

AJAX ENGINEERING
CIVIL ENGINEERING / TRAFFIC ENGINEERING

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

November 20, 2024

PROJECT NAME: Cardinal Place (12-A-24-PD)
TO: Knoxville-Knox County Planning
SUBJECT: Response Document for the Cardinal Place TIS Review Comments

Knoxville-Knox County Planning and City of Knoxville Department of Engineering Staff:

The following response document addresses the comments in an email from Mike Conger, PE, dated November 15, 2024. This letter is added to the end of the revised report in Appendix J.

1) **On Page 2 (Executive Summary, Recommendations Section) - the second intersection listed is titled "Delrose Drive at Riverside Road." Please correct this to say "Delrose Drive at Riverside Drive" instead since that is the location that this section is discussing.**

   Response: On Page 2 – the second intersection listed has been changed as requested to "Delrose Drive at Riverside Drive".

2) **On Page 61 (Evaluation of Turn Lane Thresholds) and Page 66 (Recommendations for Delrose Drive at SW Entrance) – The turn lane analysis for this location should note that the threshold is very nearly met for an eastbound left-turn lane based on the high through volumes and left turning vehicles in the PM peak period. The recommendations made for this location needs to note that there should be consideration of a left-turn lane since this is a borderline situation and the analysis relies on several assumptions about trip distribution percentages and other variables which could vary from the actual conditions once the development is complete. Please also include the minimum required storage and taper lengths for a potential left-turn lane at this location.**

   Response: An additional sentence has been added to the end of the Evaluation of Turn Lane Thresholds section on Page 62 (formerly Page 61) regarding the near warrant of a left-turn lane at the Proposed Southwest Entrance. An additional discussion regarding the consideration of a separate left-turn lane on Delrose Drive at the Proposed Southwest Entrance was added to the report on Pages 67-68 (formerly Pages 66-67). Finally, this recommendation has been added at the beginning of the report on Page 3.

3) **On Page 70 (Section 7, subsection 7f) – Please specify longitudinal crosswalk type for the recommended internal crosswalks.**

Response: On Page 72, Section 7, Subsection 7f (formerly page 70), the longitudinal crosswalk type has been included. This addition was also made on Pages 4-5.

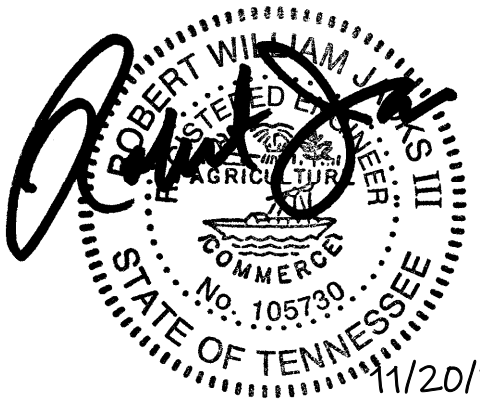
In addition to the revisions listed above, other changes in the report include the following:

- Updated Title Page
- Updated Table of Contents
- Updated Page Footers and Page Numbers
- Minor grammatical changes
- Added Appendix J to include this response letter

If you have any questions or further comments, don't hesitate to contact me. We look forward to your approval.

Sincerely,

Ajax Engineering, LLC
Robert W. Jacks, P.E.



11/20/2024

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February 28, 2025

PROJECT NAME: Cardinal Place (12-A-24-PD)
TO: Knoxville-Knox County Planning
SUBJECT: Response Document for the Cardinal Place TIS Review Comments

Knoxville-Knox County Planning and City of Knoxville Department of Engineering Staff:

The following response document addresses the comments in an email from Jessie Hillman, AICP, dated February 27, 2025. This letter is added to the end of the revised report in Appendix J.

1) **The final plan package we have for the Cardinal Place development stipulates a total of 650 units (570 apartments + 80 townhouses), rather than the 627 units in the TIS. Can you revise the study to account for this increase, or provide an addendum about this with any recommendation changes?**

   Response: The increase in housing units has been reflected and changed throughout the updated TIS report. Overall, this small increase in housing units only slightly impacted the results and did not change any of the original recommendations provided in the report other than the road widening width listed in the following.

2) **Also, City Engineering has shared that they would require Riverside Road to be widened by 20 ft, not 18 ft. Can you reflect that requirement in the study as well?**

   Response: This requested change has been made in the recommendations on Pages 2 and 66.

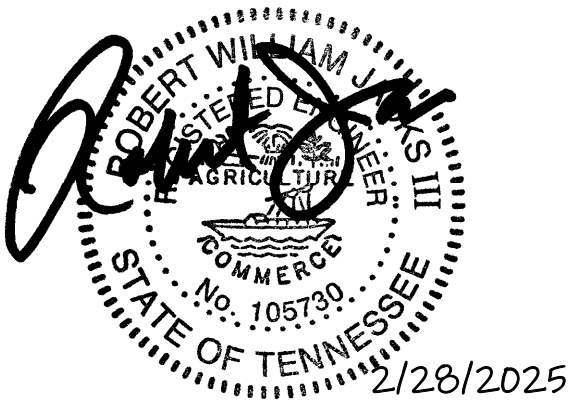
In addition to the revisions listed above, other changes in the report include the following:

- Updated Title Page
- Updated Page Footer Date
- A few Minor grammatical changes

If you have any questions or further comments, please get in touch with me. We look forward to your approval.

Sincerely,

Ajax Engineering, LLC
Robert W. Jacks, P.E.



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