Bicycle & Pedestrian Safety Study - Draft

MEMORIAL PARKWAY

HUNTSVILLE, ALABAMA

Prepared for:

HUNTSVILLE

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NOTICE

This document and its contents have been prepared and are intended solely as information for the City of Huntsville and their use in relation to pedestrian safety on Memorial Parkway.

Document History

Revision	Purpose	Originated	Reviewed	Authorized	Date
Version 1.0	Draft Report	JET/PDS	JK	JH	01/21/2022
Version 2.0					

Client Signoff

Client	**City of Huntsville**
Project	Memorial Parkway Pedestrian Crossing Evaluation
Job Number	3232154
Contract Number	General Services
Client Signature / Date	

TABLE OF CONTENTS

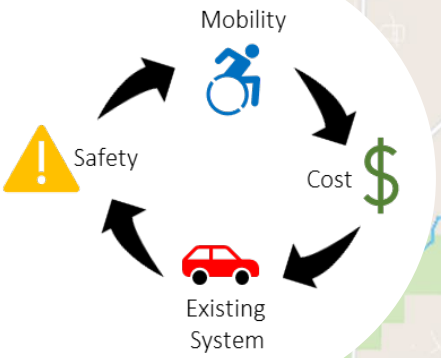
This section introduces the study area, the purpose and importance of the study, and the goals outlined with the City.

1.1. Purpose

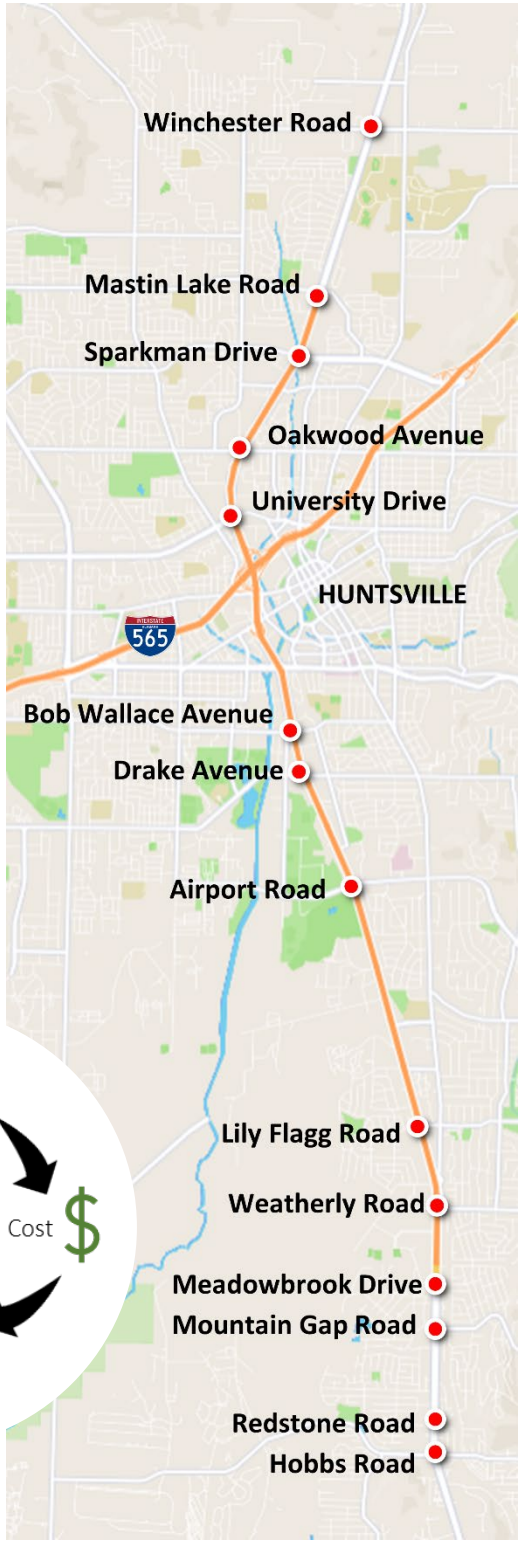
The City of Huntsville is located in the northeast region of the state of Alabama. Huntsville has been experiencing considerable growth over the past decade, and with that increase in population has also come an increase in transportation demand from automobiles, pedestrians, and bicyclists. Memorial Parkway is the vital north-south route for residents of Huntsville, and its intersections and interchanges along the corridor provide critical east-west access for not only vehicles, but pedestrians and bicyclists as well. The purpose of this study is to assess the current pedestrian and bicycle facilities, accidents, patterns, and demand at the following 14 intersections in Memorial Parkway, in Huntsville Alabama:

1. Winchester Road
2. Mastin Lake Road
3. Sparkman Drive
4. Oakwood Avenue
5. University Drive
6. Bob Wallace Avenue
7. Drake Avenue
8. Airport Road
9. Lily Flagg Road
10. Weatherly Road
11. Meadowbrook Drive
12. Mountain Gap Road
13. Redstone Road
14. Hobbs Road

This study will also provide recommended improvements that balance mobility, the cost to improve, the limits of the existing system, and safety of the end users.



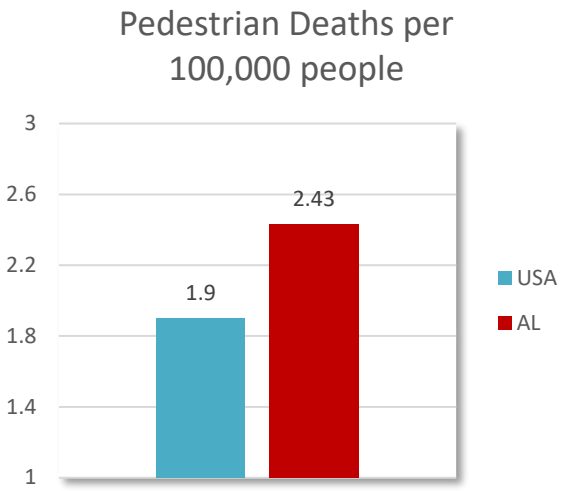
Study Intersections

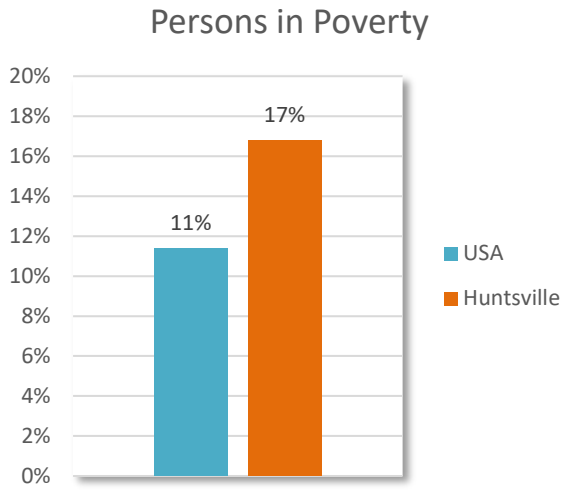


1.2. Importance

Memorial Parkway (US 431/231) runs through the heart of Huntsville and North Alabama, forming the primary north-south corridor in the region after Interstate 65. In 2018, the Parkway carried over 125,000 vehicles per weekday through the heart of downtown Huntsville. For much of the corridor, Memorial Parkway includes a central freeway that provides vehicular mobility, and adjacent frontage roads that provide local access to dense commercial and residential land uses. This dual purpose creates a unique transportation environment along the north-south corridor, where high automobile traffic volumes intersect at consecutive major east-west streets in areas with rising pedestrian and bicycle traffic. These intersections are closely spaced and form the primary commercial and residential hubs along the corridor that generate significant bicycle and pedestrian traffic.

According to 2019 data from the National Highway Traffic Safety Administration, these pedestrians are at great risk. Alabama ranks 9th among states in worst pedestrian fatality rates, with 2.43 pedestrian deaths per 100,000 people. This is over 25% greater than the national average. Several pedestrian crashes have been experienced near these study intersections, including a pedestrian fatality as recent as December 2021. National safety programs such Vision Zero highlight how unacceptable these pedestrian deaths are despite their prevalence.





Huntsville specifically serves a greater number of users in poverty that are forced to navigate these intersections. According 2019 USA Census Data, the rate of persons in poverty is 5% higher than the national average.

Improving bicycle and pedestrian safety not only protects these vulnerable users but encourages more bicycle and pedestrian activity at these key intersections, encouraging their growth as commercial and residential hubs. Health from physical activity is a further benefit; According to the CDC, Alabama had 39% obesity prevalence in 2020.

Most importantly, bicycle and pedestrian facilities can foster connection between communities and attractions. The freeway of Memorial Parkway currently can function as a physical barrier for bicyclists and pedestrians, shutting off the east side from the west. By building connections at these crucial intersections a community may be created and enjoyed at person scale, not freeway scale.

Huntsville is one of the fasted growing cities in Alabama; as population grows, so will pedestrian and bicycle traffic. Bridging these intersections is one of the first steps in moving forward to serving a larger city while promoting economic, quality of life, and safety benefits.

1.3. Process

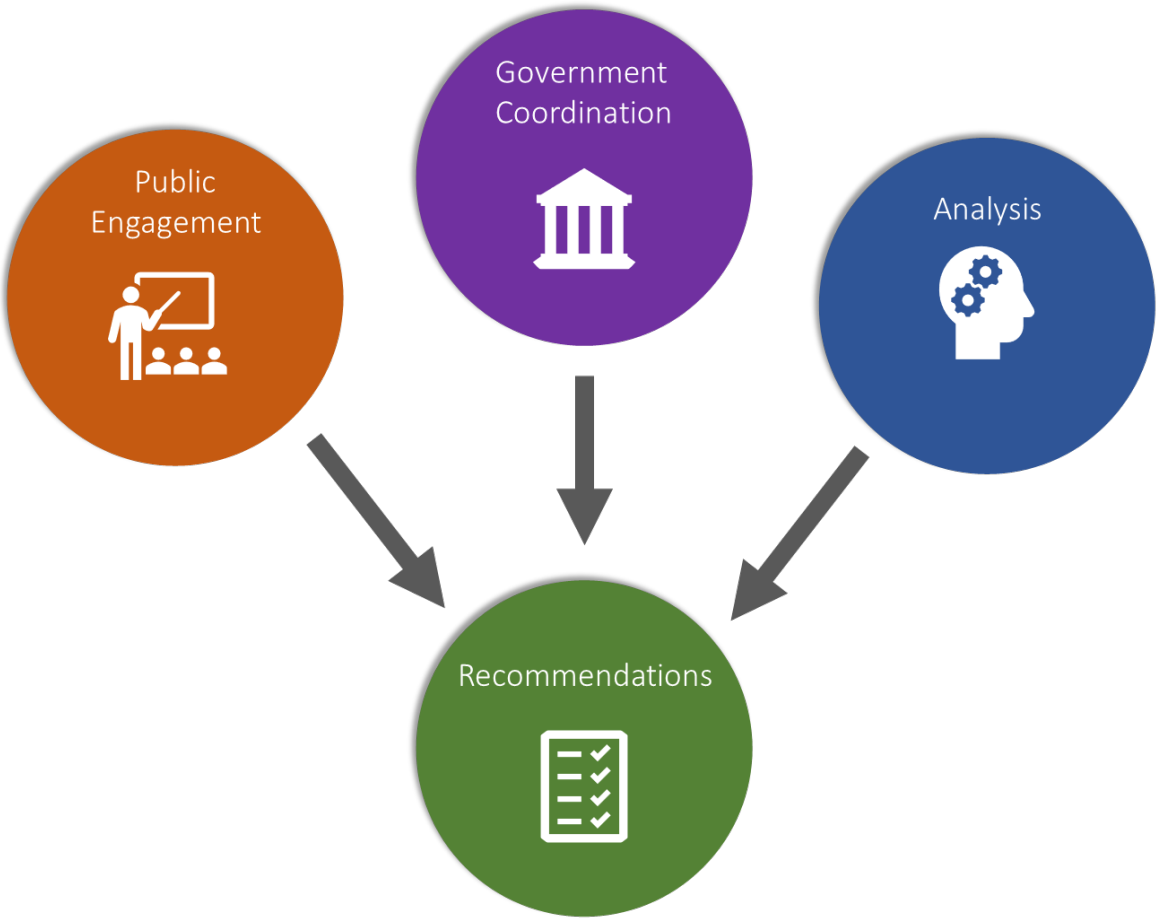
The process to evaluate recommendations comes from several sources.

Public engagement must provide real-world data and insight from the people actually using these facilities.

The **local government** must provide direction on what improvements are feasible and fit the City's goals.

Analysis of existing conditions must provide context on connecting real world conditions with a regional context.

These all coalesce to create practical recommendations within the study area.



2. PUBLIC INVOLVEMENT

To reach a diversified group of stakeholders the project team reached out to both the general public and the local business community to participate ad comment. In total, three meetings were held to engage stakeholders and collect information from communities involved in the study area. Graphics for each intersection were provided and comments were collected with markers by category:

- **Orange** – Points of interest for pedestrians & bicyclists
- **Blue** – Conflict points for pedestrians & bicyclists
- **Yellow** – Observed safety issues for pedestrians & bicyclists
- **Green** – General comments

Meeting Board with Comments

Each meeting collected valuable contributions from the respective groups and were included in analysis and recommended improvements for the assessment. These comments were digitized in GIS.

Example Comments at Mastin Lake Road

2.1. Meeting #1

The first meeting engaged the leaders of the North and South Huntsville Business Associations.

The North Huntsville Business Association is “a non-profit organization promoting a positive and informed business environment for its members to achieve cultural, civic, social, economic, and business goals, and actively contribute to the North Huntsville Community.”

The South Huntsville Business Association “supports, promotes, and advocates for businesses in South Huntsville [and is] dedicated to developing and maintaining a healthy, thriving business climate in South Huntsville by supporting existing businesses and attracting new businesses.”

The comments generally addressed improving connectivity across Memorial Parkway to enhance businesses access, as well as highlighting the major businesses in the respective regions.

2.2. Meeting #2

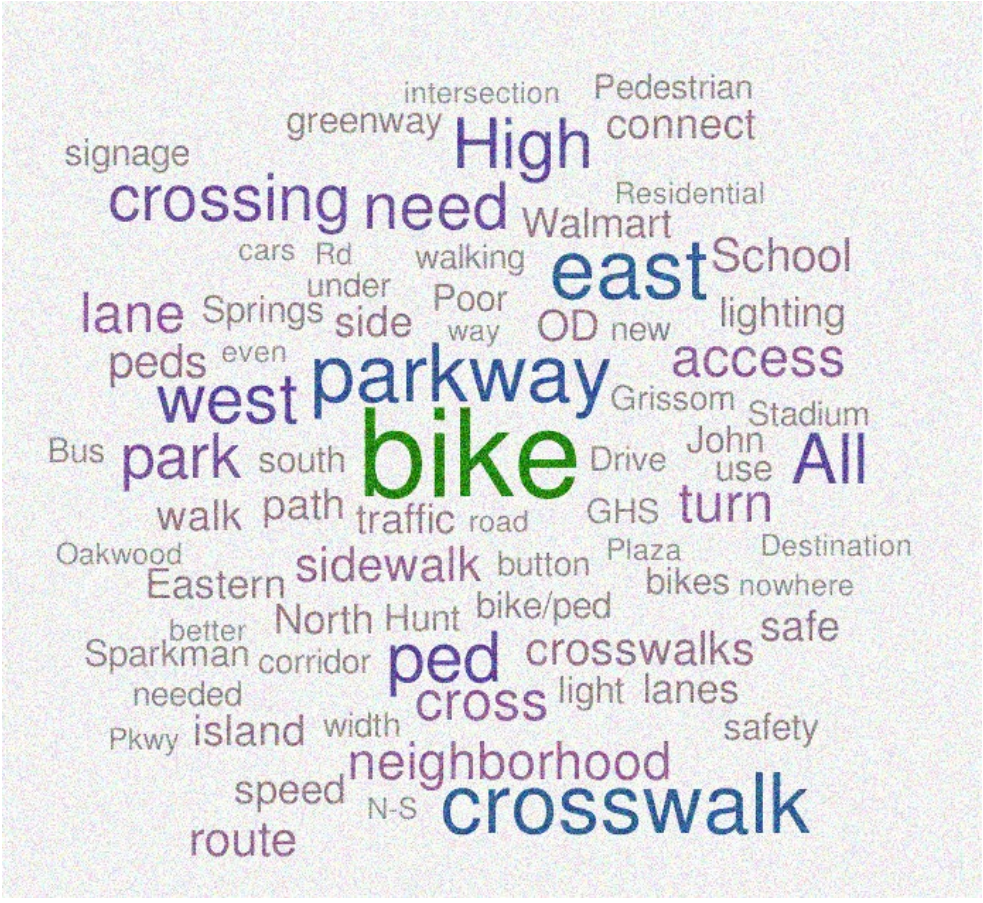
The second meeting included the Bicycle Advisory and Safety Committee, “an organization that provides knowledge about cycling to advance education, enable planning, encourage cycling, and develop safe transportation facilities

in the Huntsville area". These avid bicyclists provided detailed comments on dangerous pinch points as well as general intersection configuration comments. There were several requests for greater bicycle infrastructure.

2.3. Meeting #3

The final meeting was open to the general public and collected diverse comments from a broad spectrum or participants from across the entire study area.

The following is a word cluster diagram developed from the data base of received comments from all three meetings.



2.4. Results

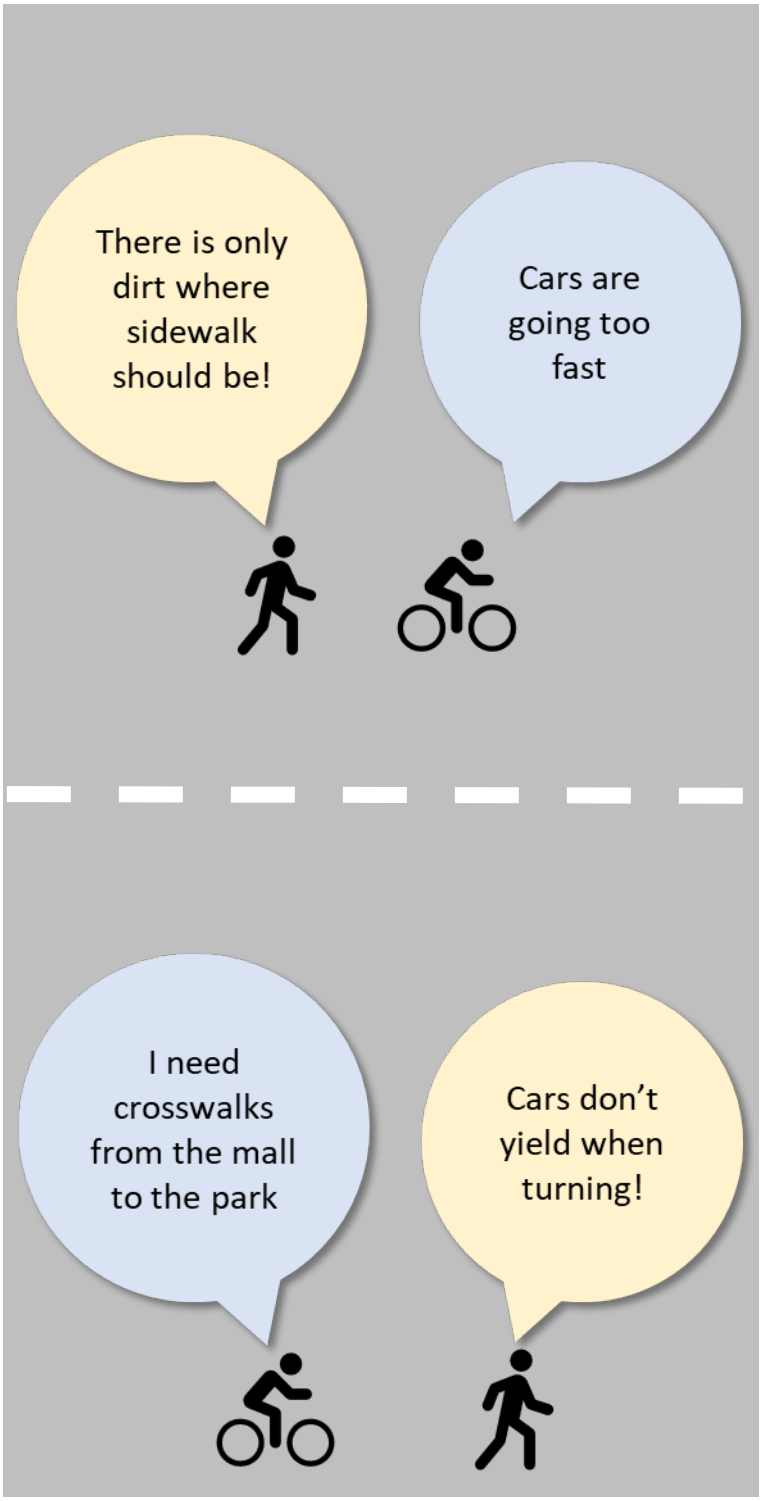
As expected, the majority of the comments focused on lack of east-west connectivity and the lack of bicycle facilities. Most of the comments received regarding connectivity issues were a result of lack of sidewalk or pedestrian landings. Additionally, most study intersections include origins and destinations on opposite sides of Memorial Parkway. Below is a selection of responses from the public involvement meetings at two of the major urban interchanges.

2.4.1. Oakwood Avenue

There are several trip generators and attractors in close proximity to the Oakwood Avenue intersection/urban interchange that lead to the increased multimodal demand in this area. Examples include the Kroger and the Madison County Service Center office. Due to this demand several comments received pointed to the lack of sidewalk and crosswalk connectivity at the intersection/urban interchange and in the immediate area.

2.4.2. Drake Avenue

Similar to Oakwood Avenue numerous comments pointed out the lack of sidewalk and crosswalk connections at the intersection entirely. The Parkway Place Mall and other smaller retail malls are huge attractors in the region. Additionally, several parks are located on the west side of the parkway.

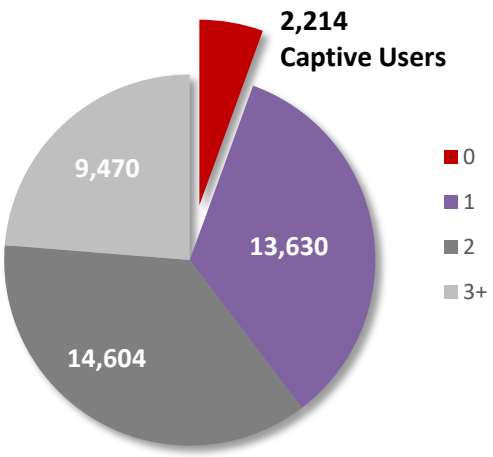


This section covers the existing conditions of the study intersections, including data provided by the City of Huntsville and the results of the field audit.

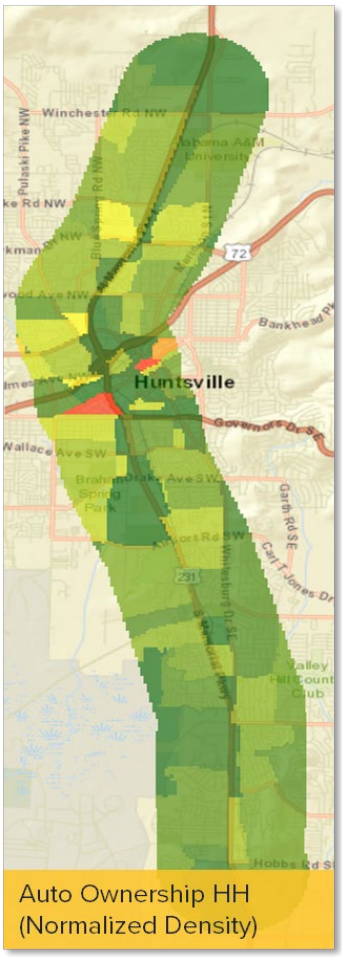
3.1. Census Data

Census data was provided by the City of Huntsville of cars per household by Traffic Analysis Zone (TAZ). Based on that data, 2,214 households in Huntsville do not have a car, and 13,630 have one car. These households are captive users, people that only walk, use transit, or bike. These are the users most endangered by poor pedestrian facilities and are forced to navigate extreme conditions along the corridor to access healthcare, employment, and commercial land uses.

Cars per Household

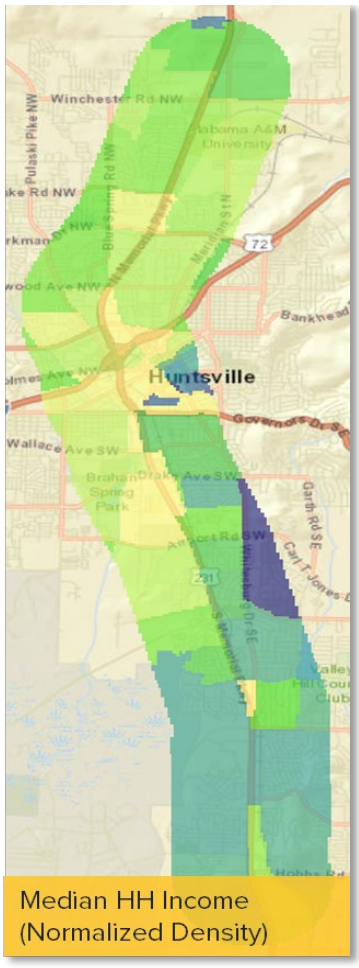


Zero Auto Ownership Density



The relationship between household income and auto ownership has been discussed and debated more in recent years as demographics have begun to change and larger groups of population are moving back into the urban and downtown core inside metropolitan areas. These two density maps showcase auto ownership, with the dark shades representing higher density of lower auto ownership, and median household income, with darker shades representing higher income. It begins to become clear why this discussion is resurfacing; upon inspection, the traditional argument of the direct correlation between high income equaling high auto ownership appears to match until reaching the urban and downtown core where we see the shifting trend of high income but lower auto ownership. As the general population's desire has increased to live, work, and play closer to home, and multimodal facilities generally are more available in the urban and downtown core, this trend can be reasonability expected to continue.

Median Household Income



3.2. Land Uses

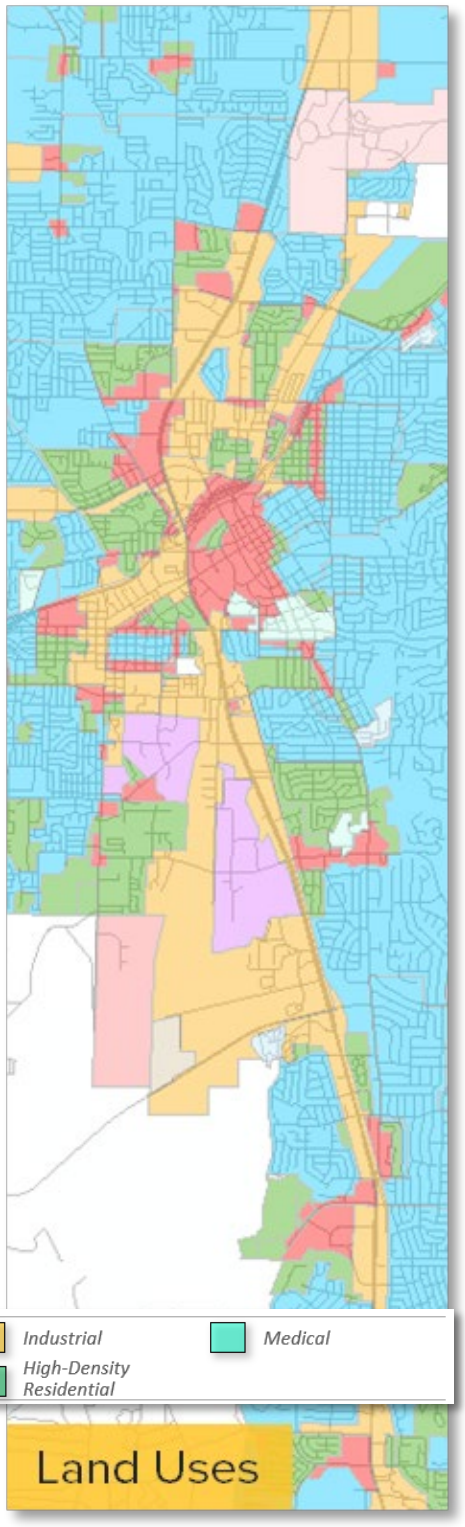
Land uses along the Memorial Parkway provide insight on what type of bicycle and pedestrian activity is prevalent along the corridor. Land uses in Huntsville were obtained from the City and evaluated at each study intersection. As expected, the central corridor of Memorial Parkway is classified as Industrial, supplemented by Commercial. These central zones are generally bounded by Residential zones. Closer to the downtown core, Industrial and Commercial zones extend much of the walking distance from the intersections, but beyond the downtown core, most zones are Residential besides any directly adjacent to Memorial Parkway.

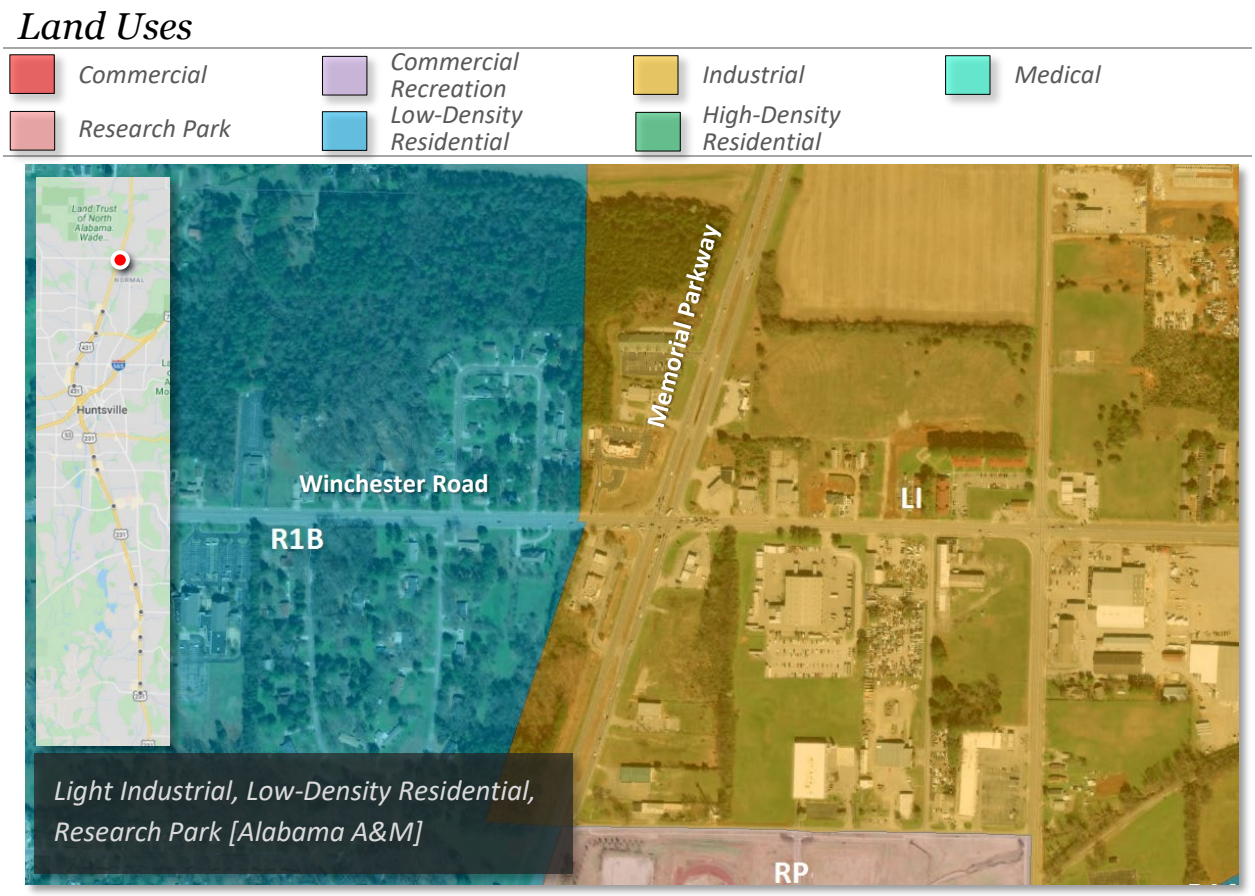
Detailed maps of the land uses are shown in the following figures.

Land use type interaction plays an integral part in overall transport demand and specifically bicycle and pedestrian. Proximity of homes, work, schools, recreation, restaurants, retail, etc. to non-motorized facilities and the level of connectivity is an important piece in creating a connected community.

Connected Community

Land Uses by Category




Land Uses
Commercial
Commercial Recreation
Industrial
Medical
Research Park
Low-Density Residential
High-Density Residential
Winchester Road
R1B
Memorial Parkway
LI
RP
Light Industrial, Low-Density Residential, Research Park [Alabama A&M]

1


C1
Memorial Parkway
R1A
RP
Mastin Lake Road
R2B
R2B
LI
R1B
Light Industrial, Residential, Commercial, Research Park [Alabama A&M]

2

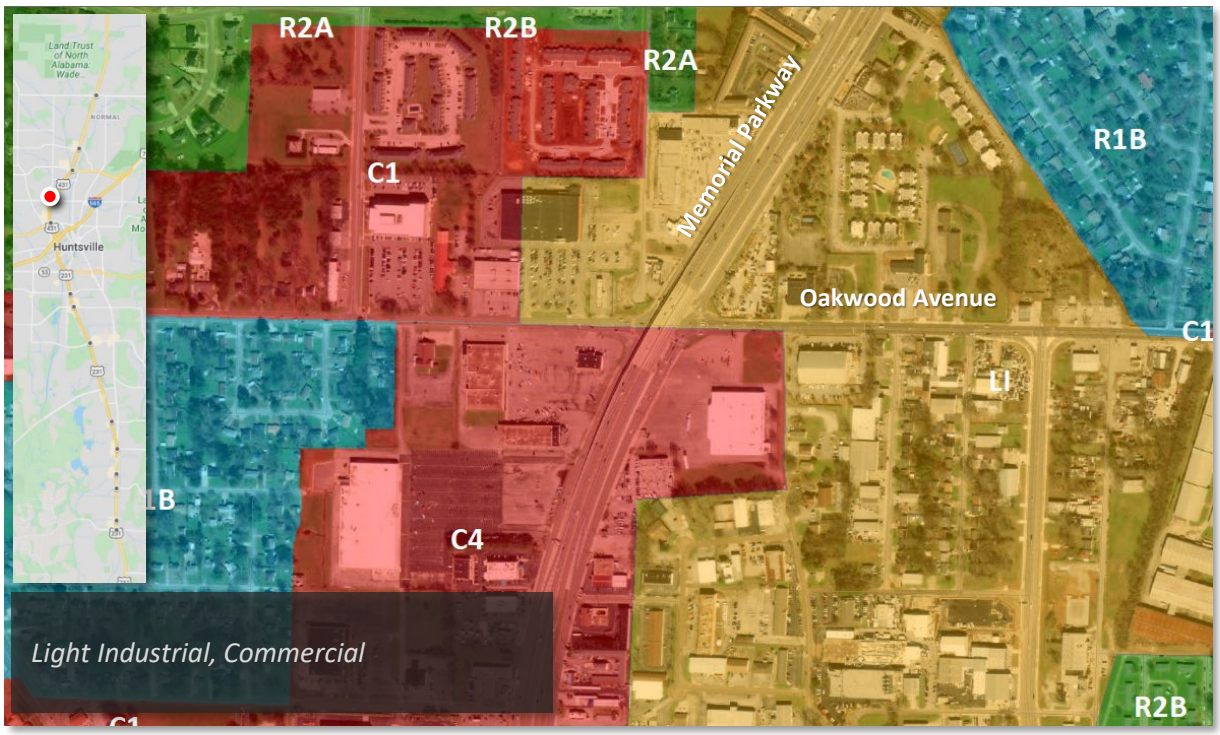
Land Uses

Commercial | *Commercial Recreation* | *Industrial* | *Medical*

Research Park | *Low-Density Residential* | *High-Density Residential*

3

4



Land Uses

Commercial | *Commercial Recreation* | *Industrial* | *Medical*

Research Park | *Low-Density Residential* | *High-Density Residential*

5

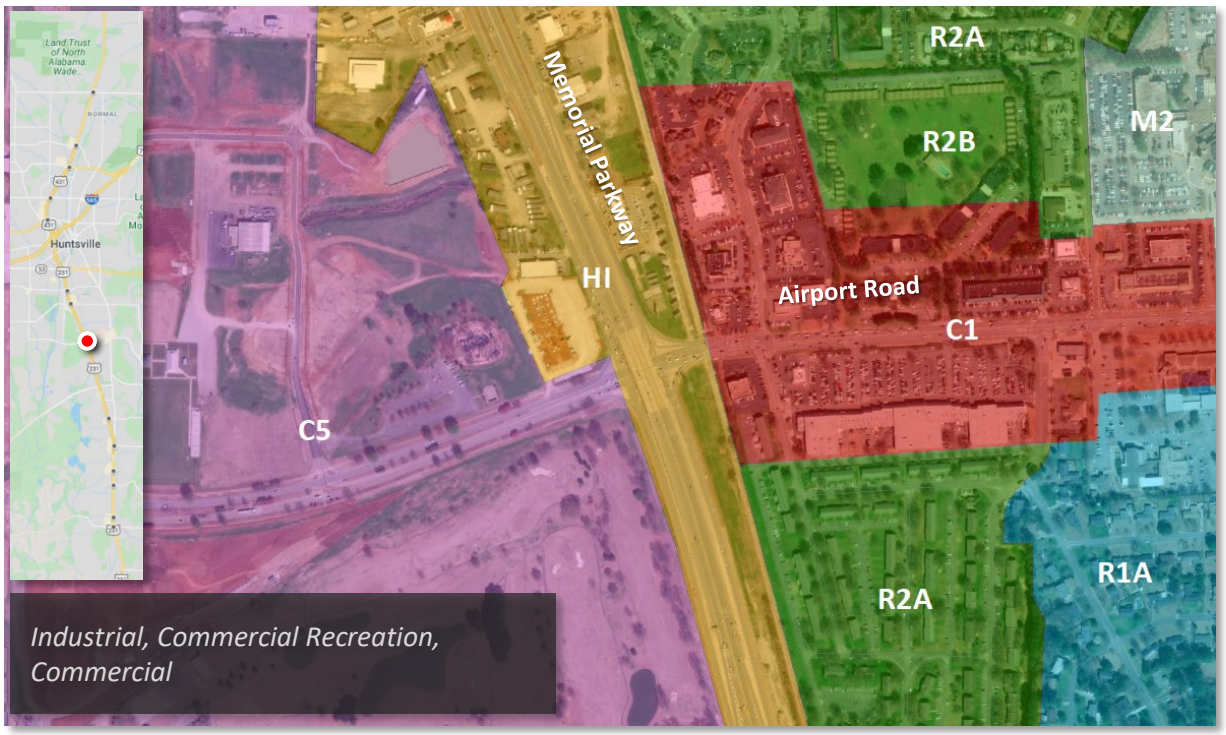
6

Land Uses

- *Commercial*
- *Commercial Recreation*
- *Industrial*
- *Medical*
- *Research Park*
- *Low-Density Residential*
- *High-Density Residential*

7

8



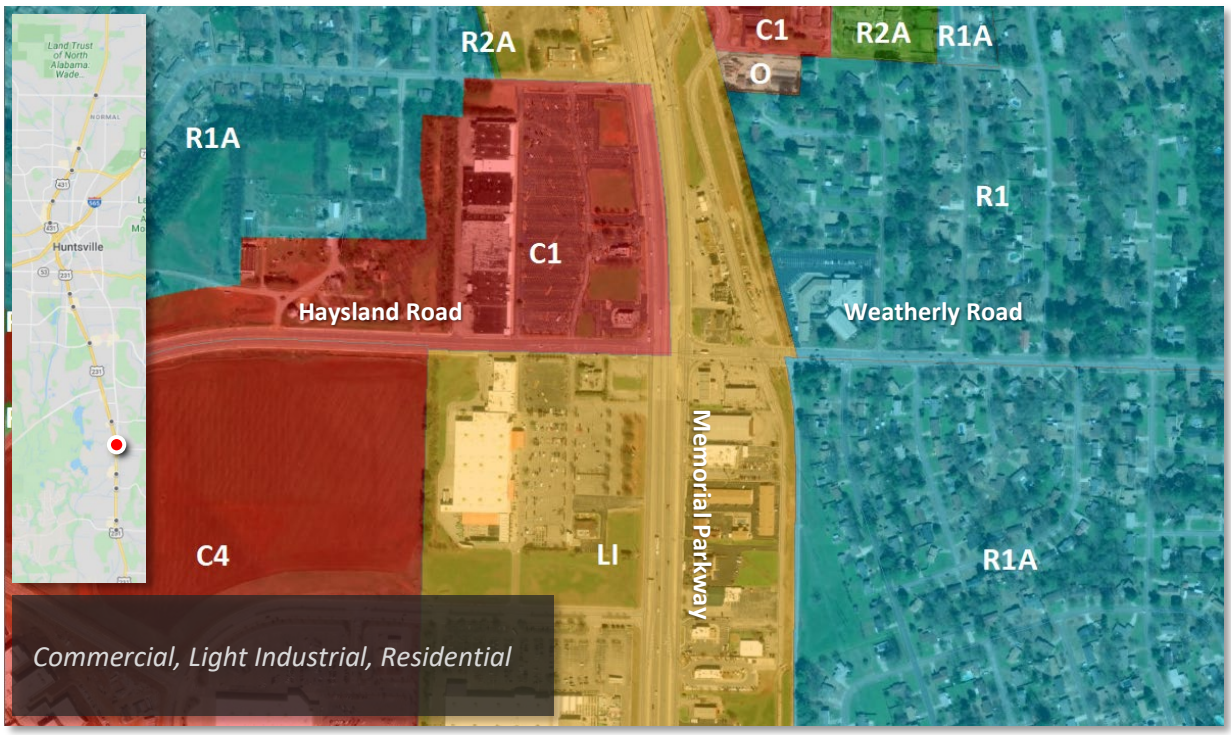
Land Uses

Commercial | *Commercial Recreation* | *Industrial* | *Medical*

Research Park | *Low-Density Residential* | *High-Density Residential*

9

10

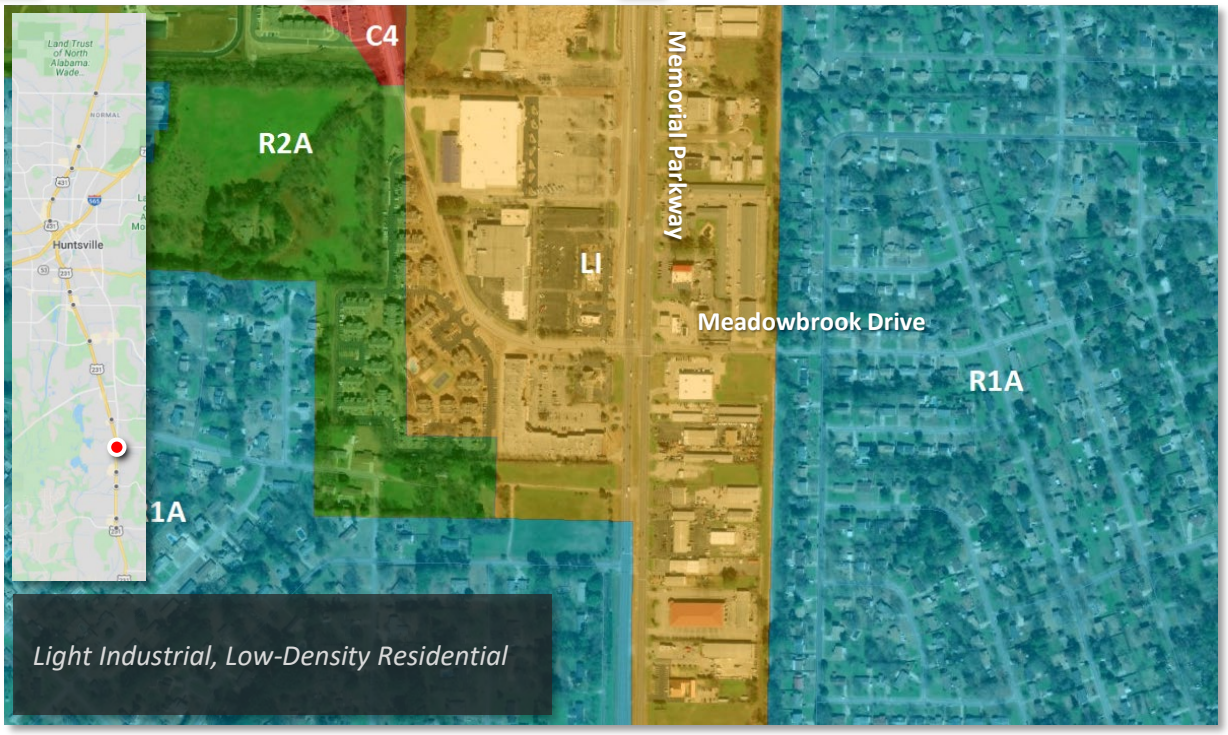


Land Uses

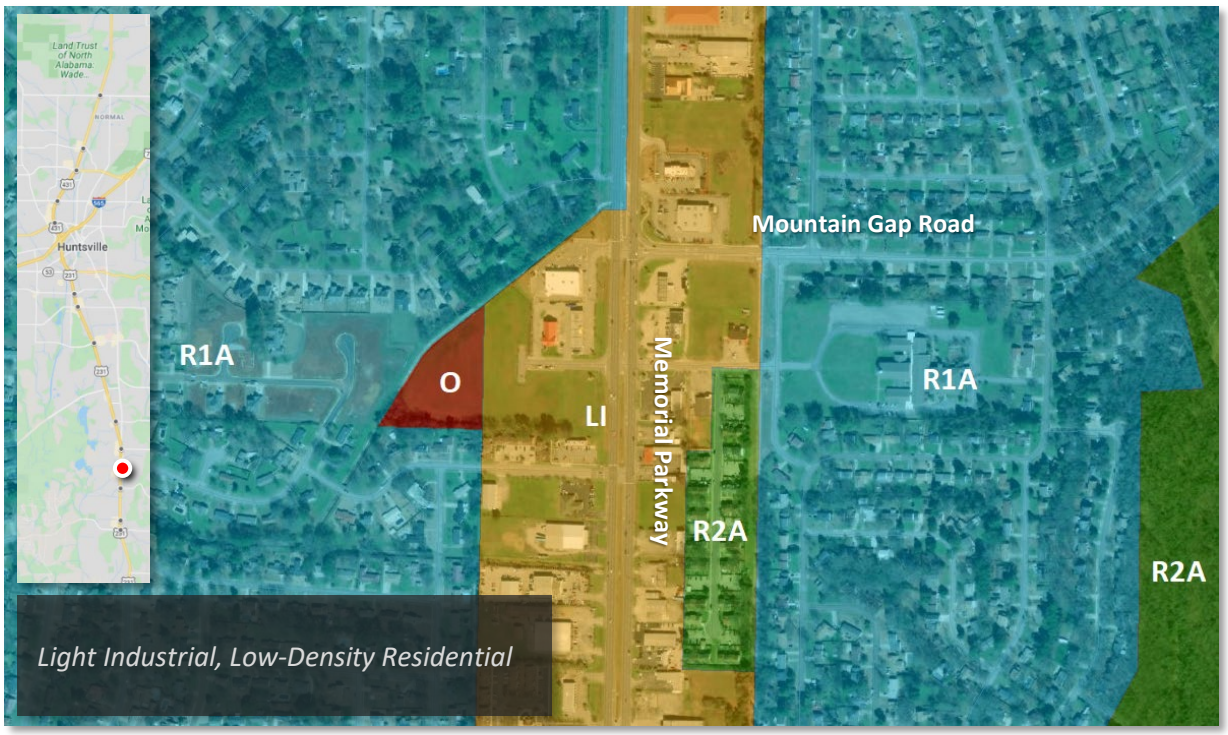
Commercial | *Commercial Recreation* | *Industrial* | *Medical*

Research Park | *Low-Density Residential* | *High-Density Residential*

11



12



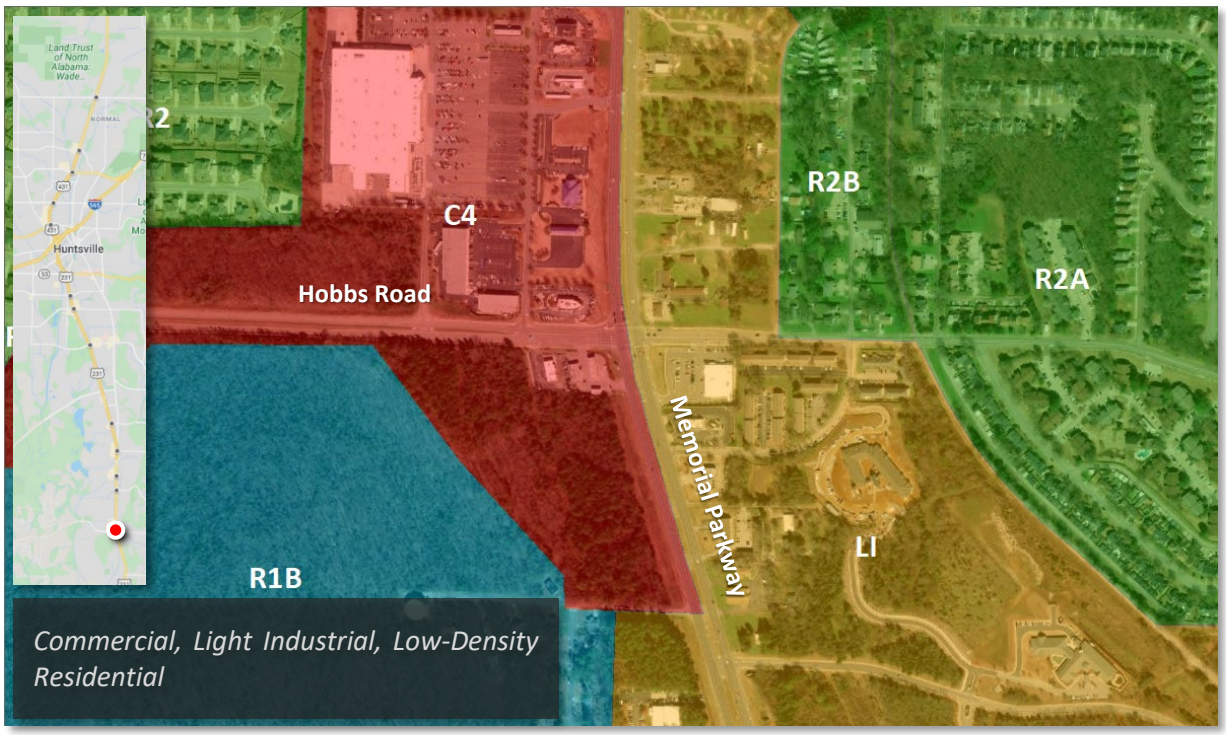
Land Uses

Commercial | *Commercial Recreation* | *Industrial* | *Medical*

Research Park | *Low-Density Residential* | *High-Density Residential*

13

14



3.3. Bicycle and Pedestrian Demand

Non-motorized travel has received increased awareness in recent years as the sustained growth in demand for roadway travel has mostly gone unmet by expansions in capacity, primarily due to continued funding limitations. Limited funding and the competitive nature of most funding programs, coupled with raising costs in fuel sources for traditional transport modes, have led to the growing need for support in prioritizing need and function coupled with sustainable design. Bicycle and pedestrian demand are still more difficult to model than larger scale modes of transport such as vehicle and transit due to nuance associated with analysis variables. Until recently, most tools available to regulatory agencies have been quite limited, but with the sophistication of data collection and analytical modeling tools these efforts have become more readily available to agencies.

For the purposes of this study, a multitude of data and data sources where utilized to create the relationship equation discussed in detail below. This modeling provides a picture of what non-motorized trips can be expected in the region. This model takes into account factors identified in the existing inventory, such as existing bicycle and pedestrian facilities, points of interest (like schools and retail), transit stops, and the population density.

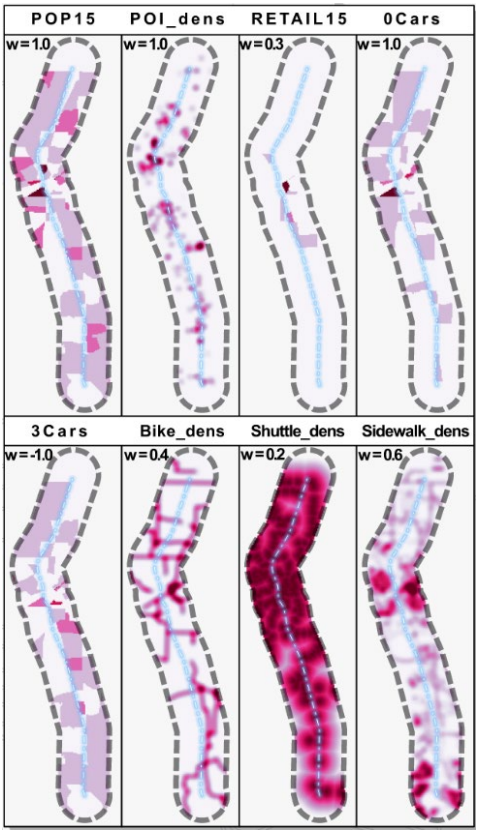
3.3.1. Modeling Approach

Non-motorized travel demand was modeled as a direct demand model as specified in Kuzmyak et al. (2014) that estimates demand as a function of variables defined over the study extent. The model defined below for this analysis shows that demand is specified as a linear combination of variables considered to have the most potential influence.

$$D = (W_1)POP15 + (W_2)POI_{dens} + (W_3)RETAIL15 + (W_4)0Cars + (W_5)3Cars + (W_6)Bike_{dens} + (W_7)Shuttle_{dist} + (W_8)Sidewalk_{dens}$$

where

D = non-motorized demand
$POP15$ = population density (2015)
POI_{dens} = point of interest desity
$RETAIL15$ = retail employment in (2015)
$0Cars$ = 0 cars per household
$3Cars$ = 3 cars per household
$Bike_{dens}$ = density of bike paths
$Shuttle_{dist}$ = distance to shuttle stop
$Sidewalk_{dens}$ = sidewalk density



The parameters, or weights (W_n) defining the relationship between the input variables and demand can be calibrated (e.g., through regression) if applicable demand survey data is available. However, no applicable survey data was available for this analysis, and the parameters were informed by the models and data presented in Kuzmyak et al. (2014), as well as from local knowledge.

The input variables were developed from data aggregated by TAZ zone, as well as from data from the City of Huntsville Data Depot. All inputs were normalized to range between 0 and 1, with all TAZ data also being normalized by zone area. The variables, or layers, and their weights are illustrated below over the study extent.

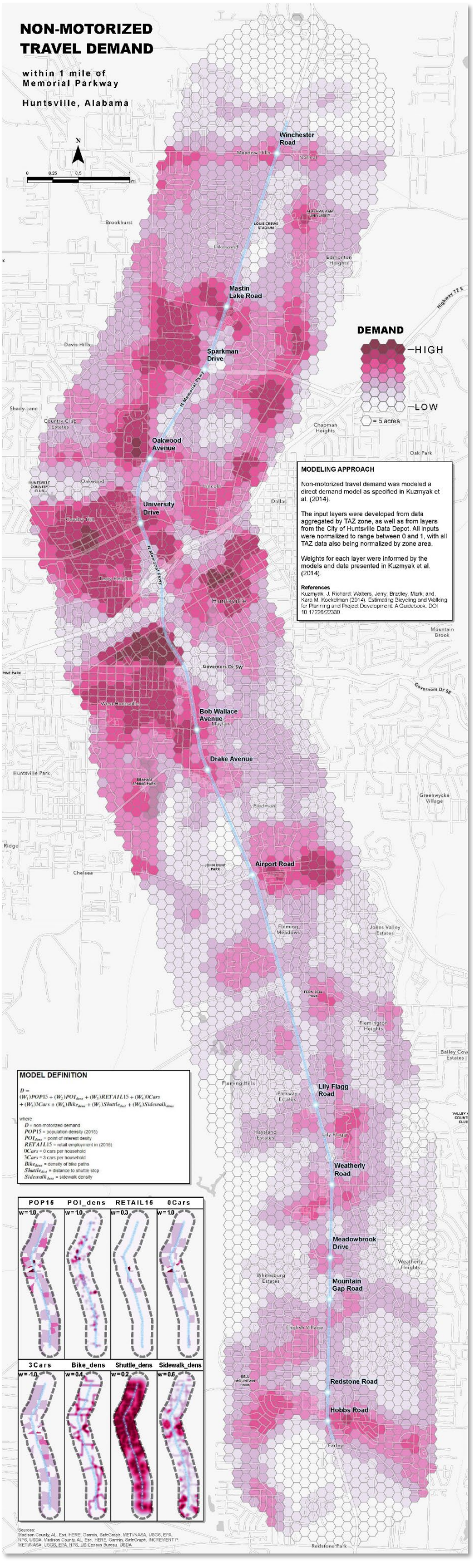
3.3.2. Modeling Results

The demand results are shown right. As shown, the expected non-motorized trip demand centers around the downtown intersections, particularly at Governors Drive and Clinton Avenue. Of the study intersections, the following intersections show greater than expected non-motorized demand:

- Mastin Lake Road
- Sparkman Drive
- Oakwood Avenue
- University Drive
- Bob Wallace Ave
- Drake Avenue

The model results provide focus for those intersections which represent the greatest demand and in correlation need within the identified study area. These intersections experience denser points of interest and greater population with fewer vehicles per household. These are not exact results, but do confirm existing observations and create a greater distinction between intersections that appear similar.

Non-Motorized Travel Demand



3.4. Level-of-Stress

MTI Report 11-19: Low-Stress Bicycling and Network Connectivity (Mineta Transportation Institute, 2012) puts forth methodology for evaluating the level of comfort experienced by bicyclists on roadway facilities, scored from 1 (comfortable for all ages and abilities) to 4 (comfortable for only strong and fearless bicyclists). There are two sets of factors that contribute to this score:

Geometric Characteristics

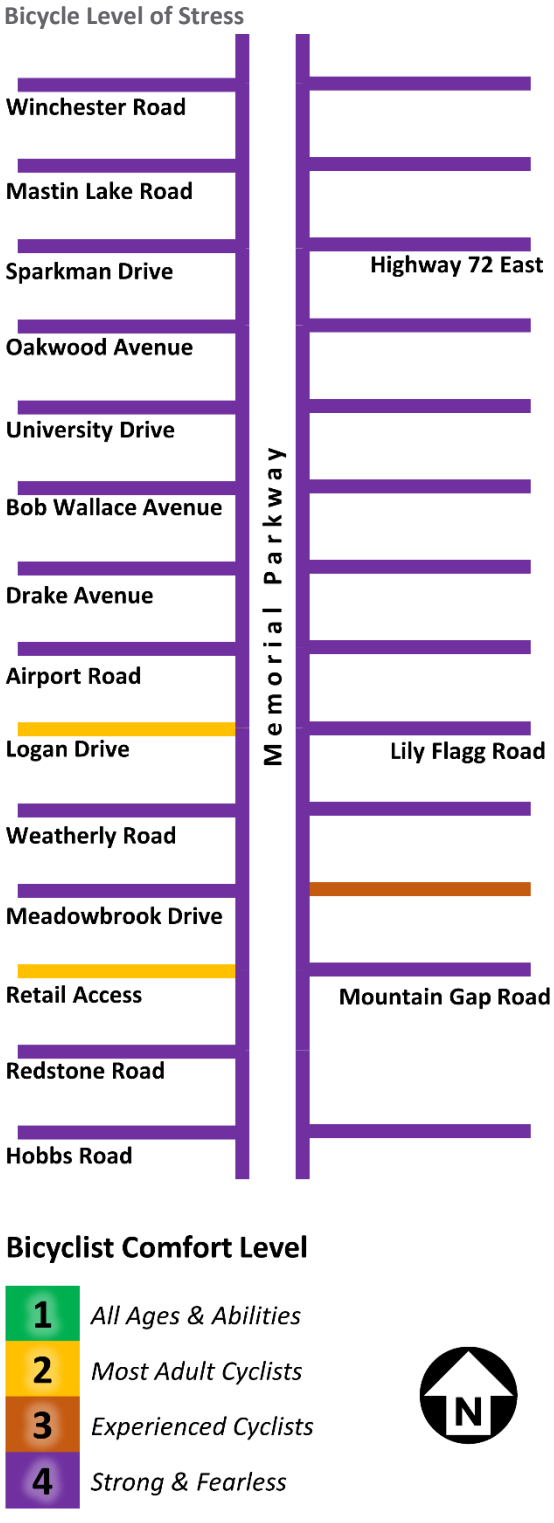
- Roadway width – number of travel lanes
- Presence of bicycle lanes – yes or no
- Presence of parking lanes – yes or no

Traffic Characteristics

- Posted speed limit
- Annual average daily traffic (AADT) volumes

The level-of-stress results for the study intersections are shown right. As expected, the majority of Memorial Parkway and intersecting study streets accommodate only Level 4 – Strong and Fearless bicyclists. This is due to the high speed, high volumes of traffic accommodated by these streets, and the limited bicycle facilities available. The exceptions are Logan Drive and Retail Access, which can accommodate Most Adult Cyclists, and the east leg of Meadowbrook Drive, which can accommodate Experienced Cyclists.

Bicyclist with no marked crossing at Drake Ave



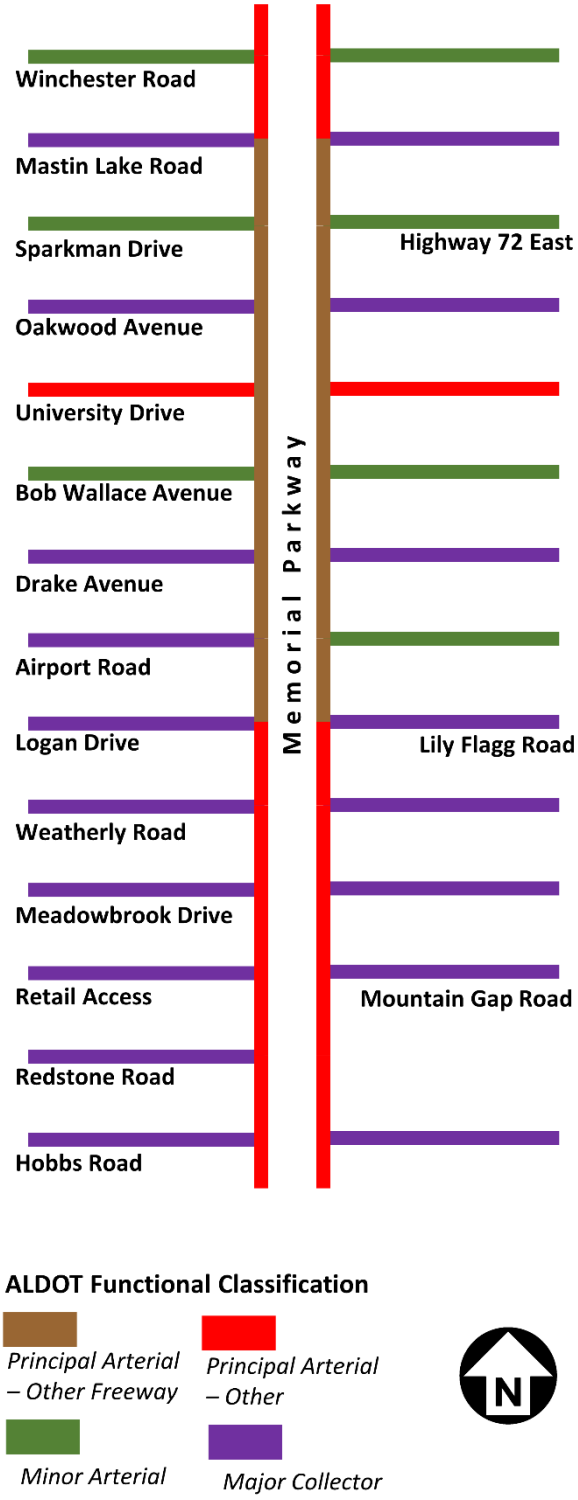
3.5. Roadway Functional Classification

Each street in the study area is classified by ALDOT according to function, classified as either Arterial, Collector, or local street. These functional classifications group streets with similar characteristics, with arterials servicing regional traffic, and local streets only accommodating neighborhood traffic. The functional classification of streets along the corridor are shown.

As expected, Memorial Parkway is classified as a Principal Arterial, with freeway sections classified as such. Of the study streets intersecting Memorial Parkway, most are classified as major collectors, which distribute traffic to minor collectors and local streets. However, some streets are classified as minor arterials, which connect major arterials and collectors. University Boulevard is the only intersecting street classified as a Principal Arterial.

University Boulevard – Principal Arterial

Functional Classification Diagram

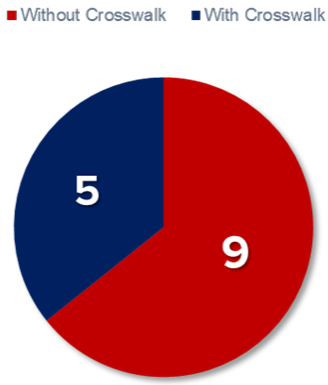


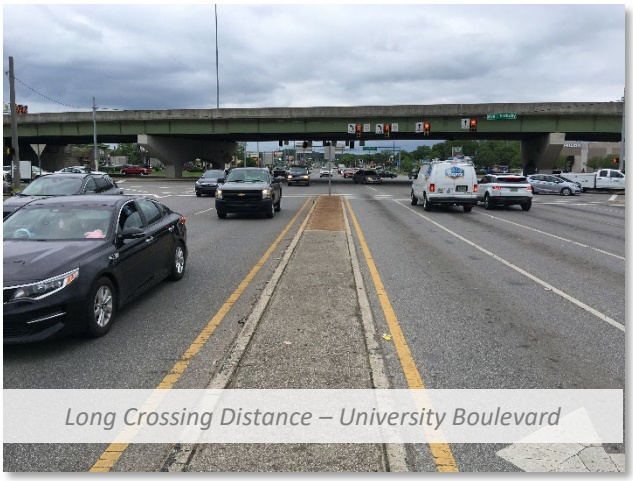
3.6. Existing Facilities Field Audits

In order to best understand the conditions of the Memorial Parkway corridor, an inventory was taken of each intersection in the study area. This inventory included an extensive inspection of the bicycle and pedestrian facilities, including condition, lighting, obstructions, and other field observations. Each intersection was first cataloged using online tools, and subsequently verified in the field. The results of the inventory for each intersection are shown below.

Pedestrian button on Drake Avenue

Overall, the corridor provides either no or only minimal facilities for bicycles and pedestrians. The majority of the study area along Memorial Parkway does not include sidewalk along the mainline, forcing pedestrians to navigate parking lots and grass shoulders to access the extensive retail and services on Memorial parkway. If a study intersection does include pedestrian facilities, those facilities are only provided on some of the intersection legs, and are usually only partial facilities, lacking receiving sidewalk, ramps, or pedestrian signal heads. The first of these is a particular problem, with pedestrian buttons located in street corners without sidewalk.




Long Crossing Distance – University Boulevard

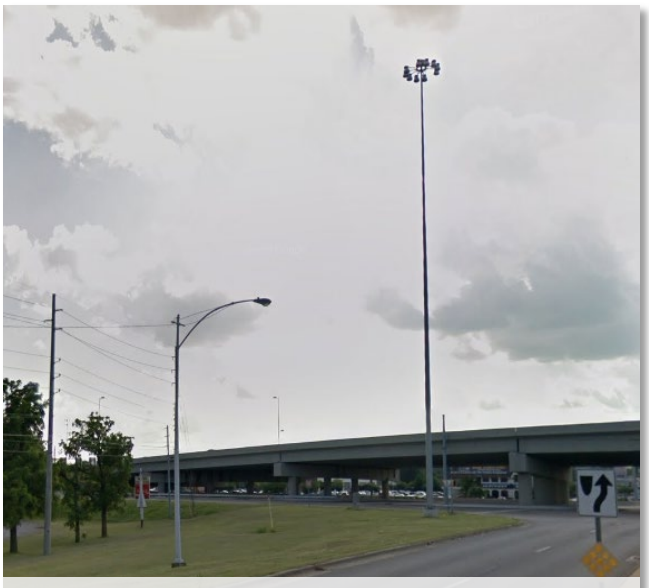
There are also considerations particular to the design of the separated freeway and frontage roads of Memorial Parkway. Most of the streets intersecting Memorial Parkway have several turning and through lanes at each approach, with no pedestrian refuge in the medians, resulting in extremely long and vulnerable pedestrian crossings on those streets. The mainline of Memorial Parkway also results in long pedestrian crossings due to bridge overpasses or grass medians. Although the bridge overpasses do offer pedestrian refuge, these crossings are not well lit and not clearly marked.

Dedicated bicycle facilities at the study intersections are nearly nonexistent. Several of the streets intersecting Memorial Parkway are signed as bike routes, but most are dangerous to navigate due to their size and the volumes those streets service. There is one bicycle lane in each direction on Drake Avenue east of Memorial Parkway, but these lanes end with no direction on how to proceed.

These shortcomings are less prevalent at newer crossings, such as the overpasses in the southern area of the study area.

Despite limited facilities, several pedestrians and bicyclists were observed navigating the study intersections. Many were clearly uncomfortable with the unclear wayfinding at many intersections or crossed at improper places since safe crossings were not marked.

Bike Route Sign – Winchester Road



Cobra overhead lighting (left) and high mast lighting (right)

These issues are compounded by the inconsistent and poor lighting provided at each intersection. The majority of intersections have only a couple overhead lights illuminating the entire intersection. Where more lights are present, they generally illuminate the mainline of Memorial Parkway, not side streets or pedestrian facilities. Some lighting is found illuminating pedestrian refuges beneath overpasses on Memorial Parkway, but this lighting does not present a welcoming environment to the busy crossing in low light situations. Lighting generally took the form of standard cobra overhead, high mast, offset, or under bridge lighting. Of these, high mast lighting is considered inadequate for pedestrians and bicyclists, since it takes the form of only a few high-powered lights mounted far above the intersection. This ambient lighting can assist automobile wayfinding but does not adequately illuminate pedestrians or bicyclists.

Sidewalk ends at RR on Airport Rd

Other more minor issues were observed, such as numerous curbs with tire marks, implying short turn radii. Additionally, railroad tracks run parallel with Memorial Parkway south of Governors drive, in some places creating railroad crossings very close to intersections with Memorial Parkway, which often results in disconnected pedestrian facilities.

Only the one overpass intersection implemented a two-stage pedestrian crossing.

Each site visit and field audit included separate evaluations of each approach and transportation mode, including an evaluation of surfaces, geometry, lighting, and observed issues. The following figures summarize the existing conditions at each study intersection.

No Connectivity to Transit Stop – Oakwood Avenue

No Connectivity to Transit Stop – University Drive

MEMORIAL PARKWAY AT WINCHESTER ROAD 01


Memorial Parkway Northbound


Memorial Parkway Southbound


Winchester Road Eastbound


Winchester Road Westbound

NOTES

VEHICLE
- Posted portable changeable message board for speed limit implies speeding issue on Memorial Parkway NB
- Trucks mounting RT channelized islands
- High speed vehicle turns
- Turn radius issue at median

BICYCLE
- No dedicated bicycle facilities
- Minimal, backlit lighting

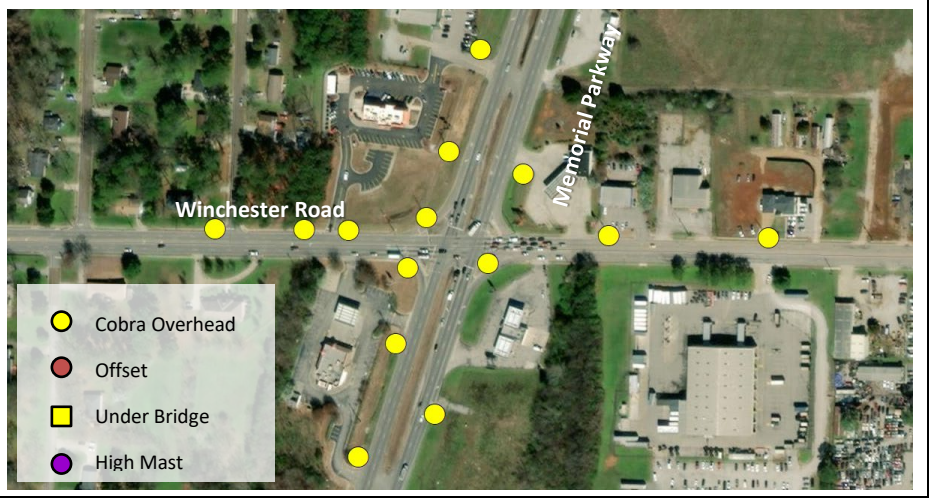
PEDESTRIAN
- Minimal, backlit lighting
- No pedestrian crosswalk facilities connecting sidewalk on East and West legs of Winchester Road
- No pedestrian facilities on Memorial Parkway
- Sidewalk stops short west

OVERALL
- New signals at intersection
- Sight distance and access issues from vegetation


Memorial Parkway Northbound
Poor drainage


Winchester Road Eastbound
Turn radius tire marks

LIGHTING DIAGRAM

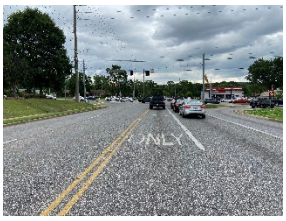


MEMORIAL PARKWAY AT MASTIN LAKE ROAD

02

Memorial Parkway Northbound

Memorial Parkway Southbound

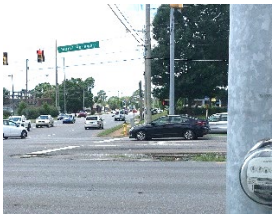


Mastin Lake Road Eastbound

Mastin Lake Road Westbound

NOTES

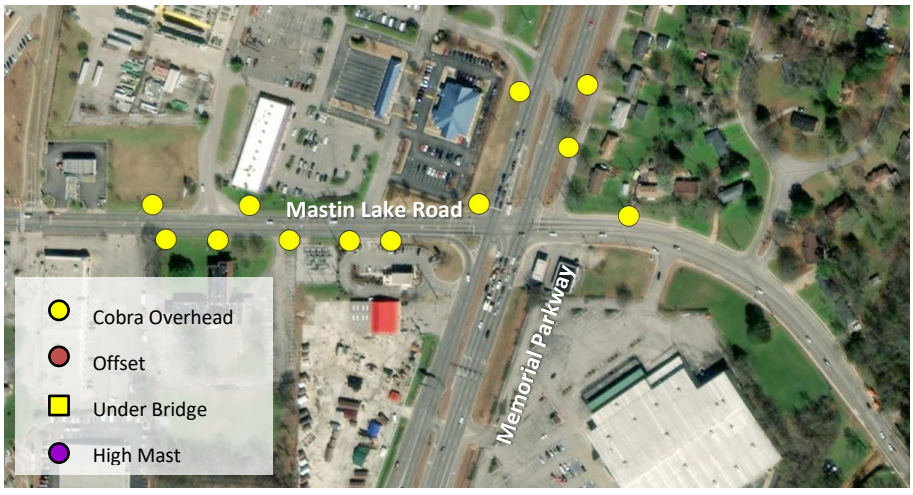
VEHICLE	- Transition point from grade-separated Memorial Parkway with frontage roads to at-grade shared roadway - High speed vehicle turns - Drainage issues between Memorial Parkway and Access Road - Turn radius issues
BICYCLE	- No dedicated bicycle facilities - Poor lighting - See Overall note
PEDESTRIAN	- Poor lighting - Only pedestrian crossing are pedestrian signals on north leg of intersection; no painted crosswalk; obstructed by SBLT turn lane and access road - Sidewalk on NE corner stops at the Access Road, short of the crossing - No pedestrian facilities on Memorial Parkway - Large curb cuts on SE corner - Sidewalk on SW corner damaged with no connectivity - Transit stop on south side of Mastin Lake Road has no sidewalk connectivity on busy road - Obstructions in sidewalk on NW corner - Overgrowth on Sidewalk
OVERALL	- Proximity of Access Road greatly increases conflict points for all transportation modes with little or no signage/striping - Abandoned business on SE and SW corners - Nearby transit stop



Memorial Parkway SB
Ped xing unmarked + blocked

Mastin Lake Road Westbound
Long curb cuts in sidewalk

LIGHTING DIAGRAM



MEMORIAL PARKWAY AT SPARKMAN DRIVE/US 72 E

03

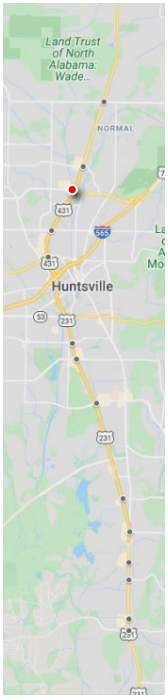
Memorial Parkway Northbound

Memorial Parkway Southbound

Sparkman Drive Eastbound

Sparkman Drive Westbound

NOTES



VEHICLE

- Limited sight distance to pedestrian crossing due to bridge abutments
- NBL truck turn radius issues
- Driveway obstructions on SB approach
- Vertical distractions on SB approach

BICYCLE

- No dedicated bicycle facilities, poor pedestrian facilities as alternative
- Poor lighting from high mast lights

PEDESTRIAN

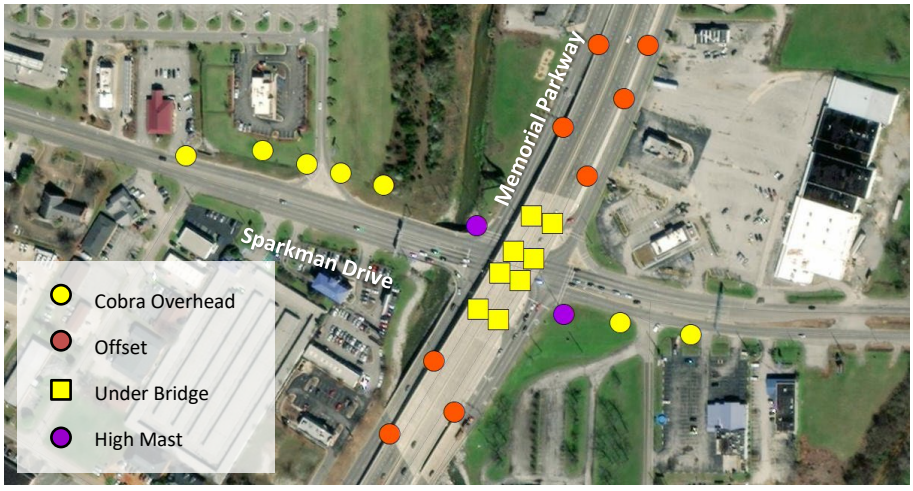
- Almost no sidewalk (some on NW corner), even for access to transit stops; primarily grass shoulder
- Deep culvert on west leg restricts pedestrian access
- Poor lighting from high mast lights
- Antbed issue on NB shoulder in pedestrian space
- Pushbuttons in grass shoulder
- Potential for utilization of 2 stage pedestrian crossing(s)
- Vehicles on channelized RTs generally don't yield before pedestrian crossings
- Poor access to nearby transit stops

OVERALL

Memorial Parkway Northbound
Ped button with no sidewalk

Memorial Parkway Southbound
Ped path in grass

LIGHTING DIAGRAM



MEMORIAL PARKWAY AT OAKWOOD AVENUE 04

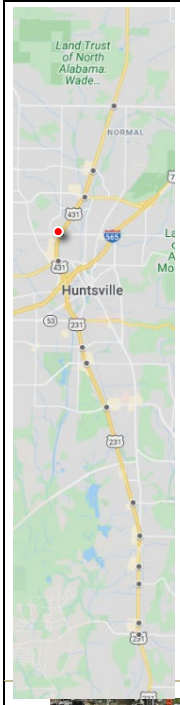
Memorial Parkway Northbound

Memorial Parkway Southbound

Oakwood Avenue Eastbound

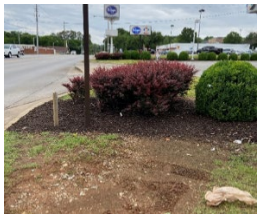
Oakwood Avenue Westbound

NOTES



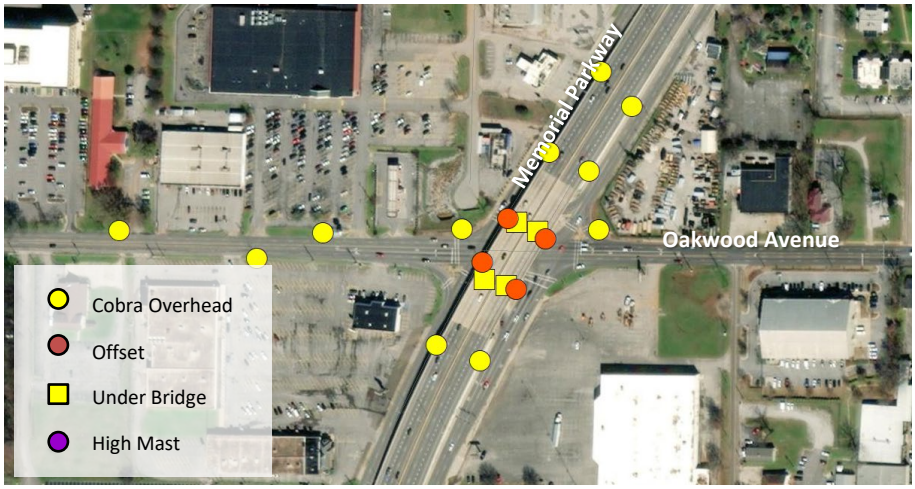
VEHICLE	- Limited sight distance to pedestrian crossing due to bridge abutments and light poles - Damaged delineator poles in underpass indicate turning issues
BICYCLE	- No dedicated bicycle facilities, poor pedestrian facilities as alternative - Drainage grate in bike path on Oakwood - Decent lighting at intersection - Steep SB driveway
PEDESTRIAN	- No sidewalk on south side of Oakwood Avenue despite new transit stop and sidewalk on east side of Memorial Parkway - Most sidewalk old, damaged, or missing - Decent lighting at intersection - Old crosswalk paint - No ramps and deteriorated facilities on NE corner - Potential for utilization of 2 stage pedestrian crossing(s) - Vehicles on channelized RTs observed not yielding before pedestrian crossings
OVERALL	- Several bicyclists and pedestrians observed using poor facilities - Nearby transit stops

Oakwood Avenue Eastbound
Ped path cut through



Oakwood Avenue Westbound
Obstructed ped path

LIGHTING DIAGRAM



MEMORIAL PARKWAY AT UNIVERSITY DRIVE

05

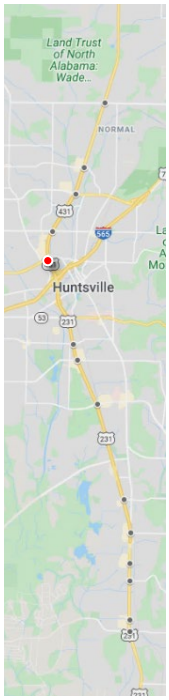
Memorial Parkway Northbound

Memorial Parkway Southbound

University Drive Eastbound

University Drive Westbound

NOTES



VEHICLE

- Limited sight distance to pedestrian crossing due to bridge abutments

BICYCLE

- No dedicated bicycle facilities, poor pedestrian facilities as alternative
- Only two light poles at intersection

PEDESTRIAN

- Only two light poles at intersection
- Sidewalk only on north side of University Drive west of Memorial
- No sidewalk access to transit stop on south side of University Drive
- No sidewalk at crosswalk on SE corner
- Potential for utilization of 2 stage pedestrian crossing(s)
- Vehicles on channelized RTs observed not yielding before pedestrian crossings
- Nearby transit stops with poor access

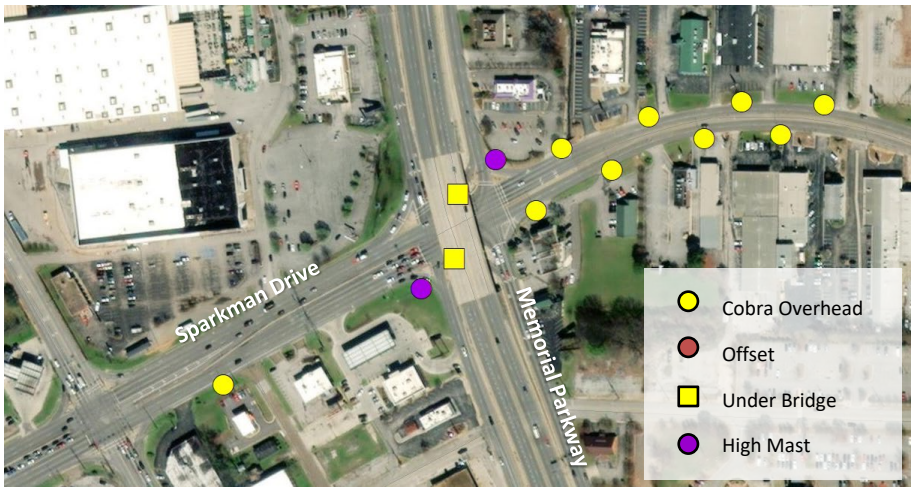
OVERALL

-

Memorial Parkway Northbound
Sidewalk broken

University Drive Westbound
Transit stop in driveway with no sidewalk

LIGHTING DIAGRAM



MEMORIAL PARKWAY AT BOB WALLACE AVENUE

06

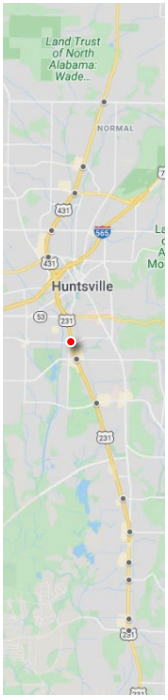
Memorial Parkway Northbound

Memorial Parkway Southbound

Bob Wallace Avenue Eastbound

Bob Wallace Ave Westbound

NOTES

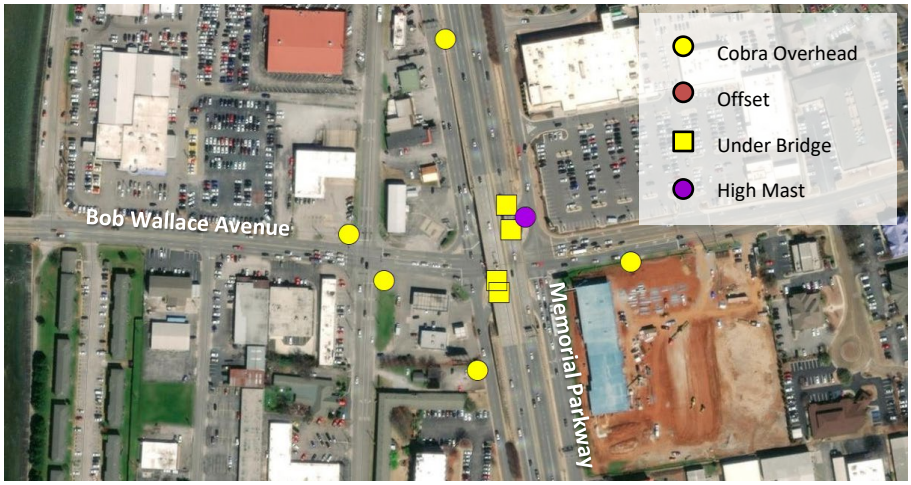


VEHICLE	- Limited sight distance to pedestrian crossing due to bridge abutments
BICYCLE	- No dedicated bicycle facilities - Sight distance issues on NE corner
PEDESTRIAN	- Limited facilities at intersection - Sight distance issues on NE corner - Potential for utilization of 2 stage pedestrian crossing(s) - Vehicles on channelized RTs observed not yielding before pedestrian crossings
OVERALL	-

Memorial Parkway Northbound
Drainage issues

Memorial Parkway Southbound
No pedestrian facilities

LIGHTING DIAGRAM



MEMORIAL PARKWAY AT DRAKE AVENUE

07

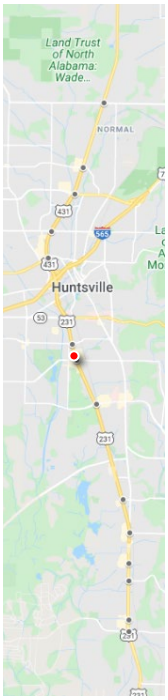
Memorial Parkway Northbound

Memorial Parkway Southbound

Drake Avenue Eastbound

Drake Avenue Westbound

NOTES

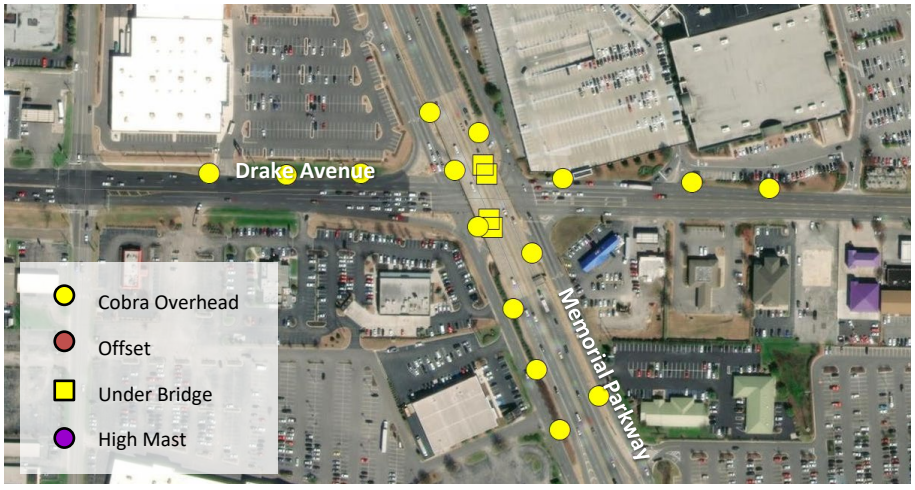


VEHICLE	- Limited sight distance to pedestrian crossing due to bridge abutments and signs - Turn radius issues
BICYCLE	- Uncovered hole in road on NB lanes - WB bike lane must merge with traffic with minimal direction; observed bicyclist confusion - Poor lighting
PEDESTRIAN	- Missing or poorly marked crosswalks, incorrectly wired or facing pushbuttons - Highway signs block EBR pedestrian refuge - Poor lighting - Potential for utilization of 2 stage pedestrian crossing(s) - Vehicles on channelized RTs observed not yielding before pedestrian crossings - New pedestrian crossing under construction on south leg of intersection
OVERALL	- Close to large recreation area and major mall with significant pedestrian and bicycle traffic

Memorial Parkway Westbound
Bicycle facilities end

Memorial Parkway Southbound
Ped button with no sidewalk

LIGHTING DIAGRAM



MEMORIAL PARKWAY AT AIRPORT ROAD

08

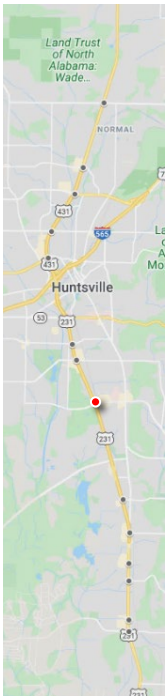
Memorial Parkway Northbound

Memorial Parkway Southbound

Airport Road Eastbound

Airport Road Westbound

NOTES



VEHICLE

- Limited sight distance to pedestrian crossing due to bridge abutments
- Turn radius issue on SB U-Turn
- Observed illegal right turn

BICYCLE

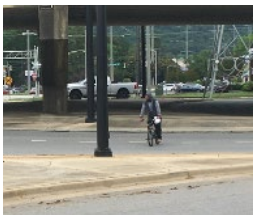
- No dedicated bicycle facilities except Bike Route
- No lighting at intersection

PEDESTRIAN

- No facilities at intersection
- Sidewalk terminates with no crosswalk facilities
- Tree buffer on EB approach

OVERALL

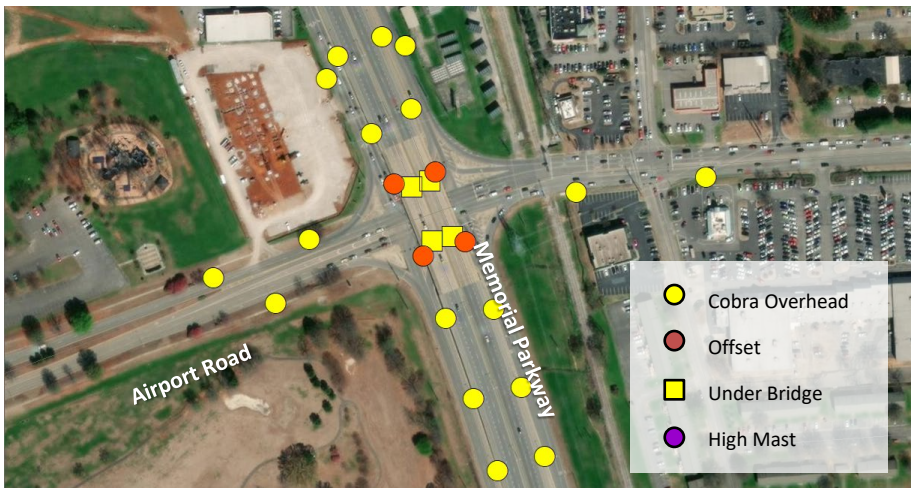
- Close to large recreation area
- Adjacent to RR crossing to east, which may result in queue issues, traffic conflicts, and distractions



Airport Road Eastbound
Bicyclist crossing with no facilities

Airport Road Westbound
Sidewalk ends at RR tracks

LIGHTING DIAGRAM



MEMORIAL PARKWAY AT LOGAN DRIVE/LILY FLAGG ROAD

09

Memorial Parkway Northbound

Memorial Parkway Southbound

Logan Drive Eastbound

Lily Flagg Road Westbound

NOTES

VEHICLE

- Driveway obstructions
- Turn radius issues

BICYCLE

- No dedicated bicycle facilities except Bike Route
- No lighting at intersection

PEDESTRIAN

- No facilities at intersection
- Adjacent to Kroger
- Pedestrian paths through parking lots and grass
- Midblock crossing for Kroger on Logan Dr

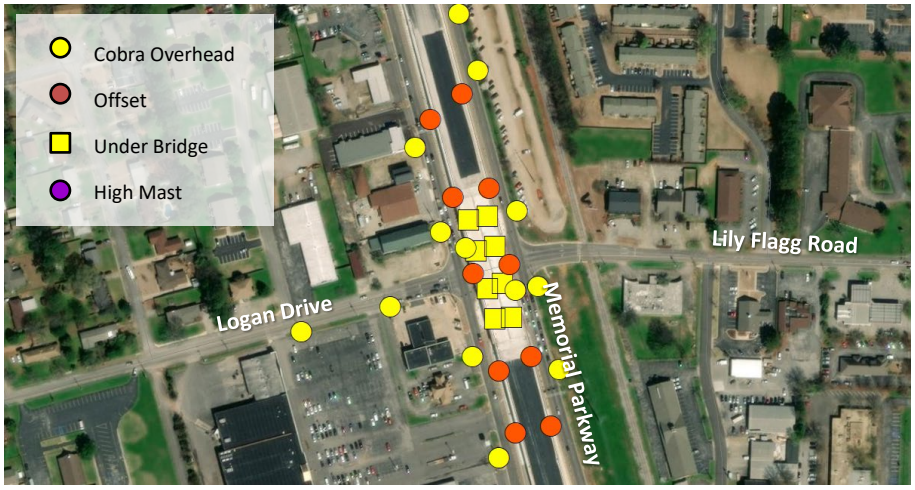
OVERALL

- Adjacent to RR crossing to east, which may result in queue issues, traffic conflicts, and distractions

Memorial Parkway Northbound
Turn radius tire marks

Lily Flagg Road Westbound
Adjacent to RR

LIGHTING DIAGRAM



MEMORIAL PARKWAY AT WEATHERLY ROAD

10

Memorial Parkway Northbound

Memorial Parkway Southbound

Weatherly Road Eastbound

Weatherly Road Westbound

NOTES

VEHICLE

- Limited sight distance to pedestrian crossing due to bridge abutments and signs/power poles
- Observed extremely fast U-Turning vehicles on NB approach
- WB turn radius issues

BICYCLE

- No dedicated bicycle facilities
- Parallel drains at driveways
- Poor lighting

PEDESTRIAN

- Poor lighting
- Two-phase pedestrian crossing better than other crossings that are single phase
- Adjacent to large retail
- Only pedestrian crossing is north side of intersection

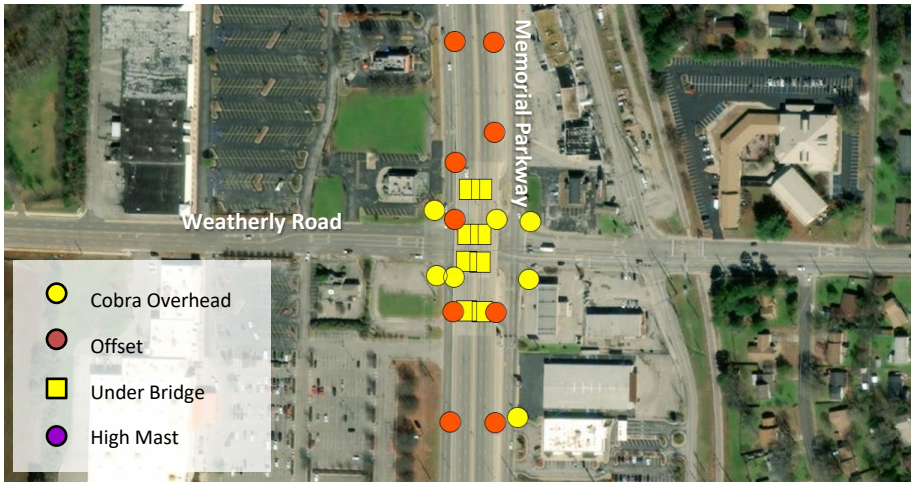
OVERALL

- Debris preventing drainage
- Grissom High School west on Weatherly Road
- Adjacent to RR crossing to east, which may result in queue issues, traffic conflicts, and distractions
- Nearby transit stop

Memorial Parkway Northbound
Drainage issue

Weatherly Road Eastbound
Grate at driveway

LIGHTING DIAGRAM



MEMORIAL PARKWAY AT MEADOWBROOK DRIVE

11

Memorial Parkway Northbound

Memorial Parkway Southbound

Meadowbrook Drive Eastbound

Meadowbrook Dr Westbound

NOTES

VEHICLE	- Poor surface condition on EB approach - Confusing SB approach of Memorial Parkway where freeway and frontage roads merge
BICYCLE	- No dedicated bicycle facilities - Poor lighting
PEDESTRIAN	- Poor lighting - No crossing facilities, limited sidewalk - Adjacent to large retail
OVERALL	- Drainage issues – no median culvert - Adjacent to RR crossing to east, which may result in queue issues, traffic conflicts, and distractions

Memorial Parkway Southbound

Confusing approach

Meadowbrook Drive Eastbound

Poor pavement condition

LIGHTING DIAGRAM

MEMORIAL PARKWAY AT MOUNTAIN GAP ROAD

12

Memorial Parkway Northbound

Memorial Parkway Southbound

Mountain Gap Road Eastbound

Mountain Gap Road Westbound

NOTES

VEHICLE	- Turn radius issues - Debris issues on south median
BICYCLE	- No dedicated bicycle facilities - Poor lighting
PEDESTRIAN	- Poor lighting - No crossing facilities, limited sidewalk on NE corner does not connect to intersection adjacent to large culvert - Very steep shoulder on west side of Memorial Parkway
OVERALL	- Adjacent to RR crossing to east, which may result in queue issues, traffic conflicts, and distractions

Memorial Parkway Southbound
Steep shoulder

Memorial Parkway Southbound
Limited sidewalk in culvert

LIGHTING DIAGRAM

MEMORIAL PARKWAY AT REDSTONE ROAD

13

Memorial Parkway Northbound

Memorial Parkway Southbound

Redstone Road Eastbound

Redstone Road Westbound

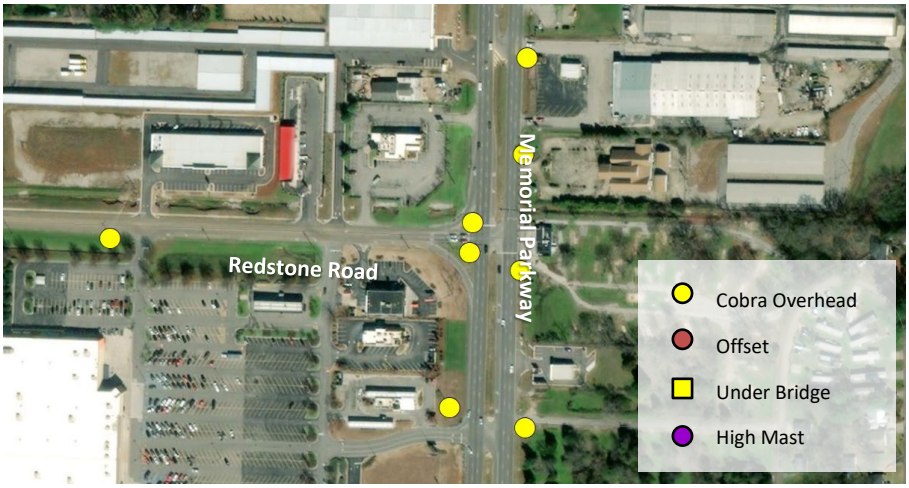
NOTES

VEHICLE	- Turn radius and drainage issues in SB median
BICYCLE	- No dedicated bicycle facilities - Poor lighting - Rumble strips
PEDESTRIAN	- Decent lighting - No crossing facilities - Sidewalk on north side of Redstone Road that ends short of intersection, leads to Redstone Arsenal
OVERALL	- New development installing new WB approach - Redstone Road leads to Redstone Arsenal to west

Redstone Road Westbound
Construction of new approach

Redstone Road Eastbound
Sidewalk ends

LIGHTING DIAGRAM



MEMORIAL PARKWAY AT HOBBS ROAD

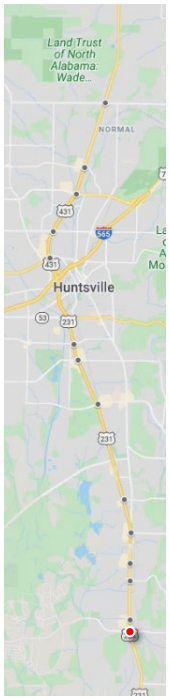
Memorial Parkway Northbound

Memorial Parkway Southbound

Hobbs Road Eastbound

Hobbs Road Westbound

NOTES



VEHICLE

- Debris issues
- Queue issue into turn lane from Chick-fil-A at NW corner of intersection
- Delineators in SB RT lane indicate turn radius issues

BICYCLE

- No dedicated bicycle facilities
- Minimal lighting
- NB RT lane conflicts with bike on NB approach

PEDESTRIAN

- Minimal lighting
- Only crossing on north side of intersection
- Crossing blocked at gas station at northwest quadrant
- Old crosswalk paint at ALDI Driveway

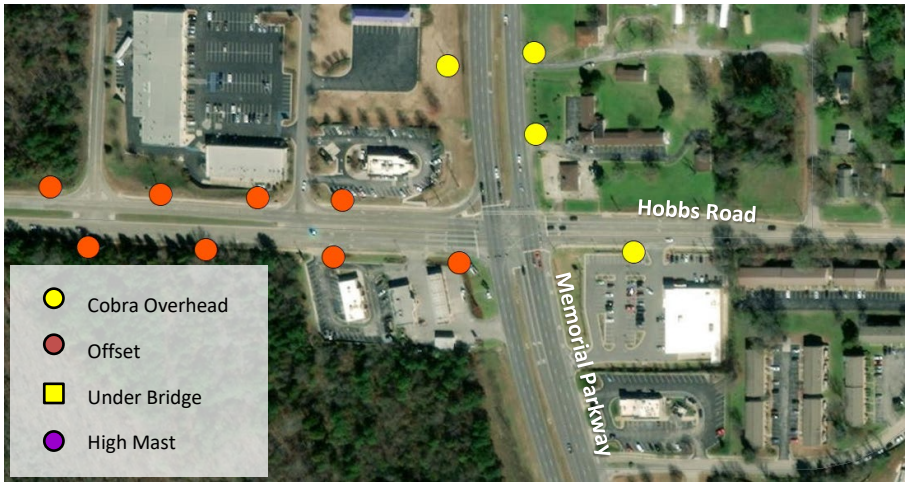
OVERALL

- Connection to Redstone Arsenal to west
- Minimal multimodal facilities

Memorial Parkway Southbound
Delineator posts

Winchester Road Westbound
Crossing blocked

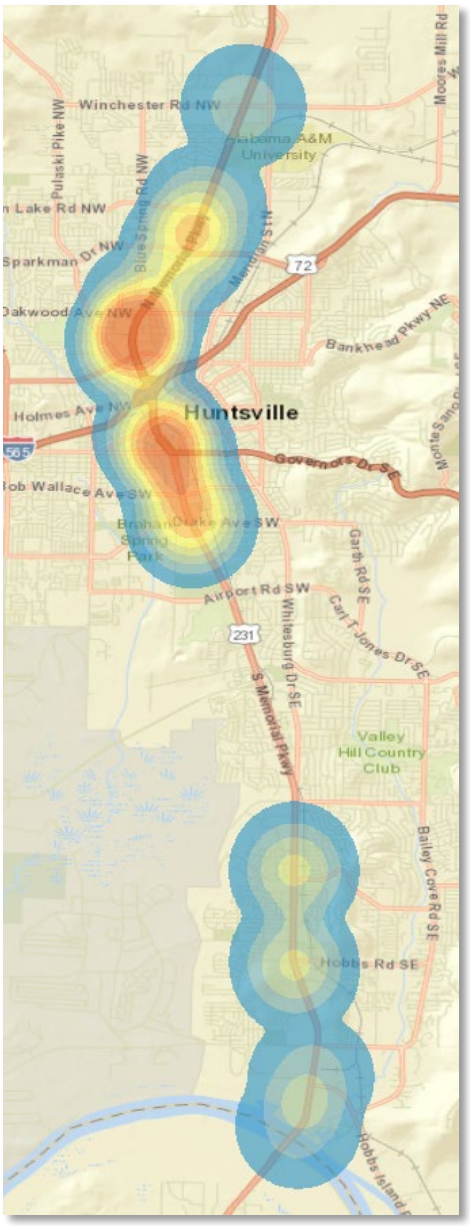
LIGHTING DIAGRAM



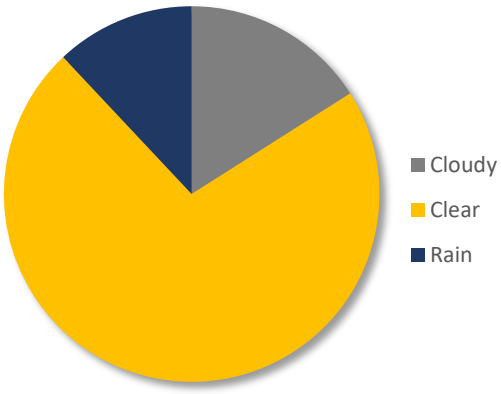
3.7. Crash Analysis

Crash data from 2015 – 2019 was provided by the City. This data was mapped and processed to look for potential causes of crashes. Of all the crashes that occur in the study area, only those that included bicycles or pedestrians were evaluated. Of those crashes, an average of 4.4 pedestrian crashes per year occur at the study intersections, and 3 bicycle crashes occurred over those 5 years. These crashes generally occur near the downtown core, as shown in the crash heat map, right.

Multimodal Crash Density



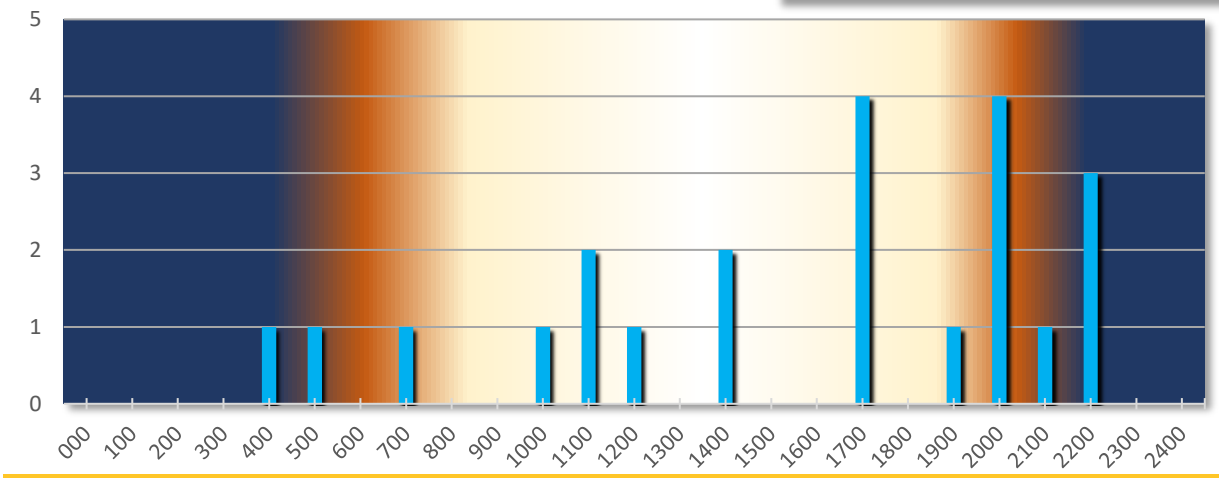
Multimodal Crashes by Weather



Of these crashes, most occur in clear conditions, as shown in the graph above. Furthermore, when looking at time of day crashes occur, they generally occur during the PM peak hour rush or evening. Some of these occur in twilight or low light hours, as shown in the chart, but also during daylight PM peak hour rush.

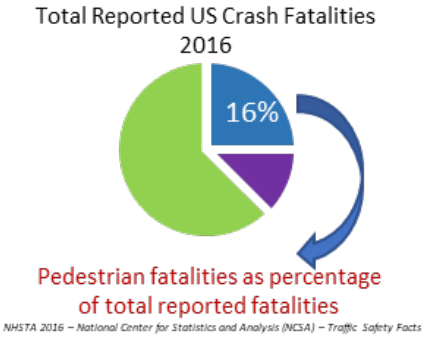
Since many of these crashes are occurring in clear conditions during daylight hours, it is expected that these crashes tend to be caused by infrastructure issues, rather than adverse external driving conditions.

Multimodal Crashes by Time of Day



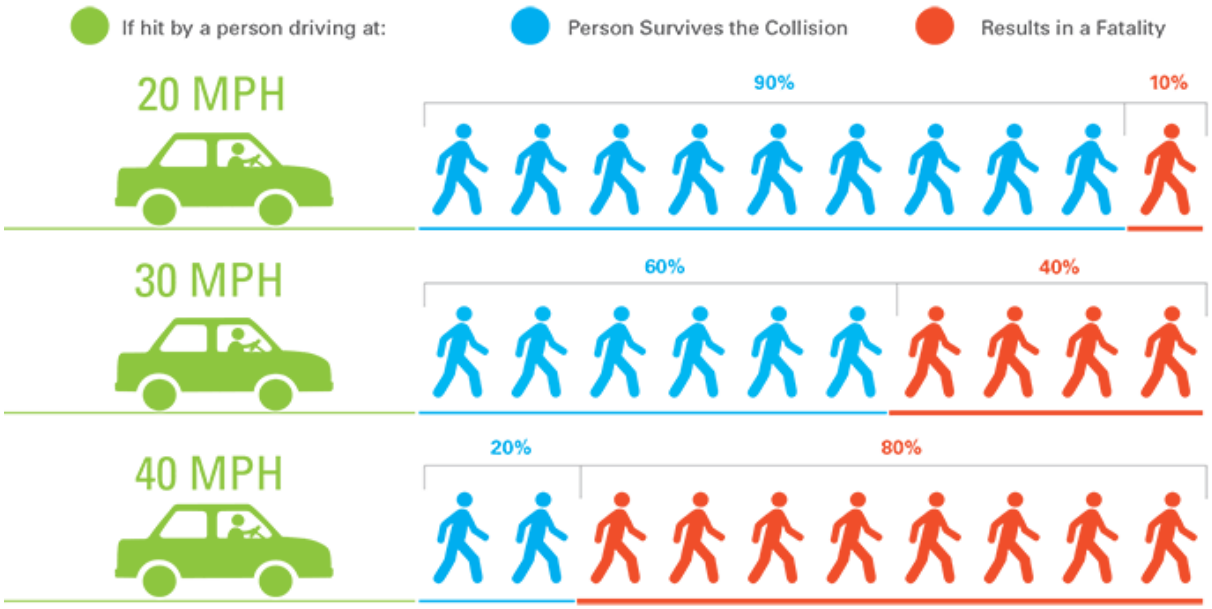
3.7.1. National Crash Statistics

The National Highway Traffic Safety Administration (NHSTA) released a publication in 2016 providing crash statistics on pedestrians. In 2016 there were 5,987 pedestrian fatalities within the United States, or an average of one pedestrian being killed in a traffic crash every 1.5 hours. This total represented 16 percent of all reported traffic crash fatalities within the United States for the year of 2016. Most pedestrian fatalities were found to occur away from intersections (72 percent), in the dark (75 percent), and within areas with higher demand potential (76 percent). Of all pedestrians killed in 2016, 70 percent were male and 13.4 percent of those killed in traffic accidents were of school age. Of pedestrian fatalities, 90 percent involved single vehicles with the majority being struck from the front of the vehicle. (NHSTA 2016) This further contrasts with the clear, daylight conditions of many pedestrian-involved crashes on Memorial Parkway.



3.7.2. Travel Speed as a Function of Crash Survival

Travel speed of a vehicle is one of the most important variables in a driver being able to see, react, and possibly avoid a crash with a pedestrian. A driver's field of vision narrows at higher speeds as their cone of observance diminishes. Speed also plays a vital role in the survivability of a crash involving a vehicle and a pedestrian. At 20 miles per hour it is expected that 90 percent will survive a collision at this speed, compared to only 20 percent at 40 miles per hour.

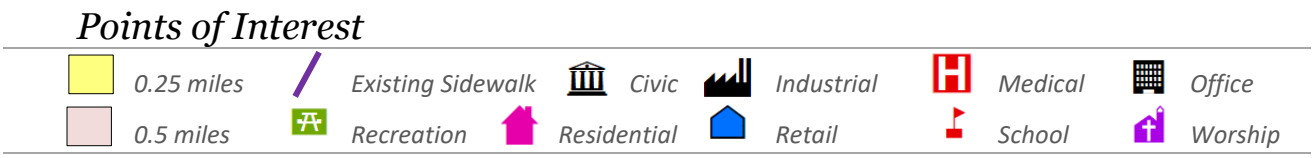


**USDT 2000 – Literature Review – Vehicle Travel Speeds and Pedestrian Injuries*

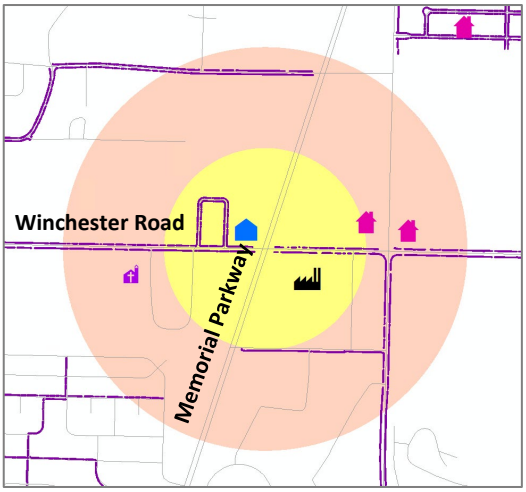
3.8. Points of Interest Identification

In order to best understand where pedestrians and bicyclists travel between, points of interests near study intersections were inventoried and mapped. These points of interest include numerous land uses that generate and receive traffic, such as schools, residential areas, civic services, and more. These points of interest were cataloged within reasonable walking distance from the study sections, which was considered a maximum of 0.5 miles. Finally, sidewalk connectivity was included to provide better insight on how these points of interests could be accessed by bicyclists and pedestrians. A summary of points of interest are shown in the following figures.

As anticipated, the Memorial Parkway corridor is lined by large traffic generators, many of which lack basic sidewalk connectivity.

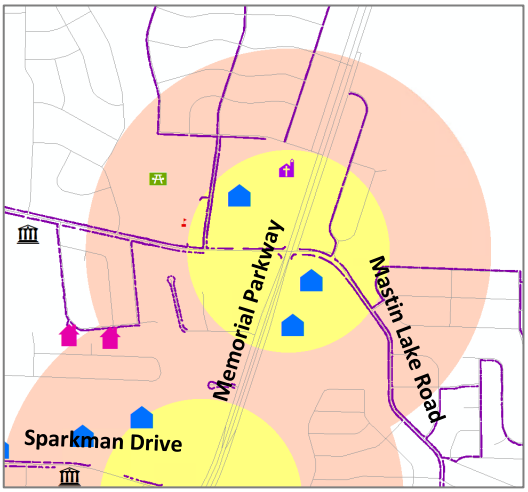


1



- UPS Customer Center
- Residential apartments
- Bojangles
- Alabama A&M University
- Union Hill Primitive Baptist Church

2

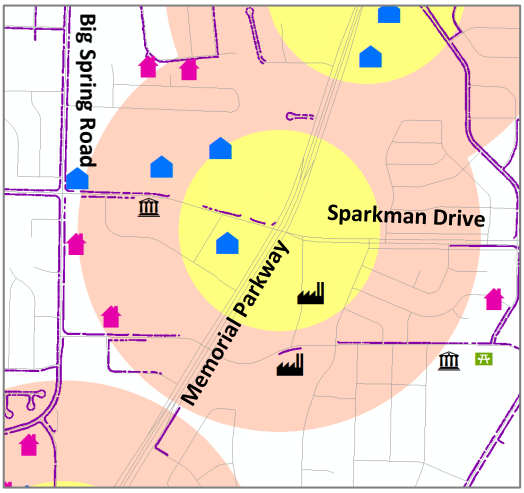


- Lakewood Community Center
- Lowes, Rural King, strip mall
- Lakewood Elementary School, Drake State Community College
- The Fellowship of Faith Church

Points of Interest

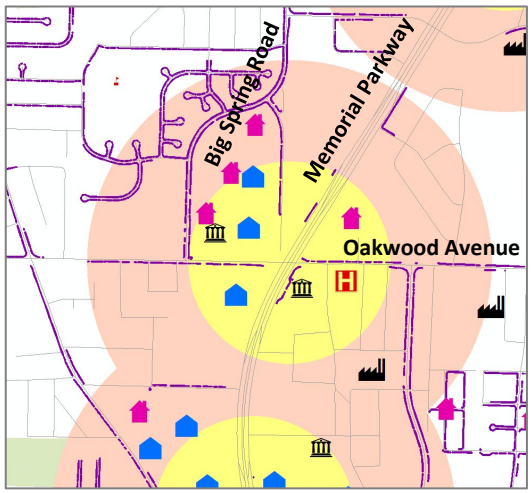
0.25 miles *0.5 miles* *Existing Sidewalk* *Recreation* *Civic* *Residential* *Industrial* *Retail* *Medical* *School* *Office* *Worship*

3



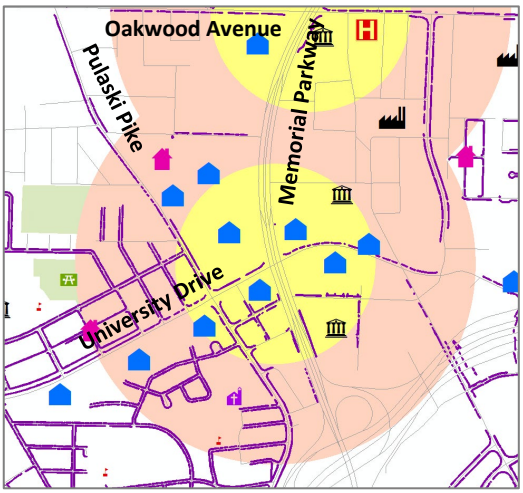
- Alabama Career Center
- Residential apartments
- Walmart Supercenter, strip mall

4



- Alabama Department of Human Resources
- Residential apartments
- Kroger, strip mall
- Huntsville Emergency Medical Services
- Montview Elementary School

5

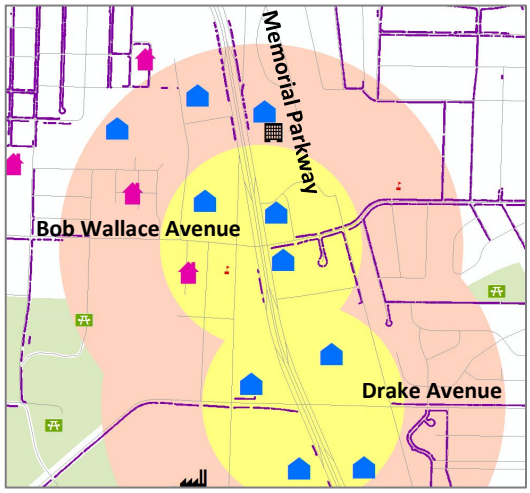


- Home Depot, Costco, assorted retail
- Northwoods Public Housing, Presbyterian Apartments
- Madison County Jail, Juvenile Detention Center
- ALEA Driver's License office
- Sonnie Hereford Elementary, St. Joseph School, Greengate School for Dyslexia
- St. Joseph Church

Points of Interest

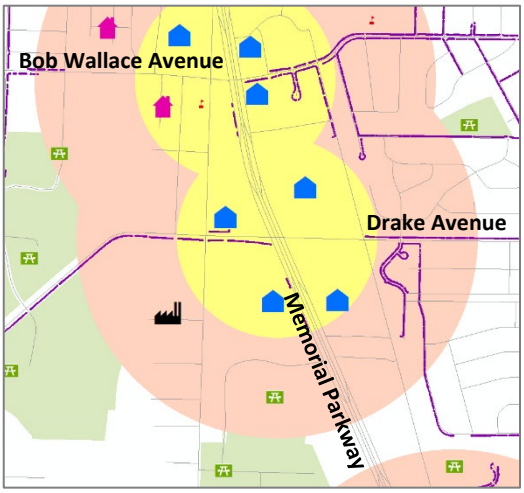
0.25 miles *0.5 miles* *Existing Sidewalk* *Recreation* *Civic* *Residential* *Industrial* *Retail* *Medical* *School* *Office* *Worship*

6



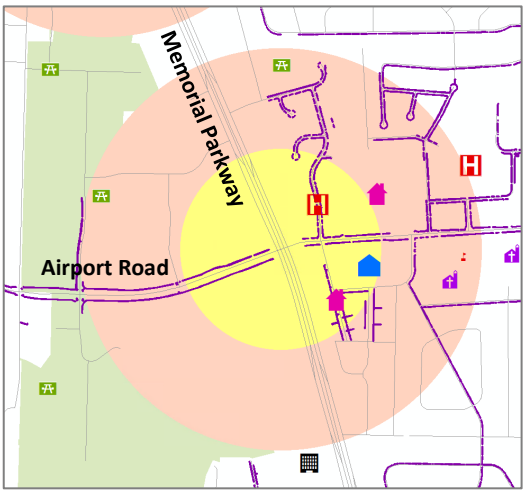
- Huntsville Hospital
- Times Plaza Office Building
- Brahan Springs Park
- Residential Apartments
- Lowe Mill, Whole Foods strip mall, other retail
- Huntsville High School, Children's House of Montessori

7



- Assorted light industrial
- Parkway Place Mall, Academy sports & Aldi, Walmart, strip malls
- Brahan Springs Park, future baseball stadium redevelopment

8

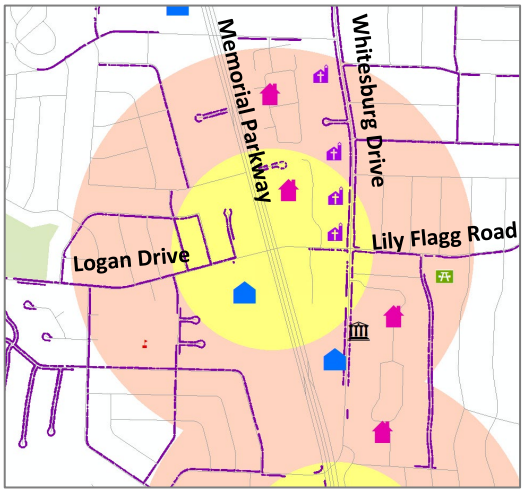


- Crestwood Medical Center, medical mall
- Lockheed Martin office
- John Hunt Park, soccer complex, Piedmont Pool
- Residential townhomes and apartments
- Assorted strip malls east of Memorial Parkway
- Holy Spirit School
- Assorted churches east of Memorial Parkway

Points of Interest

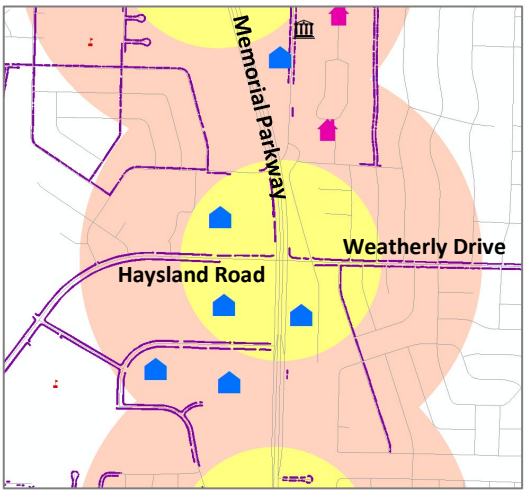
0.25 miles | *0.5 miles* | *Existing Sidewalk* | *Recreation* | *Civic* | *Residential* | *Industrial* | *Retail* | *Medical* | *School* | *Office* | *Worship*

9



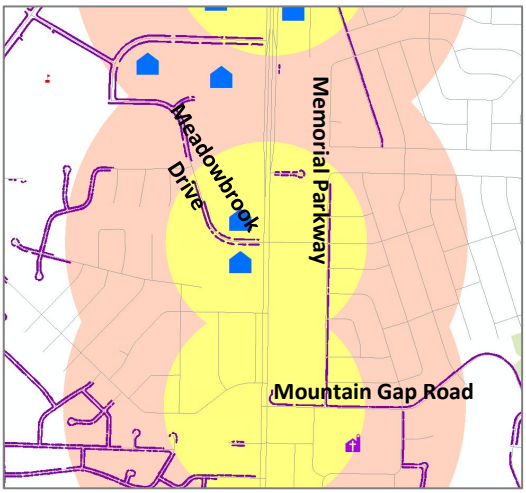
- Post Office
- Pool
- Residential apartments
- Kroger, assorted retail
- Roger B Chaffee Elementary School
- Churches on Whitesburg Drive

10



- Residential Apartments
- Home Depot, Lowes, Sam's Club, Assorted retail, Future Haysland Square redevelopment
- Grissom High School

11

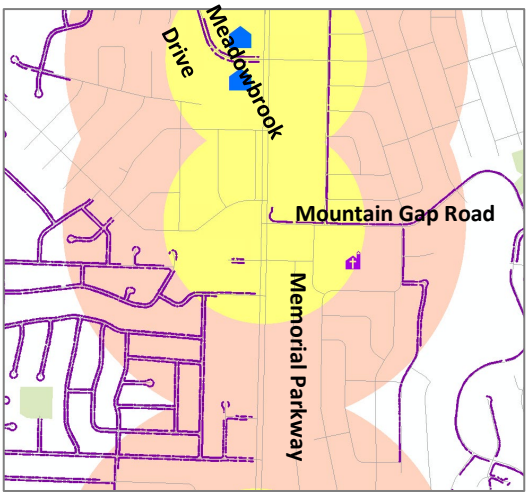


- Assorted retail + restaurants

Points of Interest

0.25 miles | *0.5 miles* | *Existing Sidewalk* | *Recreation* | *Civic* | *Residential* | *Industrial* | *Retail* | *Medical* | *School* | *Office* | *Worship*

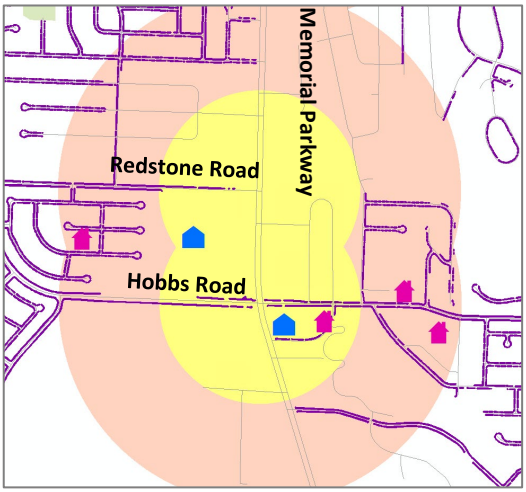
12



- Hillwood Baptist Church

13

14



- Walmart, Aldi, Chick Fil A, assorted retail
- Single family housing, apartment complexes

3.9. Connectivity

To get a better knowledge of how these points of interest are accessed, the sidewalk and transit services were cataloged within walking distance of the study intersections. As before, this was expected to be 0.5 miles from the intersection.

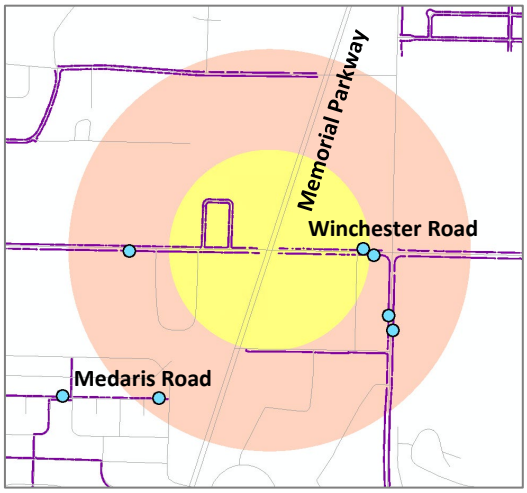
The Memorial Parkway corridor has historically been designed for automotive vehicles, reflected in the majority of frontage roads on the corridor lacking sidewalk. This is despite much of Huntsville's retail being located on the Memorial Parkway corridor, thereby restricting pedestrian access to those services. Much of the corridor also suffers from extensive curb cuts and minimal or outdated pedestrian crossing facilities. Numerous bus stops are located in areas without sidewalk, and much of the pedestrian traffic in the corridor must traverse parking lots or grass shoulders.

A summary of pedestrian connectivity by study intersection is shown in the following figures.

Sidewalk Connectivity

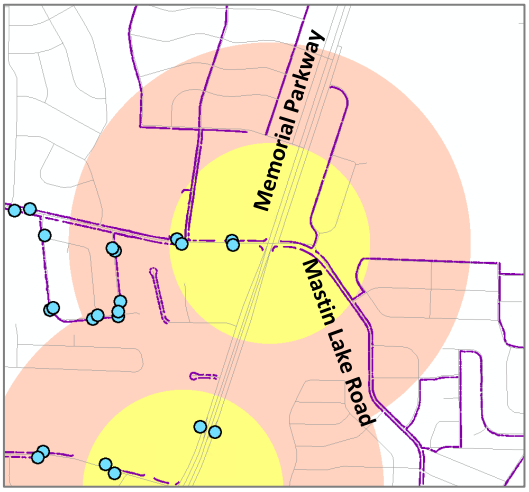
0.25 miles *0.5 miles* *Existing Sidewalk* *Transit Stop*

1



- Sidewalk stops short west of intersection
- No sidewalk on Memorial Parkway frontage
- No pedestrian crossing facilities
- High speed vehicle turns
- Signed bicycle route [check]

2

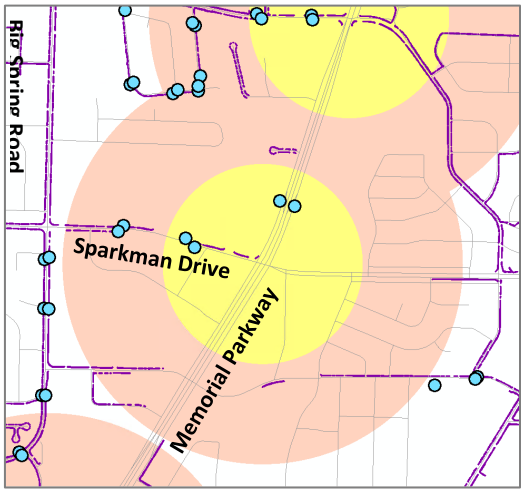


- Transit stops with no sidewalk access
- No sidewalk on Memorial Parkway frontage
- No pedestrian crossing facilities, except pedestrian signal/pushbutton for unmarked crossing on north leg. Crossing obstructed by stop line.
- Signed bicycle route through very busy intersection [check]
- No connection to nearby Sparkman Drive to south

Sidewalk Connectivity

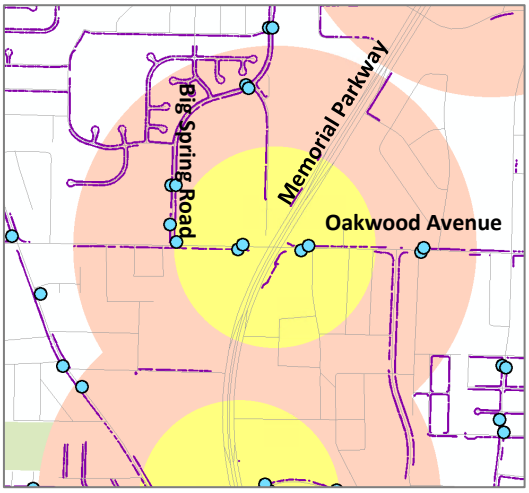
0.25 miles | 0.5 miles | Existing Sidewalk | Transit Stop

3



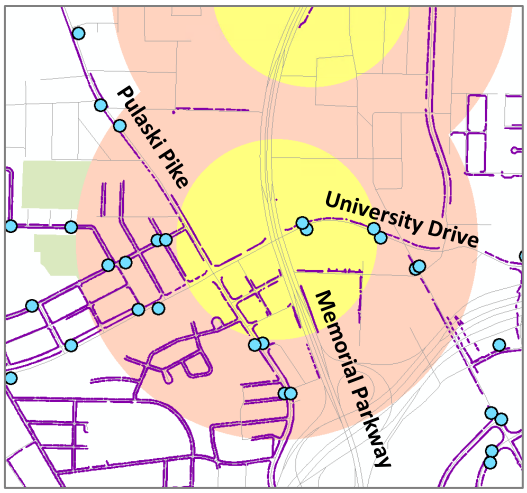
- Transit stops with no sidewalk access
- No sidewalk on Memorial Parkway frontage, observed pedestrian path in grass
- Limited sidewalk on Sparkman Dr
- Pedestrian crossing on N, E legs, only NW corner has sidewalk
- No bicycle facilities
- No connection to nearby Mastin Lake Road to north

4



- Transit stops with no sidewalk access
- No sidewalk on Memorial Parkway frontage
- No sidewalk on northwest and southeast sides of Oakwood
- Pedestrian crossing on all legs
- Obstructed sidewalk on NE corner, no sidewalk on SE corner
- Signed bicycle route [check]
- No connection to nearby University Drive to north

5

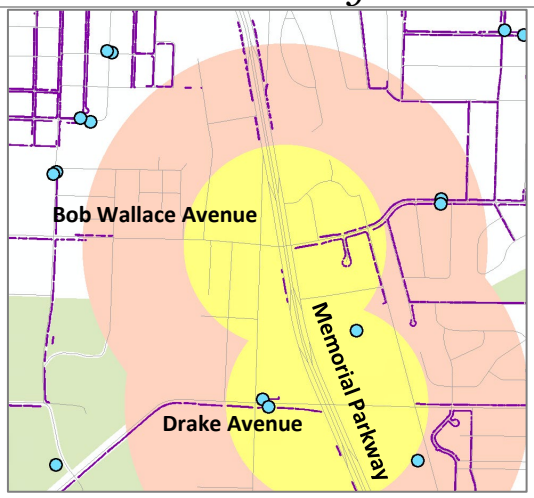


- Transit stops with no sidewalk access
- New sidewalk on northeast side of University Dr
- No sidewalk on Memorial Parkway frontage
- Pedestrian crossing on N, E, W legs
- No bicycle facilities
- No connection to nearby Oakwood Avenue to north

Sidewalk Connectivity

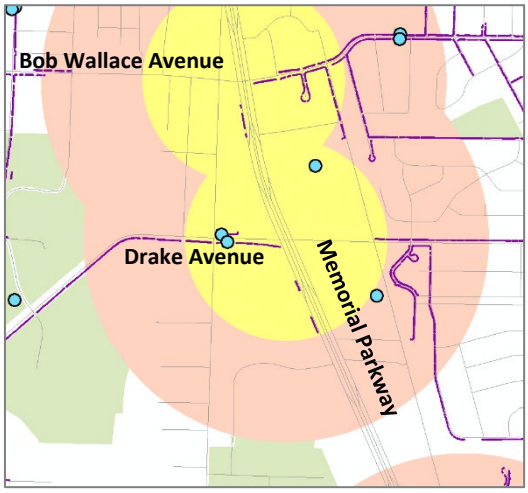
0.25 miles | 0.5 miles | Existing Sidewalk | Transit Stop

6



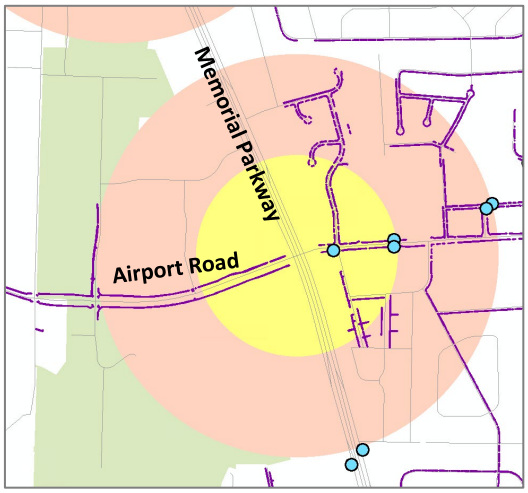
- No pedestrian sidewalk or crossing facilities on N, E, W legs
- New pedestrian crossing on S leg
- Majority of pedestrian access via parking lots
- Sidewalk from east ends at mall access
- No sidewalk on Memorial Parkway frontage
-

7



- Pedestrian signals on all legs with no marked crosswalk
- No sidewalk on NE, NW corners
- Sidewalk from east ends at mall access
- No connection between sidewalk to NE and SW
- Bicycle lanes terminate with no direction at east leg, signed bicycle route on east side [check]
- No sidewalk on Memorial Parkway frontage

8

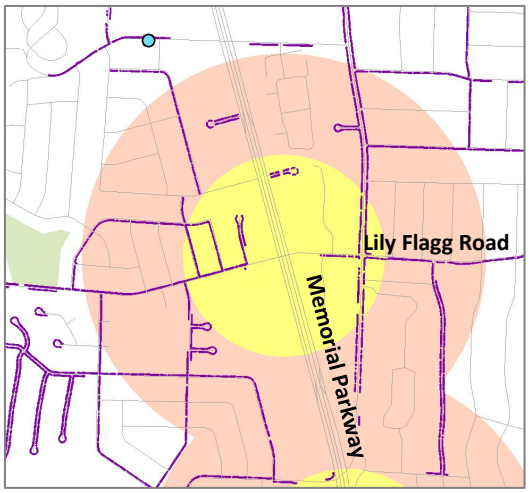


- No pedestrian crossing facilities
- RR crossing adjacent to intersection
- Sidewalk from east end short of intersection at RR crossing
- Signed bicycle route through close intersections and RR crossing
- Adjacent intersection includes crossing on Airport Road
- No sidewalk on Memorial Parkway frontage
-

Sidewalk Connectivity

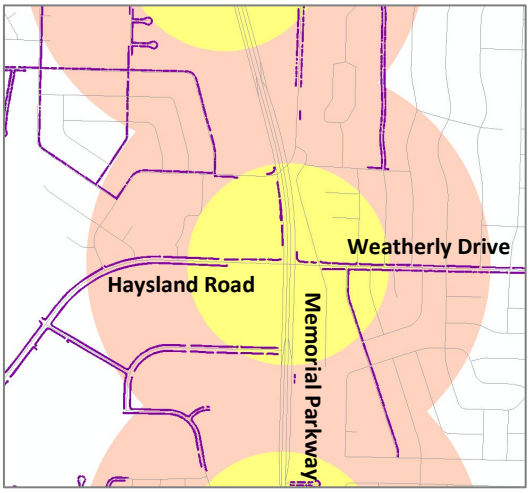
0.25 miles | 0.5 miles | Existing Sidewalk | Transit Stop

9



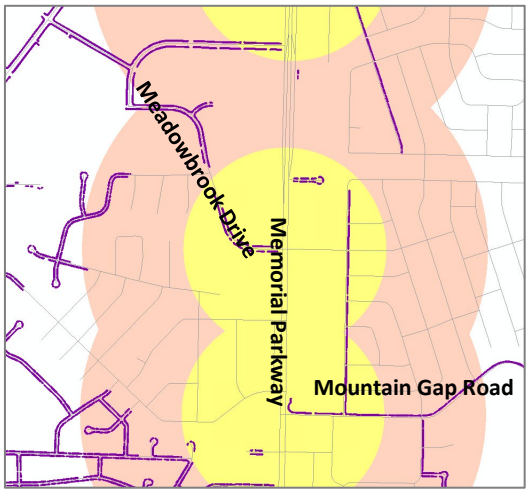
- Sidewalk ends short of intersection to northwest and southeast of intersection
- No pedestrian crossing facilities at intersection
- No bicycle facilities
- RR crossing adjacent to intersection
- No sidewalk on Memorial Parkway frontage
- Transit stop with no sidewalk access

10



- Significant crossing facilities located on north leg of at Memorial Parkway
- No crossing facilities on E, S, W legs at Memorial Parkway
- Crossing facilities on N and W leg to east at Blanda Dr
- No bicycle facilities
- RR crossing adjacent to intersection
- No sidewalk on Memorial Parkway frontage
- Transit stop with no sidewalk access

11

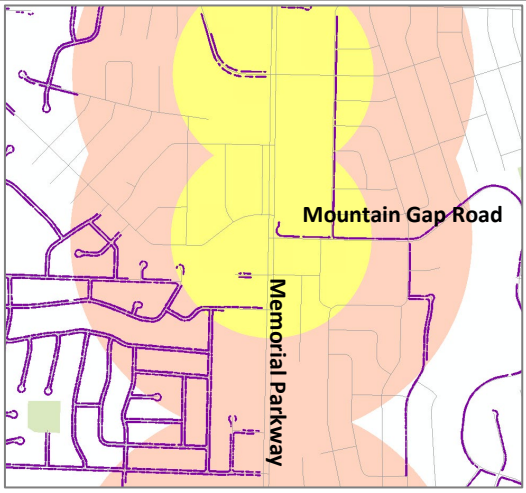


- No sidewalk on Memorial Parkway frontage
- No sidewalk on Meadowbrook Dr east of Memorial Parkway connecting to sidewalk on Hillwood Dr
- No bicycle facilities
- RR crossing adjacent to intersection
- Confusing SB approach from Memorial Parkway

Sidewalk Connectivity

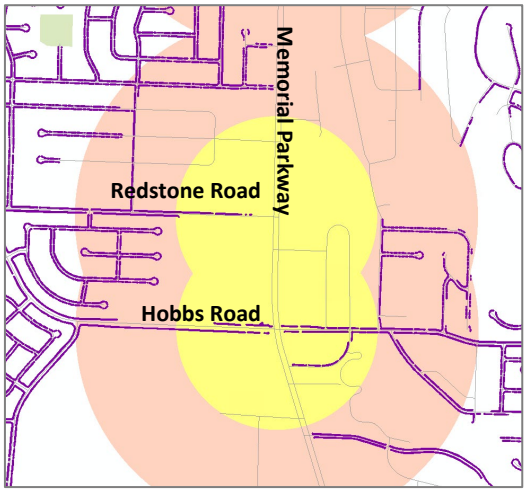
0.25 miles | 0.5 miles | Existing Sidewalk | Transit Stop

12



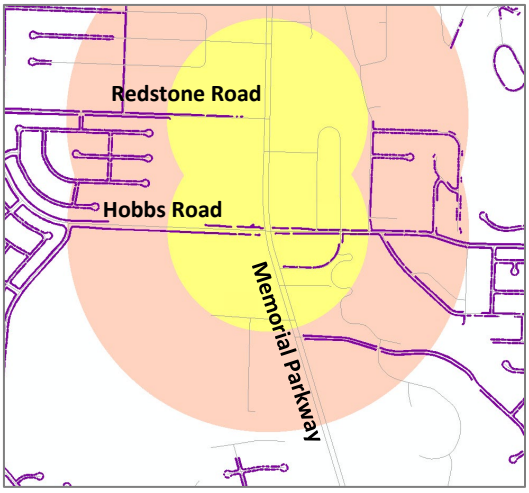
- No crossing facilities
- No sidewalk on Memorial Parkway frontage
- Sidewalk on north side of Mountain Gap Rd
- No bicycle facilities
- RR crossing adjacent to intersection
- Transit stop with no sidewalk or crossing access

13



- No crossing facilities
- No sidewalk on Memorial Parkway frontage
- Sidewalk on north side of Redstone Road stops short on intersection
- No bicycle facilities
- New access on east leg of intersection
- No crossing to transit stop to south
- No connection to nearby Hobbs Road to south

14



- Marked and signalized crosswalk on north leg
- No crossing facilities on E, S, W legs, or safe way to cross Hobbs Road
- No sidewalk on Memorial Parkway frontage
- No connection to nearby Redstone Road to north
- No crossing to transit stops to south

4. INTERIM CONDITIONS

Proposed infrastructure improvement projects in the study area were collected from The Huntsville Metro Planning Organization (MPO) 2045 Long Range Transportation Plan (TRiP) and ALDOT sources.

4.1. Committed Bicycle / Pedestrian Projects

There are no committed Bicycle / Pedestrian Projects near the study intersections based on the 2045 TRiP.

4.2. Committed Development Projects

There are some committed ALDOT improvement projects in the study area.

ALDOT ID	Transportation Plan ID	Description
100041420	15	Plans for Memorial Parkway:
100004926		Overpass at Mastin Lake Rd
100070087	16	Access Improvements at Winchester Rd

5.1. Future Planned Bicycle / Pedestrian Projects

These are visionary projects that may connect to the study area and are included for reference if those projects are completed.

Transportation Plan ID	Description
Rails & Trails Greenway	Greenway parallel Memorial Parkway from Governors Dr to Tennessee River
Meek Greenway	Greenway parallel Memorial Parkway from Governors Dr to south of Winchester Rd
Pinhook Creek Section Greenway	Greenway parallel Memorial Parkway from Governors Dr to US 72
44 and 43	Provide sidewalks and bike lanes on Oakwood Avenue from Church Street to Andrew Jackson Way

5.2. Future Planned Developments Projects

These are future projects within the study area. In particular, the access management and overpass projects will revamp four of the study intersections.

ALDOT Future Planned Projects

ALDOT ID	TIP ID	Transportation Plan ID	Description	Status
NH-0053(571)	100061838 100061839 100061840	14	Memorial Parkway: Access Management and Intersection Improvements From Hobbs Island Road to South of Weatherly Road **Include Hobbs, Weatherly, Mountain Gap, and Meadowbrook**	Fall 2022
NHF-8510(009)	100041420 100004926	16	Memorial Parkway: **Overpass at Mastin Lake Rd** Access Improvements at Winchester Rd	FY 2022
NH-0001(61)	100070087	17	Memorial Parkway: Structure removal and selective clearing and grubbing from 0.31 miles south of Mastin Lane Road to Winchester Road	Under construction

Reconfiguring Oakwood Avenue is a visionary project in the TRiP

TRiP Visionary projects

Transportation Plan ID	Description
43	Oakwood Avenue: Reconfigure to 3 lanes from Church St to Andrew Jackson Way
67	Memorial Parkway: New Interchange(s) at AL 255
68	Memorial Parkway: New Interchange at Green Cove Road
71	Memorial Parkway: New Interchanges at Meadowbrook Road and Hobbs Road

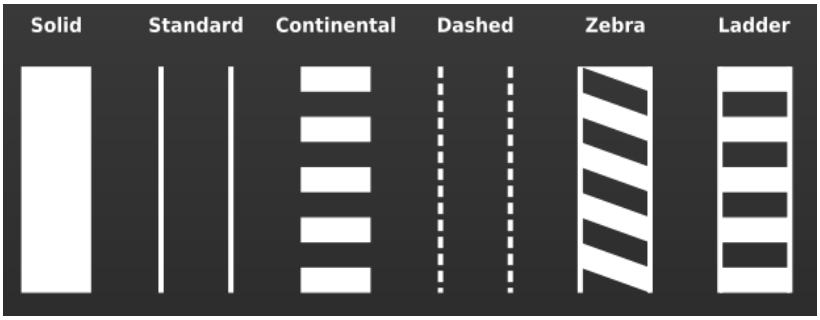
6. PROPOSED IMPROVEMENTS

This section provides an overview of potential improvements in the study area.

6.1. Potential Countermeasures

A significant amount of information was collected as a part of this study with the objective to provide a foundation of data in which could be drawn from to put forth reasonable and actionable countermeasures at each of the identified study intersections. This comprehensive approach was taken with the goal to deliver real strategies that will fall in to three separate categories which will help guide the City towards improving bicycle and pedestrian safety at the study intersections.

6.1.1. Crosswalk Markings



*FHWA

According to Crosswalk Marking Field Visibility Study (FHWA, 2010), longitudinal or ladder crosswalk pavement markings are considered much higher visibility than traditional parallel crossings.

6.1.2. Crosswalk Lighting

Furthermore, improving lighting should be considered at all crossings. According to FHWA-HRT-08-053 (2008), intersections should install lighting so that pedestrian crossings are front lit, not with traditional standard radial lighting.

6.1.3. Signalized Crossing Facilities

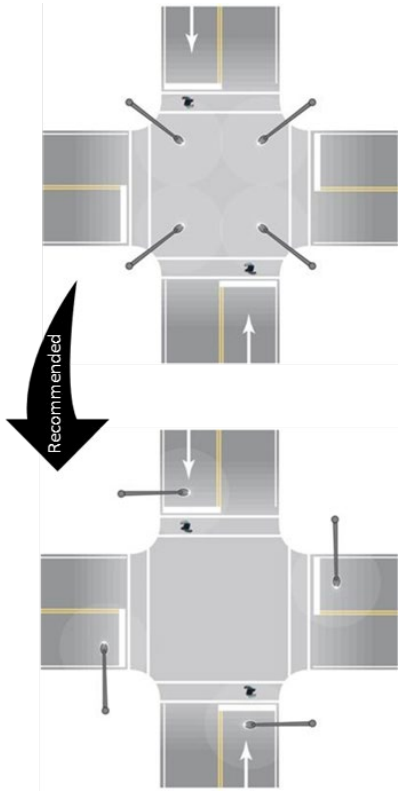
Providing Pedestrian crossing facilities, where applicable, can provide an additional measure of safety by providing a signalized crossing for both pedestrians and bicyclists that is either protected or minimizes the number on conflicting vehicular movements.

6.1.4. Paved Shoulders and Sidewalks

Providing paved shoulders increases safety and mobility for bicyclists and pedestrians. Bicyclists are more comfortable of paved shoulders and in the absence of a sidewalk is safer for pedestrians. walkway separated from the roadway provides even greater safety and mobility and reduces walking along roadway crashes.

6.1.5. Colored Bicycle Markings

Providing colored bicycle markings in conflict areas in intersections can great increase motorists and non-motorist awareness to these areas.



*FHWA

6.2. Proposed Improvement Categories

Proposed improvement strategies are divided into three categories: short, mid, or long- term.

Some otherwise short or mid-term strategies are associated with long-term improvements, such as refurbishing sidewalk in association with new curb infrastructure.

6.2.1. Short-term

Short-term improvements are those that can be implemented immediately by existing City of Huntsville maintenance staff. These strategies can include the following:

- Restriping needed for faded crosswalk
    - Upgrade crosswalks from parallel to high visibility ladder style pavement markings
- Fixing deficient facilities (broken signals, etc)
- Evaluate pedestrian clearance intervals
- Missing signs
- Relocate yield signs, add yield bars
- Replacing delineators

6.2.2. Mid-term

Mid-term improvements similarly can be implemented with existing staff, but may require more investment to improve:

- Pedestrian ramps
- Adding pedestrian heads, pedestrian pushbuttons
- Install missing pedestrian crossings
- Adding two stage pedestrian crossings (without cabinet upgrades)
- Replacement of broken lighting fixtures – New lighting fixtures

6.2.3. Long-term

Long-term improvements require more significant investment in order to implement:

- Adding two stage pedestrian crossings (with cabinet upgrades)
- New sidewalk landings or sidewalk extensions
- Pedestrian refuge islands
- No new bike facilities
- New facilities that include construction, ROW, or utility coordination/relocation
- New lighting poles
- Potential intersection reconfigurations

6.2.4. Planning and Policy Actions

Planning and Policy actions can supplement physical improvements and provide a foundation for the sustainability of any future improvements at any of the study intersections. These actions could include:

- **Bicycle sharing integration** – integration should focus near transit hubs, major job centers, universities, and entertainment areas.
- **Traffic calming and speed reduction policy** – traffic calming measures aide in alleviating speeding and cut-through trips. Measures also enhance safety for bicyclists and pedestrians.
- **Transportation Demand Management (TDM) policy** – Ensure that alternative modes of transportation are considered as congestion mitigation as future development is completed. TDM policy and plans are another tool in the toolbox in building sustainable investments for all transport users.
- **Vision Zero policy and plan** – As demand for multimodal transport continues to increase the potential for motorized and non-motorized mode conflict will also rise. Implementing Vision Zero policy safety countermeasures in high crash rate locations and utilizing demand models to prioritize needs can show commitment from the City of Huntsville towards education, enforcement, and implementation of multimodal user needs.
- **Improved connectivity** – Continue to look for ways to expand separated parallel multimodal facilities such as greenways and other trails to further improve connectivity

6.3. Proposed Improvements

The improvements recommended below provide potential improvements for each intersection for each strategy category term. Of the study intersections, **Oakwood Avenue** and **Drake Avenue** were identified as intersections that would benefit the most from extensive long-term intersection rehabilitation, due to high bicycle and pedestrian demand, insufficient bicycle and pedestrian facilities, lack of existing or future identified proposed improvements, and creating a significant break in east-west connectivity in the study area.

Proposed Improvements

Intersection with Memorial Parkway	Short Term	Mid Term	Long Term
Winchester Road	- Relocate yield signs and add yield lines at channelized right turns - Trim vegetation on east side adjacent to sidewalks	- Install bulb-out/taper on southbound right turn lane south of retail access to reduce turning speed Possibly include delineator posts	- Extend sidewalks to corners Possible utility realignment on NW corner - Add crosswalk and dual stage yield lines as possible - Add pedestrian crossing signals
Mastin Lake Road	- Addressed by future overpass improvements	- Addressed by future overpass improvements	- Install updated pedestrian facilities in association with future overpass [NHF-8510(0009)] including two-stage pedestrian crossings and adequate lighting
Sparkman Drive	- Relocate yield signs and add yield lines in advance of pedestrian crossings at channelized right turns, including two-stage yield on NE corner - Remove ant bed on SE corner - Refurbish existing crosswalk pavement markings with ladder crosswalk pavement marking - Extend pushbutton at NW corner	- Install overhead lighting on high mast light poles on NW and SE corners and signal pole on NE corner - Install two-stage pedestrian crossing on north leg as existing cabinet infrastructure allows - Refurbish sidewalk on NW corner - Align pedestrian pushbutton on NE corner with crossing on north leg - Install overhead light on NE corner	- Widen sidewalk on NW corner, extending north and west - Install pedestrian landing on NE corner - Install pedestrian landing on SE corner
Oakwood Avenue	- **Reduce speed limit** - Replace delineator poles under bridge - Refurbish existing crosswalk pavement markings with ladder crosswalk pavement marking - Relocate yield signs and add yield lines in advance of pedestrian crossings at channelized right turns	- Install overhead lighting on signal pole on SW corner of intersection - Install two-stage pedestrian crossing on north leg as existing cabinet infrastructure allows - Refurbush sidewalk on NE corner - Install overhead light on NE corner - Install overhead lighting under bridge over pedestrian pathway	- **Install bicycle lanes in the east and westbound directions,** using taper in advance of each intersection, including green paint at crossing and ramps to sidewalk on both sides of the intersection - Install pedestrian landing on NW corner - **Extend sidewalk** at a minimum to existing transit stops on NW and SE corners - Install pedestrian landing and extend to existing sidewalk on SW corner - Extend sidewalk on SE corner to limit NB right turn radius - Refurbish sidewalk on NE corner, including adding width on
University Drive	- Remove tree on SE corner - Add crosswalk to NE corner - Refurbish existing crosswalk pavement markings with ladder crosswalk pavement marking - Relocate yield signs and add yield lines in advance of pedestrian crossings at channelized right turns, including two-stage yield at NE corner	- Install overhead lighting on high mast light poles on NE corner - Install overhead lighting under bridge over pedestrian pathway - Relocate northbound stop bar to the south, and install No Right Turn on Red sign	- Extend curb on SE corner to remove right turn channelization and add No Right Turn on Red sign - Install pedestrian landing on SE corner - Install channelization island on SE corner providing pedestrian refuge

Intersection with Memorial Parkway	Short Term	Mid Term	Long Term
Bob Wallace Avenue	- Refurbish existing crosswalk pavement markings with ladder crosswalk pavement marking	- Install pedestrian crossing on east side of Bob Wallace, including pavement markings and signal. - Conduct traffic count at southbound right turn. If low, relocated southbound stop bar to the north to allow pedestrian crossing - Install overhead lighting at all corners of the intersection	- Conduct traffic count at southbound right turn. If low, relocate southbound stop bar to the north to allow pedestrian crossing and extend curb at the NW corner. Install No Turn on Red sign. - Install access management curb or pedestrian striping on wide driveway on SW corner
Drake Avenue	- **Reduce speed limit** - Fix programming of existing pedestrian signals so pushbuttons activate correct signals and reorient pushbutton signs to face correct direction. - Cover hole in road on NB lanes	- Install overhead lighting on NW, SW, and SE corners - Install overhead lighting under bridge over pedestrian pathway	- Install pedestrian landings at the NW, NE, and SW corners of the intersection - Install bicycle lanes in the east and westbound directions, using taper in advance of each intersection, including green paint at crossing and ramps to sidewalk on both sides of the intersection - Extend sidewalk to NW corner, including pedestrian landing - Install pedestrian crossings on north, east, and west legs of the intersection, including pavement markings and signal - Alternate 1: Remove westbound right turn lane and install sidewalk on north side of Drake Avenue - Alternate 2: Install midblock crossing on Drake Avenue to east, with sidewalk on south and north of Drake Avenue to connect to sidewalk at L&N Drive
Airport Road	- No existing crossing facilities to improve	- Install overhead lighting at minimum on all corners	- Remove existing yield-controlled westbound right turn lane, replacing with concrete landing, if traffic counts allow - Install pedestrian crossings on all legs of the intersection, including pavement markings and signal - Install pedestrian landings at all corners of the intersection - Install at least one sidewalk crossing at the RR crossing east of the intersection, extending to the intersection.
Lily Flagg Road/Logan Road	- No existing facilities to improve	- No existing facilities to improve	- Install sidewalk on south side from midblock crossing to existing sidewalk east of intersection - Install pedestrian crossing on south leg of the intersection, including pavement markings and signal
Weatherly Road/Haysland Road	- Refurbish pedestrian crossing pavement markings at intersection and intersection with Blanda Drive - Update drain covers to not be parallel to travel way	- No existing facilities to improve	- Extend sidewalk to retail frontage and install mid-block crossing on Haysland Road, including pushbutton activated RRFB.
Meadowbrook Drive	- No existing facilities to improve	- Install overhead lighting at SW and NE corners	Modify proposed access management plan: - Close southbound right turn, terminating road at Arbys, and reconfiguring signage on Memorial Parkway as needed - Reconfigure southbound approach to include right turn lane - Install pedestrian landing on NW corner - Install pedestrian crossings on north and west legs of the intersection, including pavement markings and signal.
Mountain Gap Road	- No existing facilities to improve	- Install overhead lighting at SE corner	Modify proposed access management plan: - Install pedestrian crossing on south leg of the intersection, including pavement markings and signal and pedestrian landing

Intersection with Memorial Parkway	Short Term	Mid Term	Long Term
Redstone Road	- No existing facilities to improve	- No existing facilities to improve	Modify proposed access management plan: - Extend sidewalk on north side of Redstone Road to NW corner - Install pedestrian crossings on north leg of the intersection, including pavement markings and signal. - Install unsignalized ped crossing on east leg of the intersection. - Install midblock crossing at east Walmart Access on Redstone Road, including RRFB
Hobbs Road	- Refurbish existing crosswalk pavement markings with ladder crosswalk pavement marking at north leg of intersection and at Aldi access - Install crosswalk at retail access on northeast side of Hobbs Road, relocating existing stop line - Install crosswalk at retail access on northwest side of Hobbs Road, relocating existing stop line - Relocate yield sign and add yield line at channelized right turn	- Install overhead lighting at NW, NE, and SE corners	Modify proposed access management plan to include ladder crosswalk pavement marking

6.4. Proposed Improvements Conceptual Exhibits

6.5. Proposed Improvements Preliminary Cost Estimates

7. CONCLUSIONS

Memorial Parkway has served as a physical barrier along its entire length, inhibiting east-west movement along the and splitting land uses to one side and the other. This, coupled along with the general geometric attributes of Memorial Parkway, has made the implementation and maintenance of bicycle and pedestrian facilities far more difficult than at more traditional intersections.

In its existing conditions Memorial Parkway does not currently have any dedicated bicycle facilities and minimal dedicated pedestrian facilities at the 14 study intersections. There are identified bicycle routes at some of the intersections, but the bicycle level-of-stress at all intersections is quite high and further limits potential users to only the most experienced.

The City of Huntsville does have several transit stops available at many of the study intersections but transferring from one mode to another is extremely difficult due to infrastructure gaps and is further compounded by minimal lighting and fading of many existing signs and crossing markings.

The proposed improvements discussed in Section 6 would provide a safer movement, more efficient movement, and provide an increased level of comfort for all users. All proposed improvements if implemented should be planned, designed, and constructed to applicable federal, state, and local guidance standard.