I-20 @ SR 5/Bright Star Road Transportation Study

Final Report and Recommendations

City of Douglasville

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ARCADIS

POND

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Study Recommendations

Short-Term Project Recommendations

- **SR 5 at Douglas Boulevard:** Construct an additional southbound left-turn lane from Bill Arp Road to Douglas Boulevard. This will provide additional capacity for the 335 left turning vehicles in existing PM conditions
- **SR 5 at I-20 Westbound:** Construct an additional eastbound right turn lane from I-20 Westbound to Bill Arp Road. This will provide additional capacity for the 720 right turning vehicles in existing PM conditions.
- **SR 5 at Concourse Road:** Construct a dedicated eastbound right-turn lane which ties in to the right turn bay which developed just south of the intersection and terminates at I-20 Westbound.

Mid-Term Project Recommendations

- **SR 5 at Douglas Boulevard:** **Costs: $3,024,500**
  - Addition of second eastbound and westbound left turn lanes
  - Construction of a dedicated westbound right turn lane
  - Construction of a dedicated southbound right turn lane

Long-Term Project Recommendations **Costs: $31,900,000 (all projects)**

- **Split diamond interchange:** At I-20 at SR 5 and I-20 at Bright Star Road with frontage roads between Bright Star Road and SR 5 and two new signalized intersections at new ramp termini with Bright Star Road.
- **Road Relocation:**
  - Relocate Douglas Boulevard at Bright Star Road to south of the existing gas station. Modify the intersection of Bright Star Road and Douglas Boulevard to consist of dual northbound through lanes.
  - Relocate John West Road to the north to tie in with Bright Star Connector. Close Cherry Lane and limit the existing John West Road to right in/right out.
- **Roadway widening:** **Cost: $16,100,000**
  - Widen Bright Star from Douglas Boulevard to Bright Star Connector from two lanes to four lanes

Additional Nearby Project Recommendations

- **Improve Post Road:** Widen to four lanes north of Mason Creek, increase cycle lengths of existing signals, signalize the I-20 eastbound ramp intersections, add dedicated westbound left and right turn lanes at the I-20 west ramp terminus.
- **Chapel Hill Road at Timber Ridge Drive/Douglas Boulevard:** Add a dedicated northbound and southbound left turn lane at Chapel Hill Road at Timber Ridge/Douglas Boulevard.
- **Chapel Hill Road at Elizabeth Drive:** Improve signal timing at Chapel Hill Road and Elizabeth Drive to coordinate signals south of I-20
- **Chapel Hill Road at Douglas Boulevard:** Add dual northbound and southbound turn lanes
- **New Road:** Add new road behind the Dunkin Donuts connecting SR 5 to Douglas Boulevard. Consider connection to Martin Drive.
- **Concourse Parkway at SR 5:** Eliminate split phase. Consider no left turns out of Concourse Parkway.
- **Transit:** Increase transit usage in the area, specifically at the underutilized park and ride lot
- **Aesthetics:** Improve lighting and wayfinding signage throughout the study area.
- **Access Management:** Consider implementing access management along SR 5 by consolidating driveways to improve traffic movement along SR 5.
- **Intersection Improvements:**
  - Roundabout at Cowen Mill Road @ Bright Star Road to reduce queuing at Cowen Mill Road and cut through on Berwin Drive.
  - Roundabout at Bright Star Road @ Central Church Road

Introduction

The purpose of this study is to determine the improvements that can be implemented not only at the I-20 and SR 5 (Bill Arp Road) interchange, but along the interstate corridor to the adjacent interchanges to improve safety, relieve congestion, and support economic development. The SR 5 interchange is one of two primary access points from I-20 to Arbor Place Mall and also provides access to downtown Douglasville and several nearby communities.

Through previous planning efforts, issues have been identified at the I-20 and SR-5 (Bill Arp Road) interchange. The interchange was identified as a high accident location with an above average crash rate. Traffic congestion is also a problem, because westbound traffic on I-20 exiting at SR 5 (Bill Arp Road) frequently queues into the travel lanes on I-20 during the evening peak period. Both the City of Douglasville and Douglas County have identified the interchange at I-20 and SR 5 (Bill Arp Road) as an area that needs improvement in their respective comprehensive transportation plans. This study examines those deficiencies and presents recommended solutions.

Study Process

The study process consisted of a series of tasks to develop a improvement concept plan for the interchange and surrounding area. These tasks included:

- Existing conditions inventory and environmental screening
- Land use and economic analysis
- Transportation and traffic analysis
- Short-term and long-term alternatives development

A prioritized list of short– and long-term recommendations has been developed. Public involvement occurred throughout the process through Stakeholder and Technical Committees, and two public meetings. This process occurred between February 2014 and January 2015.

Study Areas

Traffic, environmental, and demographic study areas were used for this transportation study. Figure 1: Study Area shows the traffic and environmental study areas. Each of the three study areas are fully described in the sections of this report that pertain to them.

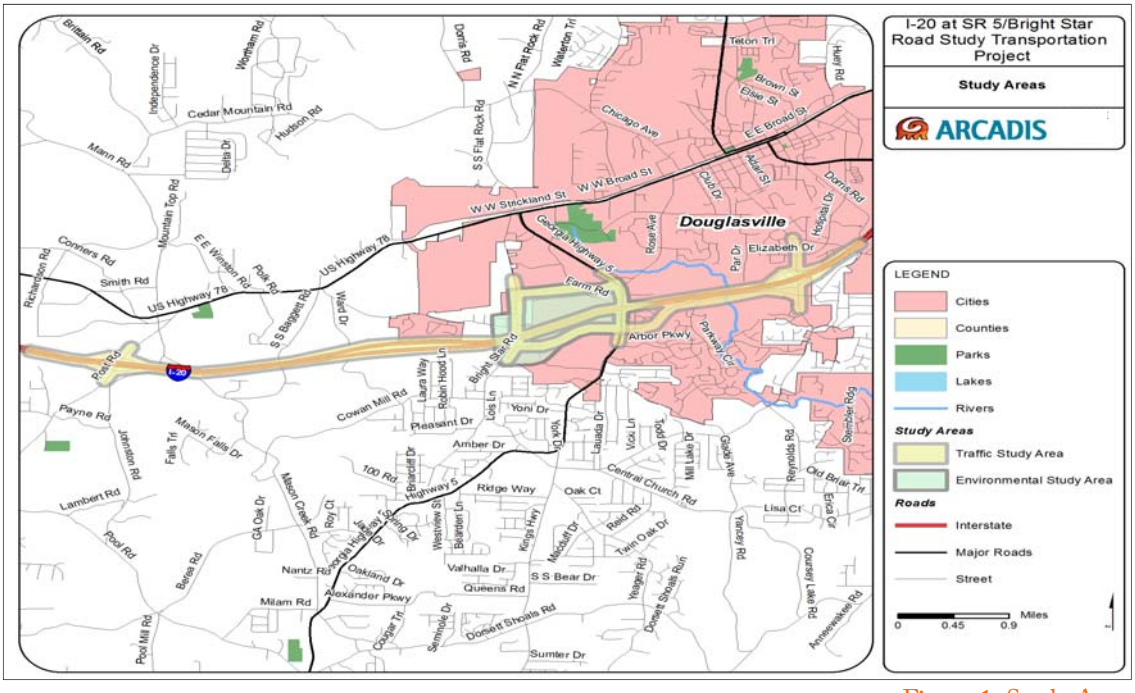


Figure 1: Study Area

Review of Existing Conditions

Study area demographics, land use, economics, the existing transportation system, and environmental screening results are summarized in this section. A detailed description of existing conditions is available in the *I-20 at SR 5/Bright Star Road Study: Technical Memo* dated June 2014.

Demographics

Population, employment, poverty, age, and commuting statistics were analyzed because these factors influence transportation behavior. The study area for the demographics analysis is comprised of 17 census block groups that are near the I-20 and SR 5 (Bill Arp Road) interchange. Figure 2: Demographic Area Block Groups below shows the demographic study area.

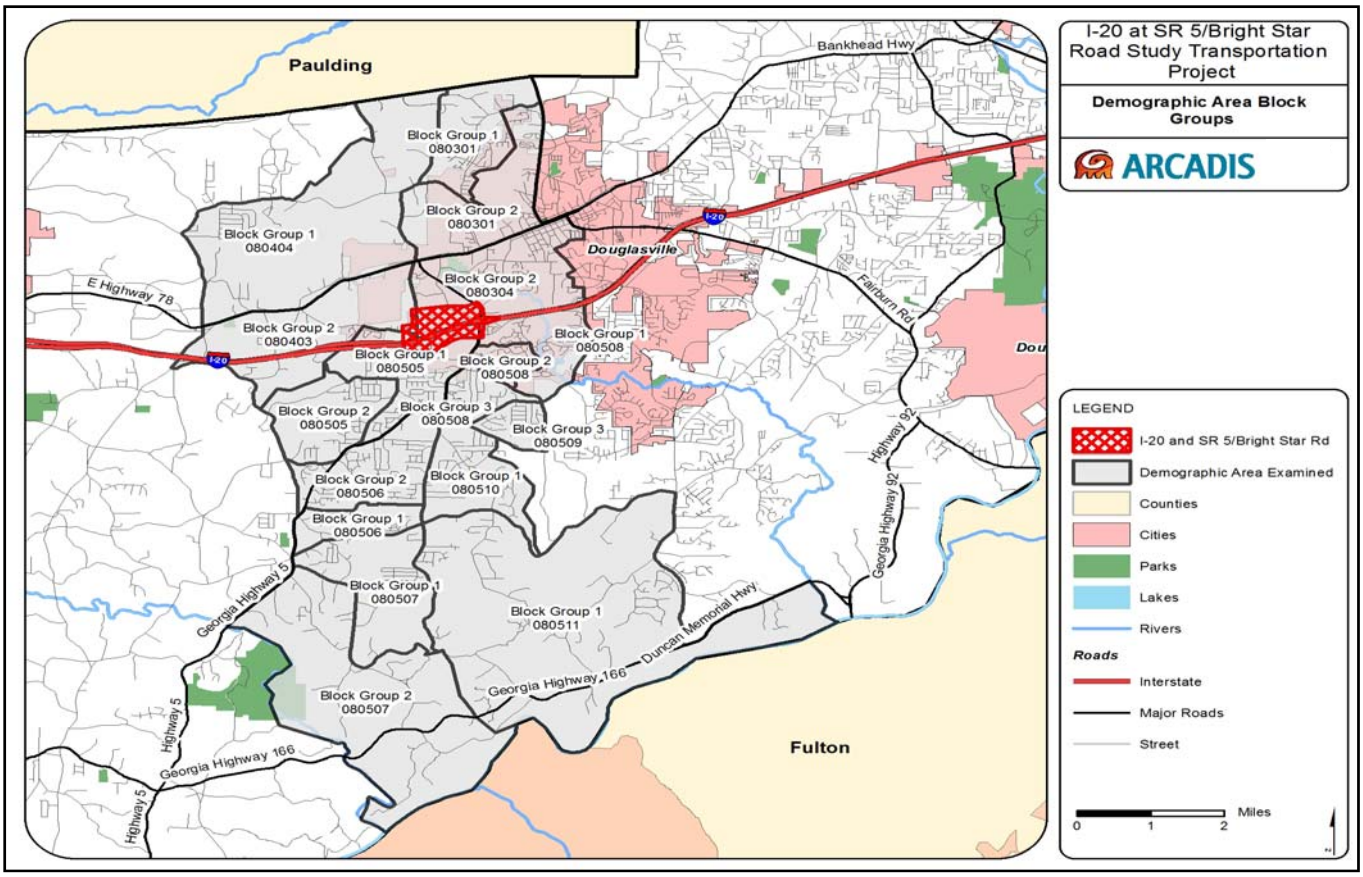


Figure 2: Demographic Area Block Groups

Recent trends based on census data and future forecasts by the ARC indicate that Douglas County has been growing and will continue to do so. Douglas County population increased from 92,174 residents in 2000 to 133,124 in 2012 and is forecasted to continue growing to 256,493 in 2040. Employment in Douglas County grew from 46,944 jobs in 2000 to 59,497 by 2012 and is projected to continue increasing to 75,422 through 2040. This forecasted population and employment growth will result in increased demand for transportation infrastructure.

Poverty rates in Douglas County, the City of Douglasville, and the study area are comparable to the national average. Approximately 12 percent of Douglas County households fall below the poverty level. The City of Douglasville has a slightly higher poverty rate at 15 percent. The study area is between the county and city rates at 13 percent of households in poverty. This is slightly better than the national average of 14 percent. Households in poverty generally have lower rates of vehicle ownership and drive less resulting in an increased demand for modes of transportation that do not require a private automobile.

Approximately 43 percent of the study area population is below the age of 30 and 20 percent is over 55. Currently, 37 percent of the study area is in their prime driving years.

Driving alone is the dominant transportation modes for commuters in the study area, with carpooling and working from home accounting for the second and third largest mode shares in 2012. Approximately 82 percent of study area commuters drive alone, which is similar to the mode share in Douglasville at 83 percent and Douglas County 80 percent. Carpool mode share for study area commuters was 10 percent, which is slightly higher than Douglasville at 9 percent and lower than Douglas County at 12 percent. Roughly 5 percent of commuters in the study area, Douglasville, and Douglas County worked from home. The combined drive alone and carpool mode share for the study area is 92 percent, indicating a heavy reliance on automobile oriented transportation infrastructure.

The majority of workers in the study area, 59 percent, commuted to workplaces outside of Douglas County. Additionally, 58 percent of study area workers had a commute time of more than 30 minutes. These travel statistics show a need for access to the regional transportation network.

Land Use and Economic Analysis

Land use and economics drive demand for transportation infrastructure. This section provides an overview of existing and future land uses in the study area as well as a market analysis. For the land use analysis, a primary target area surrounding the proposed I-20 at Bright Star Road interchange that follows the transportation analysis zone (TAZ) boundaries to the immediate north, south east, and west was identified. In addition, a larger secondary area of impact extends from Post Road east to SR 92 and includes downtown Douglasville. For the market analysis, trade areas centered on the proposed I-20 at Bright Star Road interchange with radii of three and ten miles were identified.

Existing land uses in the eastern side of the study area are automobile oriented and primarily consist of big box retail and highway oriented commercial, with some industrial uses located along SR 5 to the north of I-20. At I-20 and Bright Star Road, the development pattern changes to low density single family residential. In contrast, land uses in downtown Douglasville are at a more pedestrian scale and consist of restaurants and neighborhood commercial uses.

Several large tracts of undeveloped land are available on both sides of I-20 from Post Road to Bright Star Road and in the area around Bright Star Connector, Wood Road, and Rose Avenue. The Douglasville LCI Plan envisions a mixed use activity center with retail, restaurants, office, housing along Bright Star Road Connector at a higher density than the rest of the area. Along SR 5 at Rose Avenue, the plan includes a pedestrian friendly commercial village with retail, entertainment, restaurant, service, and office uses. Figure 3: Douglas County and City of Douglasville Zoning With Study Area below shows the existing land uses in and adjacent to the study area.

Future land uses in the unincorporated Douglas County part of the study area vary and include the following character areas. Bright Star Road north of the Bright Star Road Connecter is designated as Workplace Center, which allows intensive commercial retail and services as well as office and high technology development along major highway corridors. An area bounded by US 78 (Veterans Memorial Highway), Post Road, and Baggett Road is identified as Mixed Use Corridor, which includes commercial, retail, and light industrial uses. Most of the southern portion of the study area is designated as suburban living and allowable uses consist of single family housing with all non-residential uses to be in designated corridors or master planned developments. South of I-20 and west of Cowan Mill Road is identified as rural places, which is primarily active agricultural uses or scattered single family housing on large lots.

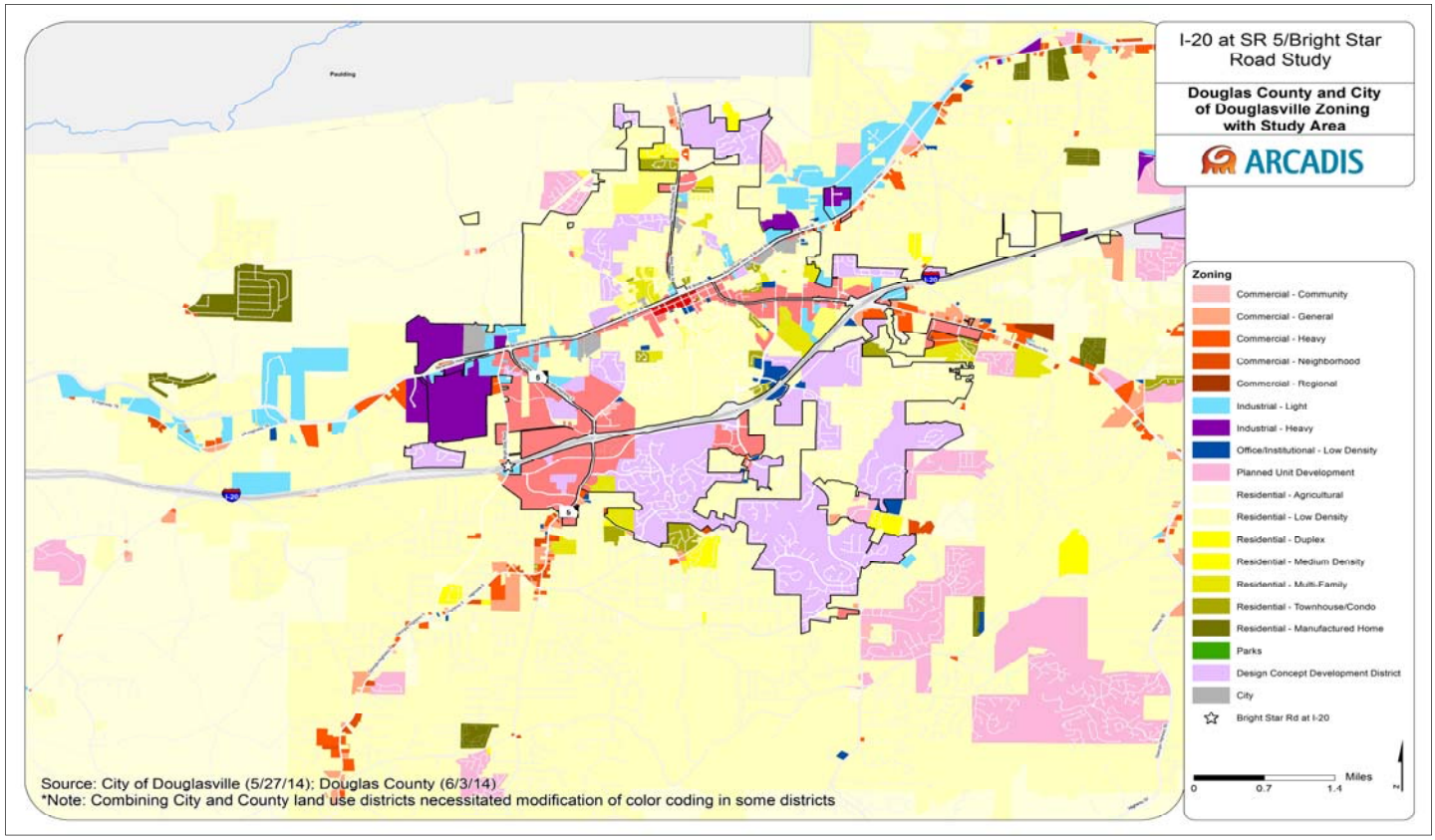


Figure 3: Douglas County and City of Douglasville Zoning

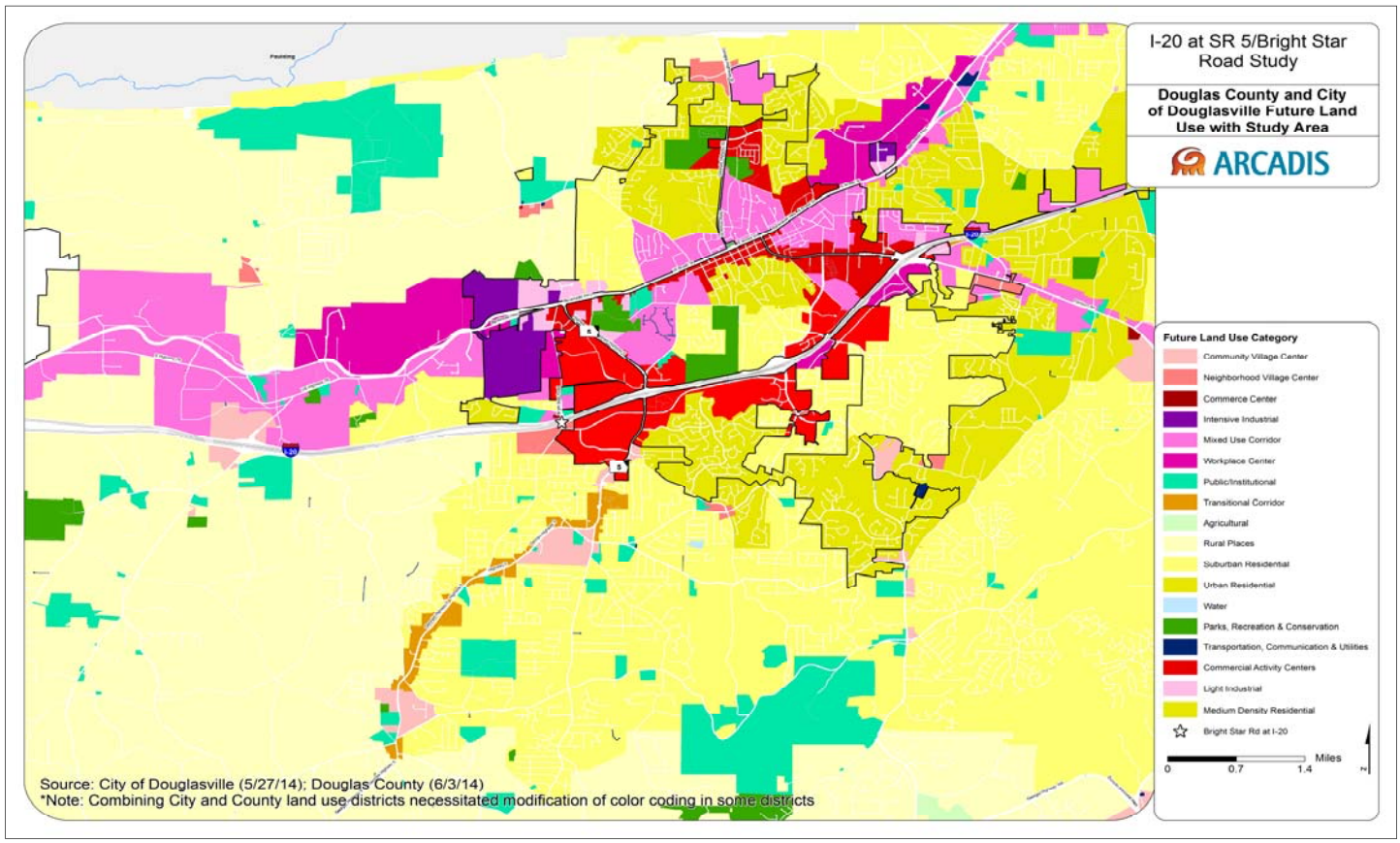


Figure 4: Douglas County and City of Douglasville Future Land Use

The future land plan in the portion of the study area that falls within the City of Douglasville is described as follows. The study area west of Bright Star Road is classified as a Regional Activity Center, which means it can support high intensity development. Typical land uses include regional malls, high rise office buildings, and both single and multi-family residential developments. Most of the study area north of downtown Douglasville and along SR 5 north of I-20 is designated as Mixed Use Development and is intended to include at least two types of land uses on a large site. Allowable land uses include commercial, residential, office, institutional, and recreation. Figure 4: Douglas County and City of Douglasville Future Land Use With Study Area shows the future land uses within and adjacent to the study area.

An economic and market analysis for the I-20 and SR 5 (Bright Star Road) was undertaken to determine potential demand for new residential, retail, and office development in the study area. From the intersection of I-20 and SR 5 (Bright Star Road) a 10 mile radius was used as the market area for residential, while a three mile radius was used for the retail and office market areas. Study area growth is anticipated to be strong, with an estimated demand for 3,500 residential units, 468,000 square feet of retail, and 249,000 square feet of office space over the next 10 years.

Transportation

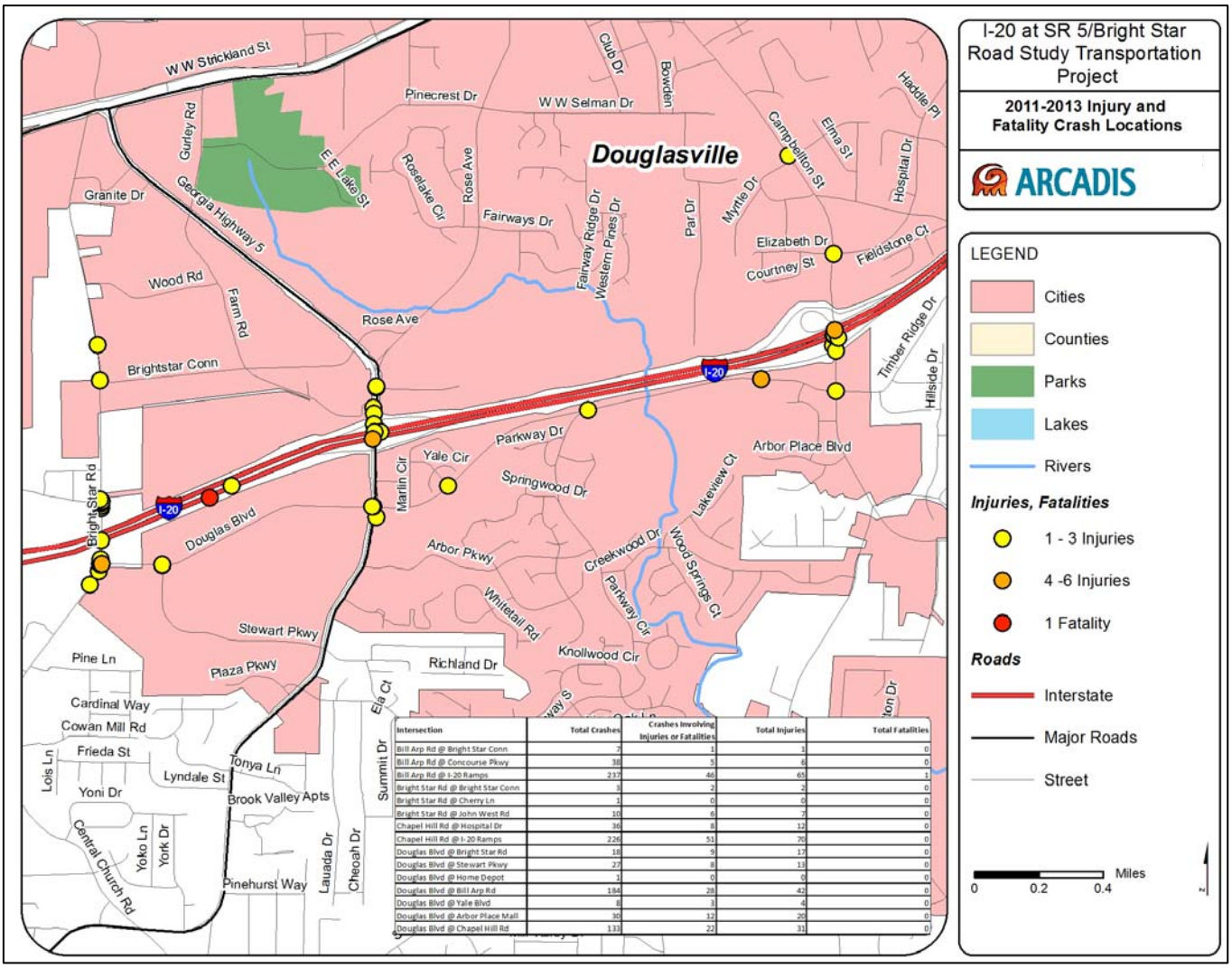
Transportation conditions in the study area were analyzed to determine current issues and provide a baseline to measure potential improvements against. The following overview of the study area transportation network includes a summary of observed roadway congestion, crash data, and available transit services.

During the AM peak period, the intersection of SR 5 (Bill Arp Road) and the I-20 eastbound ramp was the most congested location. Traffic would back up in the southbound lanes of SR 5 (Bill Arp Road) for approximately 1,000 feet from this intersection to Concourse Parkway. This was the only intersection or corridor in the study area congestion was observed at during the AM peak period.

During the PM peak period, SR 5 (Bill Arp Road) was the most congested corridor, with wait times exceeding two minutes at the I-20 interchange for both north and southbound travelers. Congested intersections during the PM peak period along SR 5 (Bill Arp Road) include Douglas Boulevard and the I-20 ramps. Chapel Hill Road at Douglas Boulevard and the I-20 interchange is also a high congestion location during the PM peak period. The remaining corridors and intersections in the study area were relatively uncongested in the PM peak period.

Crash data from 2011 to 2013 was analyzed to identify potential safety concerns on study area roadways. High crash locations include SR 5 (Bill Arp Road) at the I-20 ramps, with 237 total crashes that involved 65 total injuries and 1 fatality, Chapel Hill Road at the I-20 ramps with 226 total crashes and 70 total injuries, SR-5 (Bill Arp Road) at Douglas boulevard had 184 total crashes with 42 total injuries and Douglas Boulevard at Chapel Hill Road with 133 total crashes and 31 total injuries. Congested conditions in the PM peak period were observed at all four high crash locations. Figure 5: 2011-2013 Injury and Fatality Crash Locations below shows crash locations.

Transit service in the study area is provided by the Georgia Regional Transportation Authority (GRTA) and Douglas County Rideshare. Express bus service runs from the West Douglas Park and Ride Lot, located to the east of Bright Star Road at the corner of Stewart Parkway. Douglas County Rideshare operates work trip vanpools from Douglas County to metro Atlanta employment centers. The West Douglas Park and Ride Lot is used as a meeting point for vanpool participants.



Intersection	Total Crashes	Crashes Involving Injuries or Fatalities	Total Injuries	Total Fatalities
Bill Arp Rd @ Bright Star Conn	7	1	1	0
Bill Arp Rd @ Concourse Pkwy	38	5	6	0
Bill Arp Rd @ I-20 Ramps	237	46	65	1
Bright Star Rd @ Bright Star Conn	3	2	2	0
Bright Star Rd @ Cherry Ln	1	0	0	0
Bright Star Rd @ John West Rd	10	6	7	0
Chapel Hill Rd @ Hospital Dr	36	8	12	0
Chapel Hill Rd @ I-20 Ramps	226	51	70	0
Douglas Blvd @ Bright Star Rd	18	9	17	0
Douglas Blvd @ Stewart Pkwy	27	8	13	0
Douglas Blvd @ Home Depot	1	0	0	0
Douglas Blvd @ Bill Arp Rd	184	28	42	0
Douglas Blvd @ Yale Blvd	8	3	4	0
Douglas Blvd @ Arbor Place Mall	30	12	20	0
Douglas Blvd @ Chapel Hill Rd	133	22	31	0

Figure 5: 2011– 2013 Injury and Fatal Crash Locations

Environmental Screening

The social, cultural, natural, and physical environments in the study area were observed and analyzed. Known environmental constraints identified in this screening are summarized in the following paragraphs. The environmental screening study area extends to the north and south of I-20 from west of Bright Star Road to east of SR 5 (Bill Arp Road). Religious facilities in the study area that were identified through a windshield survey include two churches and one school. The institutions are Elizabeth Baptist Church at 2990 Bright Star Road and Douglasville Seventh Day Adventist Church and School at 2838 Bright Star Road.

The *State of Georgia Hydrologic Map Cataloging* Unit (HUC) was reviewed and an informal preliminary investigation for areas likely to contain wetlands, streams, and areas of open water was conducted. The Middle Chattahoochee – Lake Harding Watershed encompasses the entire study area. All streams, wetlands, and open waters associated with the study area drain via unnamed headwater tributaries to Anneewakee Creek, located approximately one mile east of the existing SR 5/I-20 interchange, which is outside the environmental study area.

A review of the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) for the study area showed that Special Flood Hazard Areas subject to inundation by 100 year flood events and two regulatory flood-

ways exist in the study area. A regulatory floodway and special flood hazard area is associated with Arbor Branch Tributary A, which crosses I-20 about 1,750 feet east of where Bright Star Road crosses the interstate. Another regulatory floodway and special flood hazard area is associated with Arbor Branch, which parallels Douglas Boulevard to the south in the vicinity of the study area.

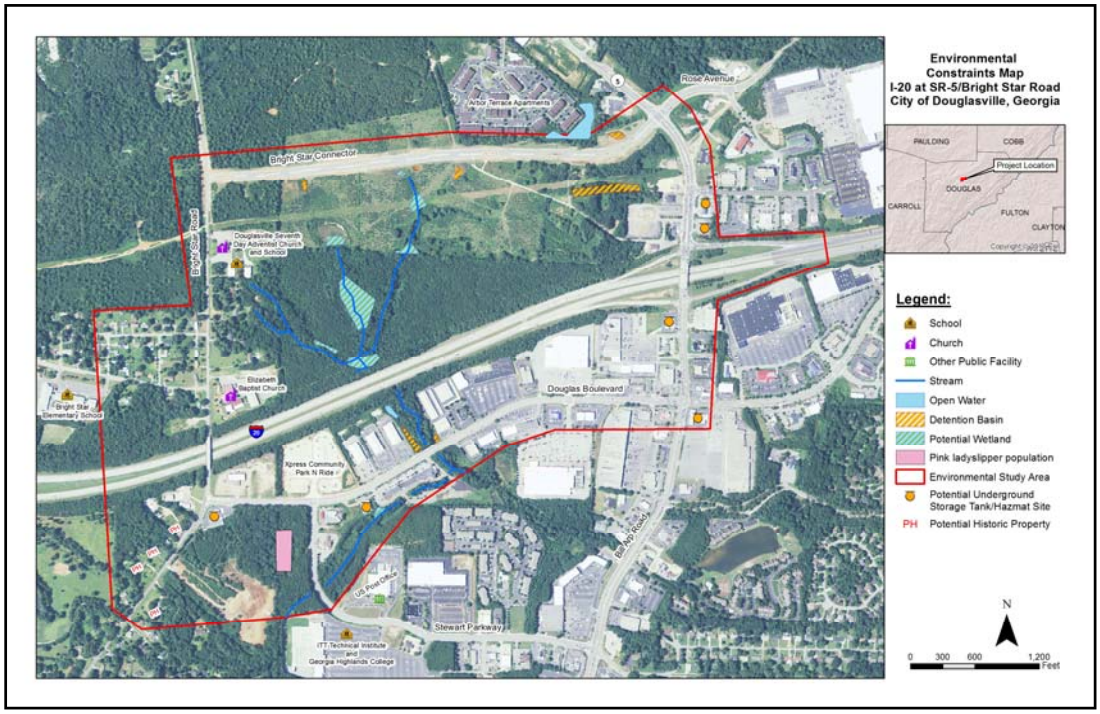


Figure 6: Environmental Constraints Map I-20 at SR 5/Bright Star Road

It is unlikely that any current federal and state listed threatened or endangered species are in the study area, based on background research as well as a preliminary walk through and windshield survey of the study area. However, mixed pine and hardwood forested habitats identified in the study area could provide suitable summer roosting habitat for the federally proposed endangered northern long-eared bat (*Myotis septentrionalis*). Additionally, a small colony of state listed pink ladyslipper orchid (*Cypripedium acaule*) was found.

Several invasive species were observed during the windshield survey. Chinese privet (*Ligustrum sinense*), Japanese honeysuckle (*Lonicera japonica*), kudzu (*Pueraria montana*), Chinese wisteria (*Wisteria sinensis*), multi-flora rose (*Rosa multiflora*), and Nepalese browntop (*Microstegium vimineum*) all occur within the study area. The proposed project will need to limit the spread or propagation of these species in compliance with Executive Order 13112.

During preliminary field visits, various types of wildlife habitats were observed in the study area. Habitats noted include developed/landscaped, secondary successional mixed pine/hardwood forest, planted and recruited pine forest, and old field/pasture, early successional/shrub, and ruderal.

A preliminary assessment of the physical environment in the study area focusing on air quality, noise, underground storage tanks or hazardous materials, and existing utilities was undertaken. Douglas County is located in the Atlanta Non-Attainment area for ozone and particulate matter 2.5, so an Air Quality Impact Assessment will be required for any proposed improvements. Because noise sensitive receptors were identified in the study area during the windshield survey, proposed improvements will require evaluation in accordance with Georgia DOT and FHWA noise policies. Phase I and Phase II Environmental Site Assessments (ESAs) will be required to determine if soil or water contamination has occurred if right of way is acquired from any of several sites potentially containing underground storage tanks or hazardous materials and waste identified in the study area. Above ground utilities alongside SR 5, Douglas Boulevard, and Bright Star Road were observed in the study area along with a large petroleum pipeline easement. Figure 6: Environmental Constrains Map I-20 at SR-5/Bright Star Road illustrates potential environmental concerns in the study area.

Public Involvement

Involving and informing the public was an important part of the I-20 at State Route 5/Bright Star Road Transportation Study. Input from the public involvement process was used in the project identification, alternatives analysis, and recommendations phases of the study.

Throughout the process, a combination of innovative and traditional techniques was used to involve the public and solicit their input including stakeholder interviews, stakeholder and technical committees, and public meetings. Public outreach efforts also included publication of Fact Sheets and newsletters in print form and on the City of Douglasville website. Study documents were also posted to the city website as they were completed. In addition to the general public, the mayor and council were kept informed of the study progress through regular briefings.

Stakeholder Interviews

Stakeholder interviews, conducted in May of 2014, included citizen stakeholders along with city and county staff. Common points brought up in the interviews include the following:

- A large commute pattern is the left on Bright Star heading south towards residential areas
- Bright Star and Cowan Mill Road intersection backs up
- SR 5 (Bill Arp Road) and Douglas Boulevard:
    - Backs up in all directions on Saturdays.
    - Trucks block the through lane and right turn lane when turning right
    - Redevelopment opportunity of the former K-Mart on the corner
- Chapel Hill Road is avoided by travelers
- An issue in the area is the SR 5 (Bill Arp Road) bridge over the interstate, which is congested in the PM peak period and backs up the I-20 exit ramp
- I-20 westbound exit ramp at SR 5 (Bill Arp Road) is a safety issue in the PM peak period.
- Single family residential growth has been to the south, residential development in the study area is primarily apartments.
- Greenfield development opportunities abound in the study area
- The vacant car dealerships on Douglas Boulevard are an opportunity for redevelopment
- A vacant Wal-Mart south of the study area on Stewart Parkway is also a redevelopment opportunity

Stakeholder and Technical Committees

Representatives from the City of Douglasville, Douglas County, Georgia DOT, GRTA, ARC and the consultant project team compromised the technical committee. Stakeholder Committee members were appointed by Douglasville City Council and included residents and business owners in the study. During the course of the project, the Stakeholder and Technical Committees met 5 times to review existing conditions, potential recommendations, and the preferred concept and prioritized list of projects.

Public Meetings

Public meetings were held on Thursday, June 26, 2014, from 6:00pm to 7:30pm and on October 14, 2014, from 6:30pm to 8:00pm at the Douglasville Conference Center. The June public meeting gave attendees the opportunity to identify issues and opportunities along the corridor. Common issues and opportunities brought up by participants ant the public

meetings included:

- SR 5 (Bill Arp Road) is congested, particularly at the I-20 ramps
- An existing issue is the lack of turn lanes at SR 5 (Bill Arp Road) and Douglas Boulevard
- New north-south road from Bright Star Connector to Douglas Boulevard
- Lack of connectivity and on arterials and major collectors
- A collector-distributer system between the interchanges would relieve traffic
- One solution may be a diverging diamond interchange at SR 5 (Bill Arp Road) and I-20

The October public meeting allowed attendees to review potential improvement recommendations. Overall, feedback generally supported additional access to Bright Star Road.

Alternatives Analysis

In the Existing Conditions Technical Memorandum, the need and purpose of this study was defined as determine improvements that can be implemented not only at the I-20 and SR (Bill Arp Road) interchange, but also along the interstate corridor to the adjacent interchanges to improve safety, relieve congestion, and support economic development. Based on the existing conditions analysis, an alternatives analysis was conducted to determine appropriate improvements in the study area that meet the need and purpose of the study.

Alternative Improvements and Fatal Flaw Analysis

This section outlines the process that took place to develop four potential improvement scenarios. Each scenario consists of several alternatives designed to improve traffic operations at various locations within the overall study area that are expected to require some type of modification to meet the predicted vehicular demand. A complete list of each alternative is found in ***Appendix A: Fatal Flaw Analysis***, along with a fatal flaw analysis summary for each alternative that describes whether the project is expected to be feasible and beneficial to the study area or not. This process considered design and construction costs, compliance with GDOT and FHWA standards for signal and interchange placement, possible objections from stakeholders and citizens, concurrence with Douglasville's 2013 Comprehensive Plan, and expected level of improvement achieved by each project.

The resulting list of projects that moved forward into detailed testing can be found in Table 1. In addition to these selected projects, a secondary list of alternatives that should be considered for implementation in the study area, but which did not move forward with further testing, can also be found in Table 1. These projects either did not have sufficient traffic data to conduct detailed analysis or were not capable of being modeled with the methodology described in the previous section.

Scenario Development

The list of projects from Table 1 were tested in greater detail using the methodologies described in the previous section to determine the extent of improvement that each alternative yielded. This process and the level of service (LOS) results are documented in a later section of this report. The complexity of the relationship between the Bright Star Road and SR

5 corridors along with the results from the intersection operational analysis suggested the need to establish several scenarios to better understand, quantify and compare the effects of the interchange designs. Each scenario consists of various individual alternatives taken from the list in ***Table 10*** and some overlap of these alternatives occurs between each scenario. In total, four scenarios were developed based on the four major improvements that have potential to improve congestion on SR 5 and at the I-20 ramp termini. The scenarios are on the following pages.

Table 1: Recommended Projects for Detailed Analysis & Future Conditions

Project ID	Description
	Recommended for Detailed Analysis
PA-001	Diverging Diamond Interchange on SR 5 at I-20 paired with SR 5 widening to six lanes from Arbor Pkwy. to Concourse Pkwy. and intersection modifications outlined in PA-001(a) at Douglas Blvd.
PA-001(a)	Dual and EB WB left turn lanes; WB right turn bay; additional WB through lane; SB right turn lane at SR 5 at Douglas Blvd.
N-1	Post Rd. corridor improvements, including widening, turn lane improvements, and signalization at I-20 EB ramp
N-3	Dual NB and SB left turn lanes at Chapel Hill Rd. @ Douglas Blvd.
PA-014	Add a lane in both directions to SR 5 from Arbor Pkwy. to Rose Ave.
PA-019	Collector-distributor system from Chapel Hill Rd. to Bright Star Rd.
PA-020	Split-diamond interchange at SR 5 and Bright Star Rd. with frontage roads between Bright Star Rd. and SR 5; relocate Douglas Blvd. to the south at Bright Star Rd.
PA-020(a)	Split-diamond interchange at SR 5 and Bright Star Rd. with roundabouts and frontage roads between Bright Star Rd. and SR 5; relocate Douglas Blvd. to the south at Bright Star Rd.
PA-036	Single point urban interchange (SPUI) at SR 5 @ I-20
PA-004	Roundabout at Douglas Blvd. @ Bright Star Rd.
PA-037	Roundabout at Bright Star Rd. @ Bright Star Connector
PA-038	Roundabout at Bright Star Rd. @ John West Rd.
N-4	Coordinate signal at Chapel Hill Rd. @ Elizabeth Dr. with signals south of I-20
	Recommended for Future Consideration
N-10	New road behind Dunkin Donuts connecting SR 5 and Douglas Blvd. with interparcel connection to Martin Dr./Lowe's
N-9	Frontage Road between Bright Star Rd., SR 5, and Chapel Hill Rd. as possible extension of project PA-020
PA-021	Access Management on SR 5
PA-026	Roundabout at Cowan Mill Rd. @ Bright Star Rd. to reduce queuing at Cowan Mill Rd. and cut-through on Berwin Dr.
PA-027	Roundabout at Bright Star Rd. @ Central Church Rd.
PA-030	Wayfinding signage to route traffic to mall, transit, etc.
PA-034	I-20 HOV lanes from Thornton Rd. to Bright Star Rd.
PA-035	Managed lanes on I-20 West from I-285 to west of Bright Star Rd.
PA-032	Pedestrian improvements
PA-033	Cycling improvements

Figure 7: Scenario 1, Widen SR 5o to six lanes

Projects Included in Scenario 1:

PA-004: Construct a single lane roundabout at Bright Star Road @ Douglas Boulevard

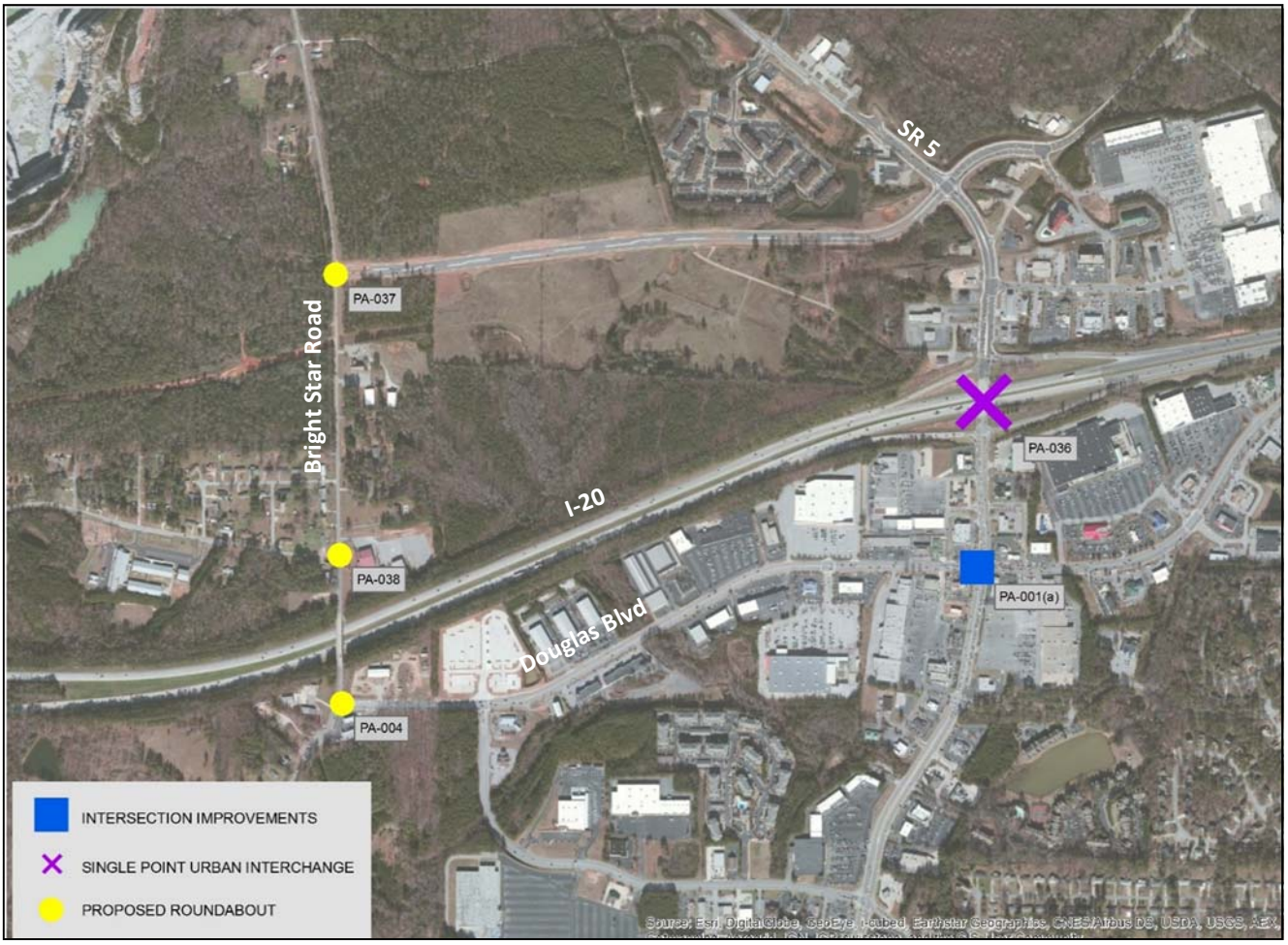
PA-014: Add a lane to SR 5 in both directions from Arbor Parkway to Rose Avenue

PA-037: Construct a single lane roundabout at Bright Star Road @ Bright Star Connector

PA-038: Construct a single lane roundabout at Bright Star Road @ John West Road

N-1: Improve Post Road by widening to 4 lanes north of Mason Creek Road, increase cycle lengths of existing signals, signalize the I-20 eastbound ramp intersections, add dedicated westbound left and right turn lanes at the I-20 west ramp terminus (not shown)
N-3: Add a dedicated northbound and southbound left turn lane at Chapel Hill Road @ Timber Ridge Drive/Douglas Boulevard (not shown)
N-4: Improve signal timing at Chapel Hill Road @ Elizabeth Drive to coordinate with signals south of I-20 (not shown)

Figure 8: Scenario 2, Construct a single point urban interchange between I-20 and SR 5



Projects Included in Scenario 2:

PA-001(a): Dual EB and WB left turn lanes; WB right turn bay; additional WB through lane; SB right turn lane at SR 5 at Douglas Boulevard

PA-004: Construct a single lane roundabout at Bright Star Road @ Douglas Boulevard

PA-036: Construct a Single Point Urban Interchange (SPUI) at SR 5 @ I-20

PA-037: Construct a single lane roundabout at Bright Star Road @ Bright Star Connector

PA-038: Construct a single lane roundabout at Bright Star Road @ John West Road

N-1: Improve Post Road by widening to 4 lanes north of Mason Creek Road, increase cycle lengths of existing signals, signalize the I-20 eastbound ramp intersections, add dedicated westbound left and right turn lanes at the I-20 west ramp terminus (not shown)

N-3: Add a dedicated northbound and southbound left turn lane at Chapel Hill Road @ Timber Ridge Drive/Douglas Boulevard (not shown)

N-4: Improve signal timing at Chapel Hill Road @ Elizabeth Drive to coordinate with signals south of I-20 (not shown)

Figure 9: Scenario 3, Construct a diverging diamond interchange between I-20 and SR 5, widen SR

Projects Included in Scenario 3:

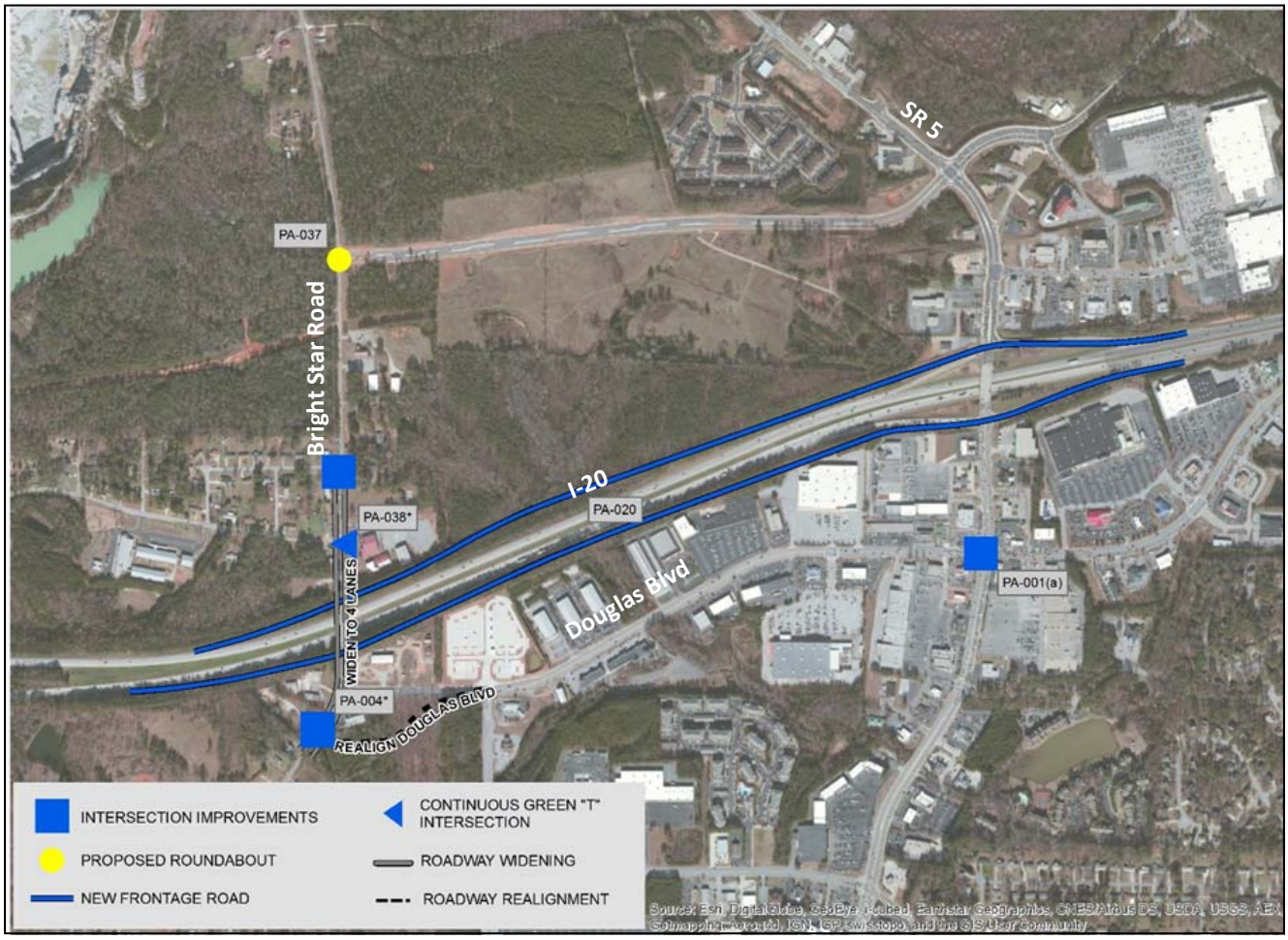
PA-001: Construct a diverging diamond interchange on SR 5 at I-20 along with widening SR 5 to six lanes from Arbor Pkwy. to Concourse Pkwy., and intersection modifications at Douglas Boulevard to include the addition of dual EB and WB left turn lanes, a WB right turn bay, an additional WB through lane, and a SB right turn lane
PA-004: Construct a single lane roundabout at Bright Star Road @ Douglas Boulevard

PA-037: Construct a single lane roundabout at Bright Star Road @ Bright Star Connector

PA-038: Construct a single lane roundabout at Bright Star Road @ John West Road

N-1: Improve Post Road by widening to 4 lanes north of Mason Creek Road, increase cycle lengths of existing signals, signalize the I-20 eastbound ramp intersections, add dedicated westbound left and right turn lanes at the I-20 west ramp terminus (not shown)
N-3: Add a dedicated northbound and southbound left turn lane at Chapel Hill Road @ Timber Ridge Drive/Douglas Boulevard (not shown)
N-4: Improve signal timing at Chapel Hill Road @ Elizabeth Drive to coordinate with signals south of I-20 (not shown)

Figure 10: Scenario 4:,Construct a split diamond interchange between I-20 @ SR 5 and I-20 @ Bright



Projects Included in Scenario 4:

PA-001(a): Dual EB and WB left turn lanes; WB right turn bay; additional WB through lane; SB right turn lane at SR 5 at Douglas Boulevard

PA-004*: Modify intersection of Bright Star Road and Douglas Boulevard to consist of dual NB through lanes

PA-020: Split-diamond interchange at I-20 @ SR 5 and I-20 @ Bright Star Road with frontage roads between Bright Star Road and SR 5 and two new signalized intersections at new ramp termini on Bright Star Road. Additionally, relocate Douglas Blvd. to the south at Bright Star Rd. and John West Rd. to the north to tie in with Bright Star Conn. The project also includes closing Cherry Ln. and limiting the existing John West Rd. to right-in, right-out.

N-1: Improve Post Road by widening to 4 lanes north of Mason Creek Road, increase cycle lengths of existing signals, signalize the I-20 eastbound ramp intersections, add dedicated westbound left and right turn lanes at the I-20 west ramp terminus (not shown)

N-3: Add a dedicated northbound and southbound left turn lane at Chapel Hill Road @ Timber Ridge Drive/Douglas Boulevard (not shown)

N-4: Improve signal timing at Chapel Hill Road @ Elizabeth Drive to coordinate with signals south of I-20 (not shown)

Bright Star Road Widening: This scenario requires that Bright Star Road be widened to accommodate additional demand from Douglas Boulevard to Bright Star Connector.

** denotes a modification of geometry from initial project description due to increased demand on roadway*

Comparison of Scenarios

The four design scenarios and the no-build scenario were compared using several qualitative and quantitative measures to better understand the relative effectiveness and value that each option provided. These measures included:

- Major Corridor Delay – a quantitative measure of the reduction in cumulative hours of delay on SR 5 and Bright Star Road during peak hour of traffic.
- Intersection Spacing/Queue Spillback Potential – this measure attempts to quantify each scenarios' inherent potential to create spillback of vehicle queues between closely spaced intersections. Major intersections within close proximity to one another are subject to decreases in capacity if blocked by a queue from a downstream intersection. This condition can lead to wasted green time and significant operational failure on both side streets and the mainline.
- Economic Development on Bright Star Road – a quantitative measure of the effects of each scenario on land use, accessibility, and economic generation along Bright Star Road and the Bright Star Connector. The scenario's which provide new connections will be expected to boost economic vitality which is important to the city's future land use plan.
- Opportunity for Bicycle and Pedestrian Environment – this measure attempts to quantify the potential to improve conditions for cyclists and pedestrians in each scenario. Linear projects are weighted higher than standalone intersection improvements due to potential to include sidewalk, trail, and bike lanes.
- Right-of-way & Development Impacts – an estimate of how each scenario will impact existing structures, businesses, community facilities, and homes. This measure is also dependent upon the amount of expected right-of-way that each scenario will require.
- Cost– an estimate of the total costs to design, permit, and construct the project.

Table 2 illustrates the results of this comparison. Note that a circle implies that there is no change or no impact as a result of the scenario, a minus sign implies that the scenario has a negative effect on conditions, and a plus sign implies that the scenario improves conditions for the design year.

Table 2: Scenario Comparison Results

Scenario	Major Corridor Delay	Intersection Spacing/Queue Spillback Potential	Economic Development on Bright Star	Opportunity for Bike/Ped Environment	ROW and Development Impacts	Cost [1]
No Build	−	−	○	−	○	○
Scenario 1: Widen SR 5	+ Average: 30% reduction on SR 5 (PM)	○	○	+ creates opportunity for bike/ped facilities	− − Costly ROW acquisition expected w/ impacts to existing dev. On SR 5	− Expensive ROW and bridge deck widening
Scenario 2: SPUI	+ Average: 20% reduction on SR 5 (PM)	+ improves close signal spacing at I-20 by reducing to one intersection	○	− lack of linear construction limits bike/ped opportunities	+ Does not require significant ROW	− Expensive bridge widening and ramp support structure
Scenario 3: Widen SR 5 and Construct Diverging Diamond Interchange	+ + Average: 35% reduction on SR 5 (PM)	− − requires I-20 ramp termini intersections to be moved closer to adjacent signals	○	+ creates opportunity for bike/ped facilities	− − Costly ROW acquisition expected w/ impacts to existing dev. On SR 5	− Expensive ROW and bridge deck widening
Scenario 4: Construct Split Diamond Interchange with Frontage Road System Between Bright Star Road and SR 5	+ + Average: 35% reduction on SR 5 (PM)	− creates more movements at I-20 ramp temini where queue spillback is a risk	+ Promotes development on Bright Star Rd	+ creates opportunity for bike/ped facilities	− Impacts to dev. is limited to Bright Star widening	− − Expensive ROW for frontage roads but less expensive ROW costs on Bright Star

(1) Cost is based on anticipated relative expense per scenario and further cost estimates are needed

○ No change − Negative impact + Positive impact

No Build Scenario

If no steps are taken to improve the study area, the corridor delay will likely worsen and this condition will be exacerbated by frequent intersection placement at the I-20 and SR 5 interchange, although, two short-term planned improvements at the intersections of SR 5 at Douglas Boulevard and at SR 5 at I-20 West ramps are expected to improve the two most congested intersections on the corridor. Additionally, without road construction projects, bike and pedestrian improvements must be implemented as stand-alone projects instead of being constructed at the same time that roadway construction takes place. This can make completing these types of projects difficult and can even lead to throw-away construction if a road widening comes through at a later date. Doing nothing also limits the accessibility to retail development zones found in the City of Douglasville's future land use plan.

Scenario 1: Widen SR 5 and Other Improvements

Widening SR 5 does improve the overall progression along the arterial, especially at the congested intersection at Douglas Boulevard. However, review of the site, traffic analysis results, and consideration of construction costs suggest that widening the state route is not necessarily beneficial enough to warrant the cost. Right-of-way along the proposed widening is owned by existing businesses, many of which have parking spaces located close to existing edge of pavement. The ROW costs along this segment would be at a premium due to the site impacts for these existing restaurants and retail stores. Widening the corridor does provide an opportunity for adjacent bike and pedestrian connections, but would require even more right-of-way than widening alone.

Scenario 2: Single Point Urban Interchange (SPUI) and Other Improvements

The single-point urban interchange concept has an advantage over Scenarios 1 and 3 in that it does not require SR 5 to be widened. Spot improvements at SR 5 at Douglas Boulevard, like adding dual east- and westbound left turn lanes, dedicated right turn bays and converting the WB right turn lane into a through lane, are needed to further improve LOS and enhance safety. This intersection between Douglas Boulevard and SR 5 was identified as a high crash location in the Douglas County Comprehensive Transportation Plan and therefore improvements like those found in project PA-001(a) may have additional safety benefits here. A study including crash diagrams for incident patterns is recommended before a final determination is made on impacts to safety. The cost estimate for this concept should consider the need to widen the bridge deck as well as the reconstruction of the I-20 ramps which would likely require a support structure much like that of the SPUI found at SR 400 at Lenox Road NE. in Buckhead, GA. Another benefit to the SPUI concept is that it removes one ramp terminus signal from the SR 5 corridor, thereby relieving some of the bottleneck that the I-20 interchange causes. As a secondary alternative to this scenario, the SPUI was modeled in Synchro as a six lane section however this resulted in only a few seconds of delay less than the four lane section and was not considered further.

Scenario 3: Widen SR 5, Construct DDI at I-20, and Other Improvements

Diverging Diamond Interchanges (DDI) is a type of interchange in which two directions of traffic on the non-freeway road cross to the opposite side of the bridge at the freeway; requiring traffic on the freeway overpass (or underpass) to briefly drive on the opposite side of the road from what is customary. Research has shown that generally, DDIs are not as effective as SPUIs when there is heavy through traffic (as on SR 5). As expected, the diverging diamond interchange of Scenario 3 must be paired with a widening of SR 5 for it to become effective at reducing delays at the interchange, especially in the afternoon when the left turn volume off I-20 West is at its heaviest. Corridor progression has the potential to be better in this scenario than in Scenario 1 because the two ramp termini signals are simplified to two phases; however, the proximity to the adjacent signals at Concourse Parkway north of the interchange and at Douglas Boulevard to the south may create queues that back up into closely spaced intersections and degrade LOS. The lane crossing maneuver of the DDI requires more space within each intersection which most likely means that the proposed DDI signals would

need to be located even closer to adjacent signals than they are currently. The effects of these closely spaced intersections should be studied in a microsimulation model to better understand the relationship between them before a determination can be made on the effectiveness of the DDI.

DDIs are generally thought of as being accommodating to pedestrians and cyclists because of the simple signal phasing and placement of crosswalks. Pedestrian crossings can take place on the outside edge of the bridge deck or within the central median area of the DDI. Bike lanes can be striped on the right-hand side of the inside lane with the only conflict point occurring where the I-20 off ramps merge with SR 5 traffic.

Scenario 4: Construct a Split Diamond Interchange and Other System Improvements

Scenario 4 offers a concept that calls for the reconstruction of the existing interchange and new connections to the Bright Star Road corridor via a frontage road system on both sides of the freeway. This design relieves congestion on SR 5 by redirecting a percentage of it to the Bright Star Road corridor. By doing so, the need to widen SR 5 is eliminated which is beneficial considering expected right-of-way costs on SR 5. As a result, more improvements are needed along the Bright Star Road corridor. A widening to four lanes is necessary between the intersection with Douglas Boulevard and the intersection with Bright Star Connector. Two new signalized intersections would be introduced to the corridor at the frontage road/ramp crossings. In order to maintain adequate signal spacing, Douglas Boulevard would need to be realigned to the south and signalized. John West Road would also be considered too close to the proposed ramp signal and would need to be modified in some way to increase distance between signalized intersections. It is proposed that John West Road be realigned to intersect adjacent to Bright Star Connector.

An additional benefit of Scenario 4 is that the split diamond interchange allows for the development of the Bright Star Connector corridor without overloading SR 5 and the existing diamond interchange. From a development impact perspective, this scenario is preferred to Scenarios 1 and 3 because if successfully removes demand from SR 5, which in turn eliminates the need to widen it to six lanes.

Recommendations

Many ideas and possible solutions were vetted through the evaluation process. The most promising ideas then underwent detailed examination, as described earlier in the report and in the Appendix. Project recommendations are listed below in phases to address both short– and long-term needs. Short-term projects were developed to address the study area's current needs and provide immediate relief to travelers by implementing quick surgical operational and safety improvements. Key attributes of short–term projects included planned intersection improvement projects that are scheduled for implementation in a relatively quick timeframe. Mid– and long– term projects were developed with the goal of addressing long term needs and to accommodate future traffic volumes. Bike and pedestrian improvements throughout the study area have also been identified.

Preferred Concept

Scenario 4 offers a concept that best meets the criteria maximizes opportunities identified by the public for intended growth and economic development. Scenario 4 includes a split diamond interchange between I-20 at SR 5 and I-20 at Bright Star Road with frontage roads between SR 5 and Bright Star Road. Scenario 4 was modified as first proposed in the analysis. Changes include tailoring improvements at Bright Star Road to meet intersection spacing requirements and additional demand requirements of this scenario.

Modifications to the intersection of Bright Star Road with Douglas Boulevard and John West Road will be necessary to provide for the minimum FHWA intersection spacing. To meet intersection requirements, it is proposed that Douglas Boulevard be realigned to intersect Bright Star Road further south and John West Road be realigned to intersect with Bright Star Road adjacent to Bright Star Connector. The existing John West Road intersection will be converted to a right-in/right-out intersection. To reduce the neighborhood cut-through traffic, the connection from Cherry Lane to Bright Star Road will be closed. Residents from Cherry Lane will have the option of accessing Bright Star Road via the right-in/right-out at the existing John West Road intersection or the proposed, newly aligned John West Road.

Figure 11; Modified Scenario 4

The roundabout originally proposed at Bright Star Road at Douglas Boulevard will not be feasible in Scenario 4 due to the additional demand generated by diverted traffic from SR 5. The preferred design for this intersection improvement is to widen to two northbound through lanes south of the intersection. The two-lane segment of Bright Star Road would end at Douglas Boulevard with one of the southbound lanes becoming a dedicated left-turn lane. Signalization would be necessary and therefore Douglas Boulevard would need to be realigned to the south to meet

GDOT and FHWA signal spacing requirements and a signal warrant analysis would need to be conducted and approved. Douglas Boulevard would also need to be realigned to the south to increase the distance between the proposed signal here and the proposed signal at the I-20 East off-ramp to Bright Star Road.

As with the intersection of Bright Star Road at Douglas Boulevard, the additional demand expected in Scenario 4 would require a widening to four lanes of Bright Star Road from Douglas Boulevard to Bright Star Connector. Initially, a multi-lane roundabout was originally proposed for the intersection of Bright Star Road, Bright Star Connector, and the realigned John West Road. However, this roundabout will not be feasible under this scenario due to the high turning volumes from the northbound and westbound approaches and future traffic volume growth along Bright Star Connector. This intersection will instead be signalized. Also, with Scenario 4, the need exists for additional westbound capacity at SR 5 at Douglas Boulevard.

One key advantage of this recommended system of improvements is the ability to design and construct this system in phases, as described below.

Short-Term Project Recommendations

There are currently several projects planned to improve operations along Bill Arp Road (SR 5). The short-term, surgical projects focus on providing relief to key movements at several interchanges. These projects have been identified by Douglas County. Below are brief descriptions of the projects:

- **SR 5 at Douglas Boulevard:** Construct an additional southbound left turn lane from Bill Arp Road to Douglas Boulevard. This will provide additional capacity for the 335 left turning volumes in existing PM conditions
- **SR 5 at I-20 Westbound:** Construct an additional eastbound right turn lane from I-20 Westbound to Bill Arp Road. This will provide additional capacity for the 720 right turning vehicles in existing PM conditions.
- **SR 5 at Concourse Road:** Construct a dedicated eastbound right turn lane which ties in to the right turn bay which developed just south of the intersection and terminates at I-20 Westbound. This improvement would provide additional capacity to traffic generated by recent and planned developments off Concourse Road.

Mid-Term Project Recommendations

These projects will require little to no right of way acquisition and can advance as funding becomes available. There are other improvements to the intersection of Bill Arp Road and Douglas Boulevard which will assist the intersection in handling the future demand; however, these improvements would require ROW. These improvements include:

- **SR 5 at Douglas Boulevard:** **Costs: $3,024,500**
    - Addition of second eastbound and westbound left turn lanes
    - Construction of a dedicated westbound right turn lane
    - Construction of a dedicated southbound right turn lane

Long-Term Project Recommendations

Costs: $31,900,000 (all projects)

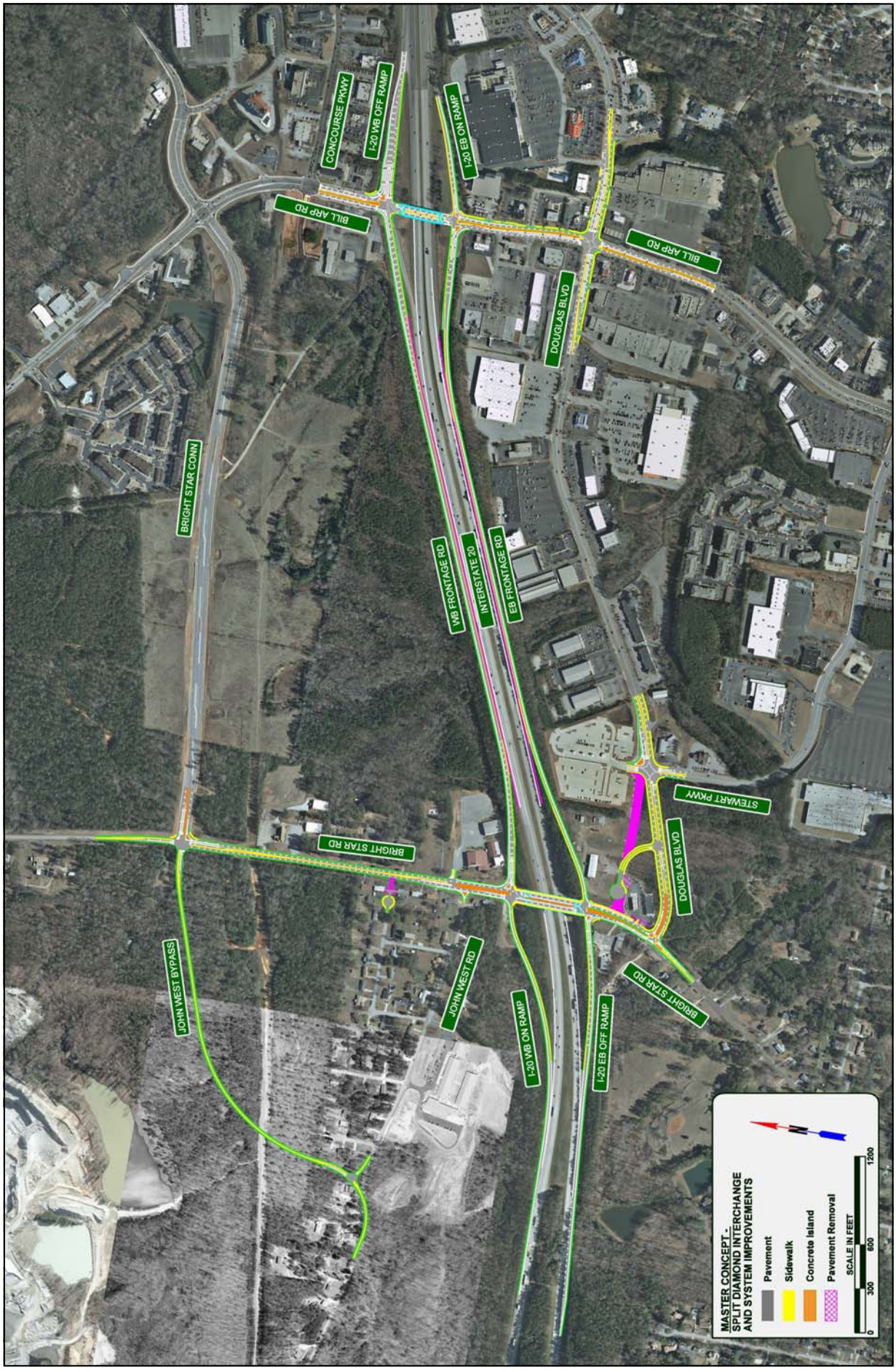
These projects were developed to address long-term needs and future traffic volumes while also providing opportunity for future growth and development along Bright Star Road and Bright Star Connector.

- **Split diamond interchange:** At I-20 at SR 5 and I-20 at Bright Star Road with frontage roads between Bright Star Road and SR 5 and two new signalized intersections at new ramp termini with Bright Star Road.
- **Road Relocation:**
    - Relocate Douglas Boulevard at Bright Star Road to south of the existing gas station. Modify the intersection of Bright Star Road and Douglas Boulevard to consist of dual northbound through lanes.

- Relocate John West Road to the north to tie in with Bright Star Connector. Close Cherry Lane and limit the existing John West Road to right in/right out.

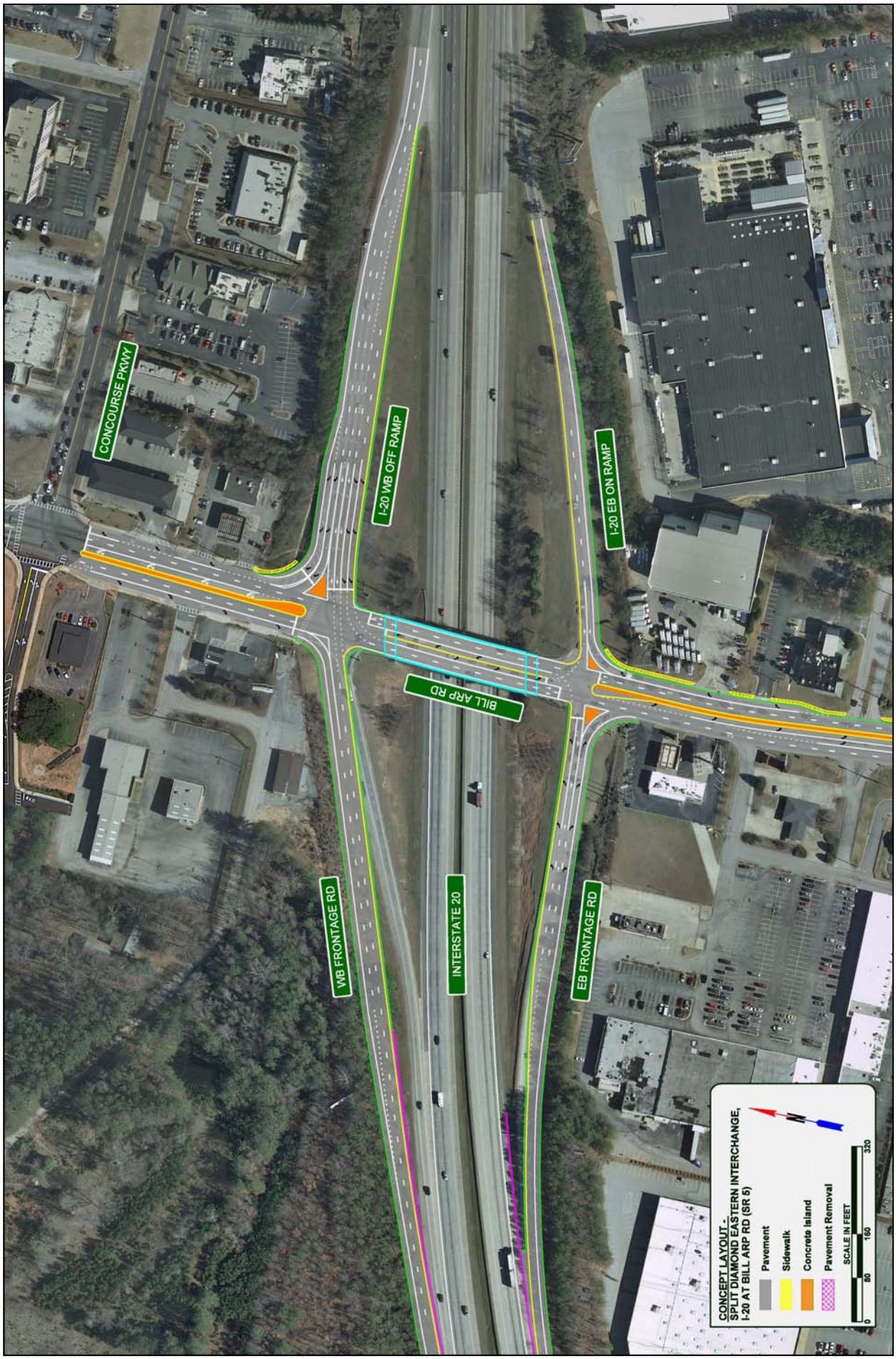
- **Roadway widening:** **Cost: $16,100.000**
  - Widen Bright Star from Douglas Boulevard to Bright Star Connector from two lanes to four lanes

Several projects identified in the long term could be implemented separately and sooner than the construction of the split diamond interchange, such relocating Douglas Boulevard, widening Bright Star Road, relocating John West Road. These projects could be implemented as funding becomes available and/or growth occurs along Bright Star Road and Bright Star Connector.



Overall Preferred Concept

SR 5 (Bill Arp Road) and Douglas Boulevard Intersection Improvements



I-20 @ SR 5 (Bill Arp Road)

i-20 @ Bright Star Road

Bright Star Road @ Bright Star Connector

Bright Star Road @ John West Road

John West Road @ John West Bypass

Bright Star Road @ Douglas Blvd

Additional Nearby Project Recommendations

These projects were identified through the technical analysis as part of Scenario 4, and through stakeholder and public input. These projects should be considered for implementation as funding becomes available and the need is warranted:

- **Improve Post Road:** Widen to four lanes north of Mason Creek, increase cycle lengths of existing signals, signalize the I-20 eastbound ramp intersections, add dedicated westbound left and right turn lanes at the I-20 west ramp terminus.
- **Chapel Hill Road at Timber Ridge Drive/Douglas Boulevard:** Add a dedicated northbound and southbound left turn lane at Chapel Hill Road at Timber Ridge/Douglas Boulevard.
- **Chapel Hill Road at Elizabeth Drive:** Improve signal timing at Chapel Hill Road and Elizabeth Drive to coordinate signals south of I-20
- **Chapel Hill Road at Douglas Boulevard:** Add dual northbound and southbound turn lanes
- **New Road:** Add new road behind the Dunkin Donuts connecting SR 5 to Douglas Boulevard. Consider connection to Martin Drive.
- **Concourse Parkway at SR 5:** Eliminate split phase. Consider no left turns out of Concourse Parkway.
- **Transit:** Increase transit usage in the area, specifically at the underutilized park and ride lot
- **Aesthetics:** Improve lighting and way-finding signage throughout the study area.
- **Access Management:** Consider implementing access management along SR 5 by consolidating driveways to improve traffic movement along SR 5.
- **Intersection Improvements:**
    - Roundabout at Cowen Mill Road @ Bright Star Road to reduce queuing at Cowen Mill Road and cut through on Berwin Drive.
    - Roundabout at Bright Star Road @ Central Church Road

Figure 12: Roundabout at Cowen Mill Road and Bright Star Road

Figure 13: Roundabout at Central Church Road and Bright Star Road

Bicycle and Pedestrian Recommendations

Potential future bicycle and pedestrian connections should be considered, where appropriate and possible, as further study and design is conducted of any of the scenarios. Potential improvements to the bicycle and pedestrian network in the study area include:

PA-032 (Pedestrian Improvements)

- Fill in gaps of sidewalk coverage in commercial areas
- Provide new sidewalk coverage in commercial areas
- Consider new sidewalks to connect to downtown Douglasville, area schools, and neighborhoods
- Construct multi-use trails to supplement sidewalk coverage
- Provide pedestrian facilities as traffic signals without crosswalks
- Construct HAWK signals to facilitate safe crossings to and from school locations

PA-033 (Cyclist Improvements)

- Limited opportunity to provide new bike lanes without widening existing roadways
- Utilize sharrows on lower speed roads (>35 mph) to connect to downtown Douglasville, area schools, and neighborhoods
- Construct multi-use trails to supplement sharrows and bike lanes

PA-030 (Wayfinding)

- Consider wayfinding strategies to guide travelers to retail destinations and other points of interest
- Utilize simple and aesthetically pleasing design for 'branding'
- Place signage on major corridors and at all major intersections including ramp interchange termini
- Place signage on multi-use trail locations

Additionally, a more specific review of the study area suggests the improvements in Table 2 and identified in Figure 14 be considered as part of the overall implementation process in the area.

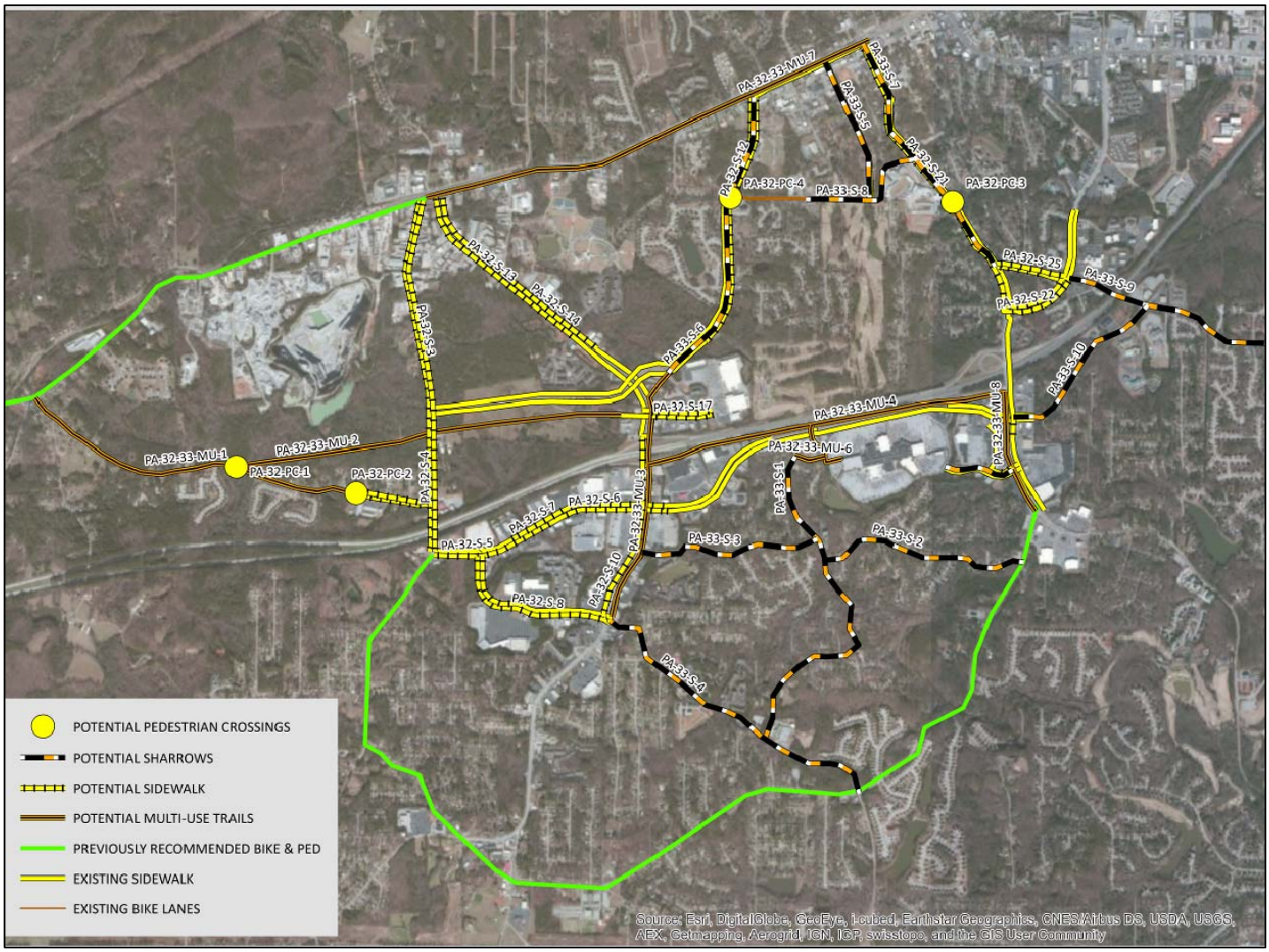


Figure 14: PA-32 and PA-33 Improvement Recommendations

Table 2: Potential Bicycle & Pedestrian Improvements

Project ID	Type	Corridor	From	To	Description
PA-32-S-1	Sidewalk	John West Road	Bright Star Elementary	Bright Star Road	On South Side of Road
PA-32-S-2	Sidewalk	John West Road	Bright Star Elementary	Bright Star Road	On North Side of Road
PA-32-S-3	Sidewalk	Bright Star Road	US 78	Douglas Boulevard	On West Side of Road. Bridge reconstruction.
PA-32-S-4	Sidewalk	Bright Star Road	US 78	Douglas Boulevard	On East Side of Road. Bridge reconstruction
PA-32-S-5	Sidewalk	Douglas Boulevard	Bright Star Road	Existing Sidewalk	On South Side of Road
PA-32-S-6	Sidewalk	Douglas Boulevard	Existing Sidewalk	SR 5	On South Side of Road
PA-32-S-7	Sidewalk	Douglas Boulevard	Existing Sidewalk	SR 5	On North Side of Road
PA-32-S-8	Sidewalk	Stewart Parkway	Douglas Boulevard	SR 5	On South Side of Road
PA-32-S-9	Sidewalk	Stewart Parkway	USPS	Douglas Boulevard	On North Side of Road
PA-32-S-10	Sidewalk	SR 5	Stewart Parkway	I-20	On West Side of Road
PA-32-S-11	Sidewalk	Rose Avenue	US 78	Pinecrest Drive	On West Side of Road
PA-32-S-12	Sidewalk	Rose Avenue	US 78	Existing Sidewalk	On East Side of Road
PA-32-S-13	Sidewalk	SR 5	Existing Sidewalk	US 78	On West Side of Road
PA-32-S-14	Sidewalk	SR 5	Existing Sidewalk	US 78	On East Side of Road
PA-32-S-15	Sidewalk	Douglas Boulevard	SR 5	Existing Sidewalk	On South Side of Road
PA-32-S-16	Sidewalk	Douglas Boulevard	SR 5	Existing Sidewalk	On North Side of Road
PA-32-S-17	Sidewalk	Concourse Parkway	SR 5	Wal Mart	On South Side of Road
PA-32-S-18	Sidewalk	Concourse Parkway	SR 5	Wal Mart	On North Side of Road
PA-32-S-19	Sidewalk	Arbor Place Boulevard	Chapel Hill Road	Existing Sidewalk	On North Side of Road. Short segment.
PA-32-S-20	Sidewalk	Chapel Hill Road	Douglas Bouelvard	Existing Sidewalk	On East Side of Road. Short segment.
PA-32-S-21	Sidewalk	Campbellton Road	US 78	Hospital Drive	On West Side of Road.
PA-32-S-22	Sidewalk	Hospital Drive	Campbellton Road	Prestley Mill Drive	On South Side of Road
PA-32-S-23	Sidewalk	Hospital Drive	Campbellton Road	Prestley Mill Drive	On North Side of Road.
PA-32-S-24	Sidewalk	Prestley Mill Drive	Campbellton Road	Existing Sidewalk	On South Side of Road

Table 2 Continued: Potential Bicycle & Pedestrian Improvements

Project ID	Type	Corridor	From	To	Description
PA-32-S-25	Sidewalk	Prestley Mill Drive	Campbellton Road	Hospital Drive	On North Side of Road
PA-32-PC-1	HAWK Signal	John West Road	N/A	N/A	At Proposed Multi-Use Trail Connection
PA-32-PC-2	HAWK Signal	John West Road	N/A	N/A	At Bright Star Elementary School
PA-32-PC-3	HAWK Signal	Campbellton Road	N/A	N/A	At existing crossing to Douglas County High
PA-32-PC-4	Pedestrian Crossings	Rose Avenue @ Pinecrest Drive	N/A	N/A	Upgrade Signal
PA-33-S-1	Sharrows	Parkway Circle	Arbor Place Connection	W Stewart Mill Road	
PA-33-S-2	Sharrows	Creekwood Drive	Parkway Circle	W Stewart Mill Road	
PA-33-S-3	Sharrows	Arbor Parkway	SR 5	Parkway Circle	
PA-33-S-4	Sharrows	W Stewart Mill Road	SR 5	Stewart Mill Road	
PA-33-S-5	Sharrows	Bowden Street	US 78	Selman Drive	
PA-33-S-6	Sharrows	Rose Avenue	US 78	SR 5	
PA-33-S-7	Sharrows	Campbellton Street	US 78	Prestley Mill Road	
PA-33-S-8	Sharrows	Pinecrest Road & Selman Avenue	Cambellton Street	Existing Bike Lanes	Where bike lanes do not exist.
PA-33-S-9	Sharrows	Prestley Mill Road	Campbellton Street	Skater Mill Road	
PA-33-S-10	Sharrows	Timber Ridge Drive	Chapel Hill Road	Prestley Mill Road	
PA-33-S-11	Sharrows	Arbror Place Boulevard	Arbor Place Mall	Chapel Hill Road	Connect to Arbor Place Mall
PA-32-33-MU-1	Multi-Use Trail	John West Road	US 78	Gas Easement	Multi-use Trail on south side of John West Road
PA-32-33-MU-2	Multi-Use Trail	Gas Easement	John West Road	SR 5	Multi-use Trail connecting into Concourse Parkway

Table 2 Continued: Potential Bicycle & Pedestrian Improvements

Project ID	Type	Corridor	From	To	Description
PA-32-33-MU-3	Multi-Use Trail	SR 5	Rose Avenue	Stewart Parkway	Mutli-use Trail on east side of SR 5. Utilize old R-O-W on Rose Avenue to connect with proposed sharrows on Rose Avenue. Coordinate project with SR 5 and interchange mprovements.
PA-32-33-MU-4	Multi-Use Trail	I-20	SR 5	Chapel Hill Road	Multi-use Trail to the south of I-20. May not be feasible, especially if C-D system is built on I-20.
PA-32-33-MU-5	Multi-Use Trail	Arbor Place Mall Connection	Douglas Boulevard	Parkway Circle	Multi-use Trail connecting to trail parallel to I-20, Arbor Place, and Parkway Circle proposed sharrows
PA-32-33-MU-6	Multi-Use Trail	Arbor Place Mall Connection	Douglas Boulevard	Parkway Circle	Multi-use Trail connecting to trail parallel to I-20, Arbor Place, and Parkway Circle proposed sharrows
PA-32-33-MU-7	Multi-Use Trail	US 78	Bright Star Road	Campbellton Street	Multi-use Trail on north side of road between road and railroad. Limited room in downtown Douglasville areas for implementation.
PA-32-33-MU-8	Multi-Use Trail	Chapel Hill Road	Stewart Mill Road	Douglas Boulevard	Multi-use Trail on west side of road. Connect to proposed trail south of I-20.

Potential Funding Sources

As travel demand continues to grow at the national, state, and regional levels, as well as in the City of Douglasville, funds available for public infrastructure projects have been declining. Because of increasing competition between states, counties, and cities for limited transportation funding, the need for coordination and cooperation between jurisdictions is important to increase the chances that a project will be funded. Additionally, careful consideration of transportation costs, funding availability, and benefits are an important component of corridor planning to demonstrate that a proposed project is cost effective.

To address these constraints, this section describes some of the funding conditions, issues and opportunities available to the City of Douglasville, Douglas County, and the State of Georgia to fund the recommended improvements. Sources of funding for transportation infrastructure that are in place today as well as potential future sources are described. Various funding sources are available at the private, local, regional, state, and federal levels. In general, the amount of available money at the local level is substantially less than the federal level and increases with jurisdiction size. Also, larger entities tend to include more restrictions and legal and regulatory requirements with the funding they provide. One way to fund transportation improvements at the local level is through public/private partnerships. For the partnership to be feasible, it needs to be equitable for the public and private entities participating. Both sides need to contribute resources to and receive benefits from the project.
Public/private partnerships at the local level can take many forms. For example, a developer might construct a roadway

or other potential improvements as part of redevelopment. Alternately, the city could build improvements, while a developer donates or sells right-of-way below market cost.

The City of Douglasville receives revenue from a variety of sources. The majority of Douglasville's revenues come from the following taxes: property and sales taxes that make up 73 percent of the city's general fund revenue. The other 27 percent of revenues come from charges for services, licenses and permits, fines and forfeitures, and miscellaneous revenues.

In 2013, the City of Douglasville spent approximately 25 percent of the city budget on the Public Works Department. This equates to roughly 5 million dollars. Spending on street maintenance and construction was 50 percent of the Public Works account, or 2.6 million dollars.

Douglas County currently has a Local Option Sales Tax (LOST) of 1 percent which is collected through the Georgia Department of Revenue and distributed to the county and each city using a population based formula.

Issuing bonds is another option available to the City of Douglasville to finance infrastructure improvements. A disadvantage to bonds is that the money has to be paid back with interest, which may preclude other needed improvements in the future.

The long range Regional Transportation Plan (RTP), titled Plan 2040 and the short range Transportation Improvement Program (TIP), are regional sources of funding that are managed by the Atlanta Regional Commission (ARC).

The Georgia DOT offers funding through the GATEway program, which offers an annual maximum of $50,000 in grant allocation for any organization, local government, or state agency for landscape enhancement of state routes. Projects must involve the local community, display the right of way in an attractive fashion and promote pride in Georgia. The maximum cumulative fund allotment each year shall be $50,000 within a local government entity. This funding mechanism is fairly restrictive, and does not allow for application toward highway construction, median enhancement, lighting, or other hardscape items. It is for the sole purpose of landscape plant material.

Georgia DOT also provides funding through the Local Maintenance and Improvement Grant (LMIG) program. Money from this program can be used to resurfacing of existing streets or build new roadway facilities. Funds are allocated according to a formula that is based on population by congressional district and paved road miles, as established by the GDOT governing board. The total LMIG revenues disbursed varies annually according to funding availability. Finally, LMIG funds require a 30 percent local match.

The Georgia State Road and Tollway Authority (SRTA) offers low-interest loans and grants to finance local transportation projects through the Georgia Transportation Infrastructure Bank (GTIB), established by House Bill 1019 in April 2008. The GTIB is a revolving infrastructure investment fund, much like a bank, that provides loans with attractive terms to state, regional and local government entities to fund much needed local transportation projects. Projects eligible for possible funding include highways, roads, bridges, air transport and airport facilities, rail and transit or bicycle facility projects. Eligible costs include all project phases except for ongoing maintenance. The GTIB will be managed by SRTA, whose code was amended to receive initial funding to offer $33.1 million in loans and $10 million in grants. The City of Douglasville is eligible to receive loans from the GTIB, however the current Grant Program is not applicable in this study corridor, as it is restricted to transportation projects by formally recognized Community Improvement Districts (CID's).

Through the U.S. Department of Transportation (DOT) and Federal Highway Administration (FHWA), the federal government has made available funding for Transportation Enhancement (TE) activities. TE activities offer funding opportunities to increase transportation choices and enhance the transportation experience. As a subcomponent of the Surface Transportation Program (STP), all policy and procedural requirements that apply to STP also apply to TE. For example, laws governing traditional federal-aid projects, such as the National Environmental Policy Act (NEPA), also apply to TE activities. Additionally, a 20 percent local funding match is required for TE activities.

Only certain types of projects qualify as TE activities. FHWA has published a list of eligible activities. Additionally, TE funds are only available for non-motorized uses. For example, allowing alternative vehicles, such as golf carts, on multi-use trails would preclude TE funding for the project. The following are qualifying TE activities applicable to the SR 5 (Bill Arp Road)/Bright Star Road recommendations:

- **Provision of facilities for bicyclists and pedestrians** – new or reconstructed sidewalks, walkways, wide paved shoulder, bike land striping, construction of off-road multi-use path, bridges and underpasses for pedestrians and bicyclists.
- **Landscaping and other scenic beautification** – landscaping, street furniture, lighting, public art, and gateways along transportation facilities.

These funds are awarded by GDOT through a competitive "Call for Projects" process. The State Transportation Board Member serving your Congressional District makes the final selections and determines the funding level for each selected project.

Appendix A: Fatal Flaw Analysis

ID	Potential Strategies and Alternatives	Project type	Cost	ROW	FHWA/ GDOT Standards	Potential community/ city objections	Won't make significant impact	Other	Notes
	Turn Lanes								
N-3	Turn lanes at Chapel Hill Road @ Douglas Blvd (dual NB and SB lefts)	Turn Lanes							*Synchro analysis indicates additional turn lanes address operational failures anticipated by year 2040.*
	New Roads								
PA-006	New road over I-20 from new E-W golf course road to Douglas Blvd at western mall entrance (next to Olive Garden)	New Roads				X	X		*Design detail to "t" traffic into Rose Avenue, for the purpose of diverting cut-through traffic off Rose Avenue. Potential community objections*
PA-007	New north-south road from Bright Star Connector to Douglas Blvd over I-20	New Roads					X		
PA-008	Douglas Boulevard west extension, from Bright Star Road to Post Road (via Mason Creek Road)	New Roads	X				X	X	*conflicts with city's FLUM*
PA-009	Divert Mall traffic with a bypass tying to the existing frontage road	New Roads			X		X		*demand coming from the east and not the west*
PA-011	From SR 5/ Rose Avenue behind Walmart, near I-20 to Douglas Blvd. (could tie into western entrance to mall)	New Roads				X	X		*same as PA-006*
PA-012	From Stewart/Douglas Blvd. over I-20 to rejoin Bright Star Connector	New Roads					X		*may have merit for Saturday peak. Allows people to move around without having to get out onto the main*
PA-013	Flyover (from SR 5 exit over Douglas Blvd and SR 5 Corridor coming down at the intersection with Stewart Pkwy)	New Roads	X		X	X			
N-10	New road behind Dunkin Donuts connecting SR 5 and Douglas Blvd. Consider connection to Martin Drive (by Lowe's)	New Roads							*needs to be right in/right out.*
	Road Widening								
PA-014	Add a lane in both directions to SR 5 from Stewart Pkwy to Rose Avenue	Road Widening							*consider short term and long term project based on need (modified widening). Additional through lanes on SR 5 successful at mitigating LOS failures at Douglas Blvd but ineffective at other intersections.Not supported by GDOT.*
N-1	Post Road Corridor Improvements, including widening, turn lane improvements, and signalization at I-20 EB ramp	Road Widening							*Alternative addresses LOS failures anticipated by the year 2040.*
	Interchange Improvements								
PA-001	**Add a lane in both directions to SR 5 from Arbor Parkway to I-20 EB ramps. Turn lanes at SR 5 @ Douglas Blvd (double-lefts both EB and WB, and SB, WB right turn bay, additional WB through lane, SB right turn). Improve tight turning radii for trucks at SR 5/Douglas Blvd. Diverging Diamond at the interchange of I-20 and SR 5.**	**Interchange Improvements**							*combined with PA-014 and PA-015. Develop traffic and concept for all three projects. Project then should be broken down into short term and long term projects.*
PA-015	Diverging Diamond Interchange (DDI) at I-20 and SR 5 (similar to I-285 and Ashford Dunwoody Rd)	Interchange Improvements							*Per Synchro analysis, heavy through movements on SR 5 limit benefits of DDI. Combined with PA-001 and PA-014*
PA-016	Add full access interchange at Bright Star Rd	Interchange Improvements			X				*include PA-012, less than a mile between interchanges*

ID	Potential Strategies and Alternatives	Project type	Cost	ROW	FHWA/ GDOT Standards	Potential community/ city objections	Won't make significant impact	Other	Notes
PA-017	1/2 interchange (to/from east) at Bright Star Rd	Interchange Improvements			X				*less than a mile between interchanges.*
PA-018	Collector-distributor system from SR 5 to Bright Star Rd	Interchange Improvements			X				*include with PA-012.*
PA-019	**Collector-distributor system from Chapel Hill Road to Bright Star Rd**	**Interchange Improvements**							*include PA-012, C-D system possibly effective at mitigating freeway weaving movements west of Chapel Hill Road.*
PA-020	**Split-diamond interchange at SR 5 and Bright Star Road. Frontage road between Bright Star and SR 5. Relocate Douglas Blvd at Bright Star Road.**	**Interchange Improvements**							*Includes N-9*
PA-020A	**Split-diamond interchange at SR 5 and Bright Star Road (with roundabouts). Frontage road between Bright Star and SR 5. Relocate Douglas Blvd at Bright Star Road.**	**Interchange Improvements**							*Includes N-9*
PA-036	**SPUI @ SR 5**	**Interchange Improvements**							
N-7	Add full access interchange at Bright Star Road- relocate Bright Star Road west to meet minimum federal spacing requirements	Interchange Improvements	X		X		X	X	*Doesn't meet the Need and Purpose because the road would need to be moved too far to the west to meet the federal standards. Bright Start doesn't justify interchange on its own.*
N-8	Early off-ramp to Douglas Blvd	Interchange Improvements			X			X	*done in conjunction with other interchange, C-D improvements.*
N-9	Frontage Road between Bright Star Road, SR 5 and Chapel Hills Road	Interchange Improvements							*cheaper than C-D system. Now included in PA-020 and PA-020A*
	Operational Improvements								
PA-004	**Roundabout at Douglas Blvd @ Bright Star Rd.**	**Turn Lanes**							*Per Synchro analysis, this design is successful in significantly reducing delay at this intersection. plan was for GRTA to have slip road access which would be a problem with this design*
PA-021	**Access management on SR 5**	**Operational Improvements**							*Continues as policy recommendation. Consider driveway consolidation and left turn prohibitions.*
PA-023	No left out of Concourse Parkway @ SR 5. No left turn from new street across from Concourse Parkway.	Operational Improvements						X	*Currently is dual left turn lanes from Concourse Parkway to SR 5. this would force all left turns from Walmart/Sam Club to use Rose Ave via Starla St. Allow left turns onto Concourse Parkway from SR 5. Per Synchro, has minimal impact at intersection and adversely affects intersection with Rose Avenue. Develop conceptual internal circulation to show how it would work. Carrot vs. stick approach. Impact to WB lefts from Rose Avenue would be tremendous. Note in report to eliminate split phase at Concourse Parkway at SR 5.*
PA-024	Median along Douglas Blvd from Bright Star to Chapel Hill	Operational Improvements					X		*project from citizens*
PA-025	Create new mall entrance on Douglas Blvd	Operational Improvements			X				
PA-026	**Roundabout at Cowan Mill Rd. @ Bright Star Rd to fix queuing at Cowan Mill Rd. and to reduce use of cut-through via Berwin Dr. to turn right onto Bright Star Rd.**	**Operational Improvements**							*continuous flow is good and compatible with surrounding land uses*
PA-027	**Roundabout at Bright Star Rd. @ Central Church Rd.**	**Operational Improvements**							*consistent with Douglas County Long Range Plan, continuous flow is good, compatible with surrounding land uses*

ID	Potential Strategies and Alternatives	Project type	Cost	ROW	FHWA/ GDOT Standards	Potential community/ city objections	Won't make significant impact	Other	Notes
PA-037	**Roundabout Bright Star Road @ Bright Star Connector**	**Operational Improvements**							*Synchro analysis indicates roundabout design mitigates operational failures otherwise anticipated by year 2040.*
PA-038	**Roundabout at Bright Star Road @ John West Road**	**Operational Improvements**							*Synchro analysis indicates roundabout design mitigates operational failures otherwise anticipated by year 2040. Attention should be paid to pedestrian movements from nearby elementary school*
	Other Ideas								
PA-028	Increase transit usage in the area, specifically at the underutilized park and ride lot	Other						X	*this is a goal, not a recommendation*
PA-029	Traffic enforcement of cars blocking intersections	Other						X	*include signage saying to not block intersection (PA-*
PA-030	**Wayfinding signage to route traffic**	**Other**							*to find the mall, transit, etc*
PA-031	Better lighting of existing interchange	Other						X	*citizen recommendation? Policy recommendation*
PA-032	**Pedestrian improvements to improve and allow transport by wal**	**Other**							*Fill in gaps around commercial areas*
PA-033	**Cycling improvements to improve and allow transport by cycling and transit**	**Other**							
PA-034	I-20 HOV lanes, from Thornton Road (SR 6) to Bright Star Road	Other						X	*managed lanes system plan- long term. GDOT hasn't finished plan update*
PA-035	Managed lanes on I-20 West from I-285 to west of Bright Star Road	Other						X	*same as P-034*
PA-036	Signal Coordination	Other					X	X	*where? SR 5 is already part of RTOP so signals are managed. Douglas County manages Douglas Blvd. signals during holidays.*

Appendix B: Data Collection and Methodology

To conduct the technical traffic analysis on the SR 5, Bright Star Road and Bright Star Connector corridors, data collection was undertaken that related to traffic volumes, geometric characteristics and constraints, and historical development and growth patterns. From this data, a reasonable estimate of daily and peak hour traffic volumes were developed for a design year of 2040.

Traffic Counts

AM and PM turning movement counts (TMCs) were collected at 20 intersections along the I-20 corridor between its interchange with Post Road and Chapel Hill Road /Campbellton Street in Douglas County. The TMC locations are shown as green circles in ***Figure 1***. Additionally, 24-hour counts with classification were collected at one location on I-20 (this count is shown as a red line in ***Figure 1***), two locations on Post Road, two locations on Bill Arp Road / SR-5, two locations on Douglas Boulevard, one location on Bright Star Road, one location on Bright Star Connector, and one location each on Chapel Hill Road and Campbellton Street. These tube count locations are shown as blue lines in Figure B-1. Ramp tube counts with classifications were collected at 13 ramps along I-20, including: at Post Road (4), Bill Arp Road /SR-5 (4), and Chapel Hill Road /Campbellton Street (5). Ramp tube count locations are shown as orange lines in Figure B-1. All TMC and tube counts were collected on Thursday, May 1st, 2014.

Field/Study Area Inventory

The area of study is large, encompassing several interstate interchanges, major arterials, and state highways. See Figure B -1 for the extent of the study area. The large size of the study area naturally leads to the presence of a diverse and complex set of characteristics which were investigated prior to traffic analysis. Knowledge of the geography of the area and the potential challenges that it presents is expected to help guide decisions regarding the most effective improvement.

Federal Highway Administration (FHWA) regulations require a minimum distance of 1 mile between interchanges. Currently, interchange spacing is adequate, with approximately 1.47 miles between Exit 34 (SR 5) and Exit 35 (Chapel Hill Road) and approximately 1.76 miles between Exit 35 and Exit 37 (SR 92). The Bright Star Road overpass over I-20 is approximately 0.90 miles west of Exit 34 and the next interchange is approximately 4.16 miles to the west of Exit 34 at Exit 30 (Post Road).

Moderately dense commercial development exists along the entire extent of the Douglas Boulevard corridor, with the large trip attractor, Arbor Place Mall, located east of the intersection of Douglas Boulevard and SR 5. This commercial development along Douglas Boulevard and SR 5 south of the I-20 interchange has been built relatively close to the I-20 right-of-way with little room present between the freeway and existing structures. At some locations west of SR 5, developed lots are only approximately 70' from the eastbound lanes of I-20. The city-owned golf course, West Pines Golf Club, is located north of I-20 between interchange Exit 34 (SR 5) and Exit 35 (Chapel Hill Road) and its southern border lies within approximately 100'-200' of the westbound lanes of I-20.

On I-20 between Exits 34 and 35, there is an extended weaving section of freeway in both the eastbound and westbound directions. This condition is created by a lane add at the upstream ramp and a lane drop and the downstream ramp instead of merge/diverge points at these ramp termini. The entire weaving segment length from gore to gore is approximately 3,500'.

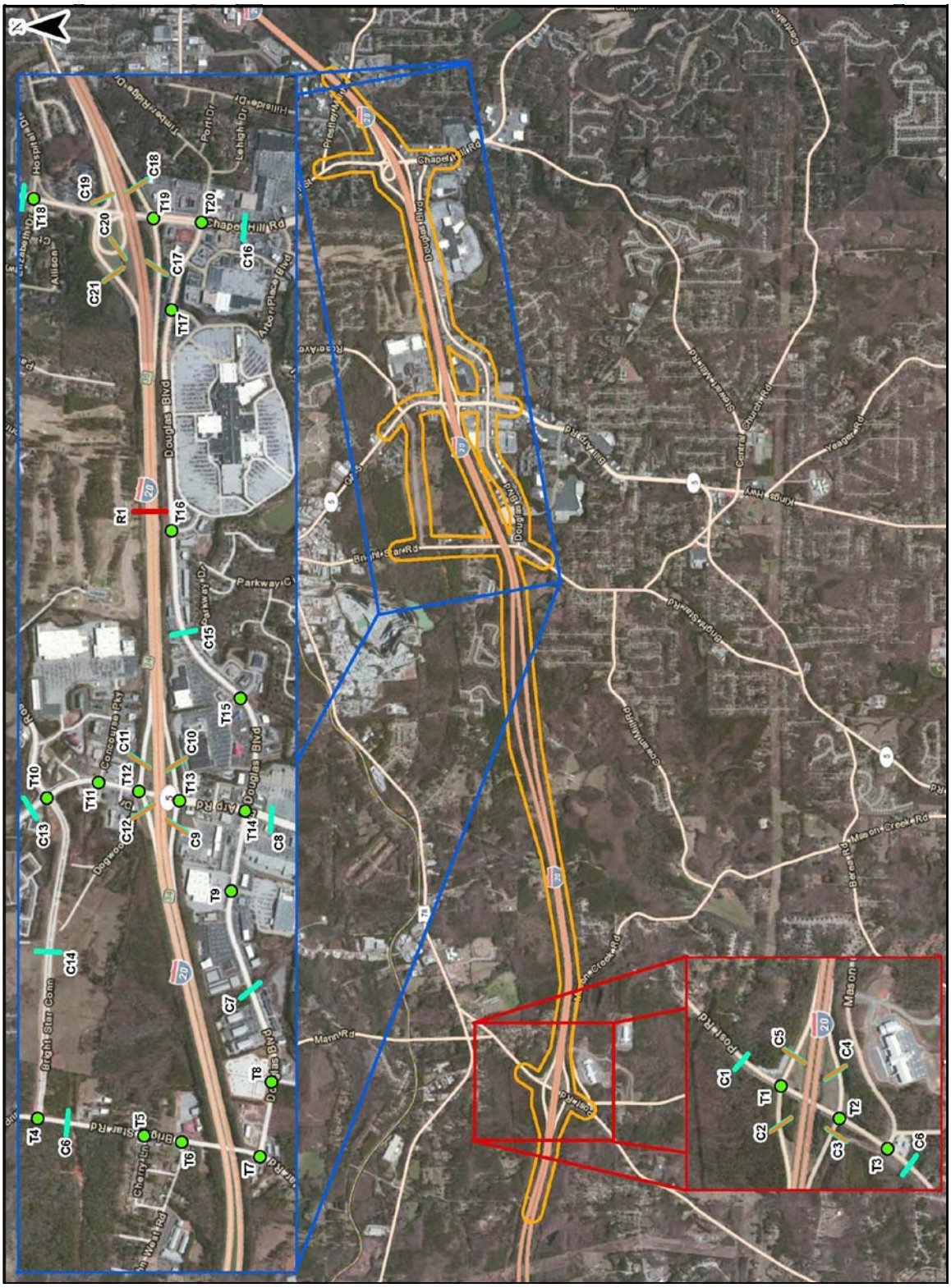


Figure B-1: Study Area

Traffic Forecast

To determine the appropriate growth rate to use for this study, data was obtained from two sources: Georgia Department of Transportation (GDOT) traffic count systems and Atlanta Regional Commission's (ARC) Travel Demand Model. The sections below discuss the findings from each of the sources.

Georgia Department of Transportation Historical Traffic Counts

Historical traffic data, obtained from GDOT Traffic Count Database System and GDOT State Traffic and Report Statistics, was first evaluated. Seventeen stations were located within the study area and are listed below:

- Station 097R807 – I-20 WB Off-Ramp at Chapel Hill Road
- Station 097R208 – I-20 EB On-Ramp at Chapel Hill Road
- Station 097R808 – I-20 WB On-Ramp at Chapel Hill Road
- Station 097R207 – I-20 EB Off-Ramp at Chapel Hill Road
- Station 097R805 – I-20 WB Off-Ramp at Bill Arp Road/SR-5
- Station 097R806 – I-20 WB On-Ramp at Bill Arp Road/SR-5
- Station 097R206 – I-20 EB On-Ramp at Bill Arp Road/SR-5
- Station 097R205 – I-20 EB Off-Ramp at Bill Arp Road/SR-5
- Station 0970196 – Campbellton Street
- Station 0970014 – Bill Arp Road/SR-5
- Station 0974181 – Douglas Boulevard
- Station 0970141 – Post Road South of I-20
- Station 097R803 – I-20 WB Off-Ramp at Post Road
- Station 097R804 – I-20 WB On-Ramp at Post Road
- Station 097R204 – I-20 EB On-Ramp at Post Road
- Station 097R203 – I-20 EB Off-Ramp at Post Road
- Station 0970143 – Post Road North of I-20

The analysis showed that, for almost all of the count locations, the counts did not vary greatly from year to year, with annual changes of greater than 20 percent occurring on only nine occasions. Table B-1 shows the historical data for the seventeen count stations.

Table B-1

Location	Year	Volume	Growth	Location	Year	Volume	Growth
Station 097R807: I-20 WB Off-Ramp E/O Chapel Hill	2012	9,860	0%	Station 097R208: I-20 EB On-Ramp E/O Chapel Hill	2012	9,190	0%
	2011	9,880	3%		2011	9,210	2%
	2010	9,620	-12%		2010	9,020	-13%
	2009	10,930	10%		2009	10,360	9%
	2008	9,920	-3%		2008	9,490	-6%
	2007	10,180	7%		2007	10,050	11%
	2006	9,480	-3%		2006	9,030	-4%
	2005	9,780	-		2005	9,360	-
Station 097R808: I-20 WB On-ramp W/O Chapel Hill	2012	7,390	0%	Station 097R207: I-20 EB Off-Ramp W/O Chapel Hill	2012	6,720	0%
	2011	7,400	-5%		2011	6,730	92%
	2010	7,820	-5%		2010	3,510	-51%
	2009	8,250	12%		2009	7,210	-3%
	2008	7,350	5%		2008	7,400	15%
	2007	6,980	5%		2007	6,460	8%
	2006	6,620	2%		2006	5,960	-11%
	2005	6,460	-		2005	6,660	-
Station 097R805: I-20 WB Off-Ramp E/O Bill Arp	2012	13,660	-6%	Station 097R806: I-20 WB On-Ramp W/O Bill Arp	2012	3,950	-17%
	2011	14,510	-1%		2011	4,770	-1%
	2010	14,730	-1%		2010	4,840	-11%
	2009	14,920	3%		2009	5,450	13%
	2008	14,440	-2%		2008	4,810	-6%
	2007	14,700	25%		2007	5,130	3%
	2006	11,750	-35%		2006	4,980	-11%
	2005	18,070	-		2005	5,590	-
Station 097R206: I-20 EB On-Ramp E/O Bill Arp	2012	12,550	-1%	Station 097R205: I-20 EB Off-Ramp W/O Bill Arp	2012	4,380	-11%
	2011	12,740	-1%		2011	4,930	-1%
	2010	12,930	-7%		2010	5,000	-7%
	2009	13,950	5%		2009	5,370	15%
	2008	13,250	-7%		2008	4,670	-13%
	2007	14,220	13%		2007	5,350	6%
	2006	12,630	-5%		2006	5,070	-26%
	2005	13,250	-		2005	6,840	-
Station 0970196: Camp-bellton Street	2012	9,110	-2%	Station 0970014: Bill Arp Rd	2012	26,110	-17%
	2011	9,270	4%		2011	31,420	-2%
	2010	8,900	-1%		2010	32,190	-1%
	2009	8,980	0%		2009	32,480	0%
	2008	8,990	-27%		2008	32,510	-4%
	2007	12,240	12%		2007	33,690	25%
	2006	10,910	-14%		2006	26,870	-16%
	2005	12,630	-		2005	31,930	-
Station 0974181: Douglas Blvd	2012	14,250	-2%	Station 0970141: Post Rd S of I-20	2012	9,300	-1%
	2011	14,500	-2%		2011	9,440	-3%
	2010	14,860	-1%		2010	9,770	-1%
	2009	15,000	0%		2009	9,880	-1%
	2008	14,970	-3%		2008	9,930	-6%
	2007	15,360	-16%		2007	10,560	-1%
	2006	18,300	37%		2006	10,720	3%
	2005	13,340	-		2005	10,380	-

Table B-1 Continued

Location	Year	Volume	Growth	Location	Year	Volume	Growth
Station 097R803: I-20 WB Off-Ramp E/O Post Rd	2012	4,440	0%	Station 097R804: I-20 WB On-Ramp W/O Post Rd	2012	2,320	-2%
	2011	4,450	9%		2011	2,360	-9%
	2010	4,080	-16%		2010	2,600	-8%
	2009	4,860	5%		2009	2,840	10%
	2008	4,610	0%		2008	2,590	0%
	2007	4,610	0%		2007	2,590	-5%
	2006	4,590	-38%		2006	2,720	-11%
	2005	7,370	-		2005	3,060	-
Station 097R204: I-20 EB On-Ramp E/O Post Rd	2012	4,850	-1%	Station 097R203: I-20 EB Off-Ramp W/O Post Rd	2012	2,140	-1%
	2011	4,920	8%		2011	2170	-6%
	2010	4,540	-15%		2010	2,300	-8%
	2009	5,330	-1%		2009	2,490	5%
	2008	5,400	-7%		2008	2,380	-18%
	2007	5,790	5%		2007	2,920	15%
	2006	5,530	8%		2006	2,550	9%
	2005	5,110	-		2005	2,330	-
Station 0970143: Post Rd N of I-20	2012	7,150	-2%				
	2011	7,260	-3%				
	2010	7,510	-1%				
	2009	7,600	0%				
	2008	7,590	-5%				
	2007	7,980	-6%				
	2006	8,470	-6%				
	2005	9,030	-				

Growth rates from 2006 through 2013 were used for all locations. The average growth rate for each of the locations is shown in Table B-2 below.

The average growth rate from these seventeen stations combined showed little change in volumes historically, with the average being a decrease of 1.2 percent. This lack of growth can be attributed to the lack of new construction during the economic downturn and the roadway nearing capacity during peak hours.

Table B-2

Location	Annual Growth Rate
I-20 WB Off-Ramp at Chapel Hill Road	0.4%
I-20 EB On-Ramp at Chapel Hill Road	-1.6%
I-20 WB On-Ramp at Chapel Hill Road	1.0%
I-20 EB Off-Ramp at Chapel Hill Road	5.1%
I-20 WB Off-Ramp at Bill Arp Road/SR-5	-2.0%
I-20 WB On-Ramp at Bill Arp Road/SR-5	-3.8%
I-20 EB On-Ramp at Bill Arp Road/SR-5	-0.1%
I-20 EB Off-Ramp at Bill Arp Road/SR-5	-4.8%
Campbellton Street	-3.6%
Bill Arp Road/SR-5	-2.0%
Douglas Boulevard	1.5%
Post Road South of I-20	-0.9%
I-20 WB Off-Ramp at Post Road	-5.1%
I-20 WB On-Ramp at Post Road	-1.1%
I-20 EB On-Ramp at Post Road	-0.9%
I-20 EB Off-Ramp at Post Road	0.4%
Post Road North of I-20	-2.1%
Average Annual Growth Rate	**-1.2%**

Atlanta Regional Commission Travel Demand Model

ARC's regional travel demand model was used to obtain projections for future growth in the area. In addition to population and employment growth, ARC's model includes travel pattern changes due to new facilities and capacity improvements. Table B-3 shows ARC annual growth rates between model years 2010 and 2040 which range from -0.5 percent to 2.7 percent. The average growth rate from the travel demand model is 1.3 percent. This growth is expected to come from development of currently undeveloped land and an increase in development density.

By combining the historical data and ARC data for growth rates, an overall average growth rate was determined. Based on the historical rate of -1.2% from GDOT count stations in the area and the projected ARC rate of 1.3%, a very small amount of growth was expected. However, this did not take into account the current slow economy and variations in historical data. Therefore, more emphasis was placed on the expected growth in the area. It is expected that the annual growth rate in the study area will range between 0.5 and 1 percent over the next 20-30 years and a conservative approach is recommended; therefore, an annual growth rate of 1 percent was used for the project area.

This expected annual growth rate was applied to balanced 2014 turning movement counts to forecast 2040 AM and PM peak hour traffic. The Office of Planning within GDOT reviewed and approved the methodology described above as well as the balanced traffic flow diagrams for existing conditions and 2040 "no build" conditions.

Table B-3

Location	Annual Growth Rate
I-20 WB Off-Ramp at Chapel Hill Road	0.1%
I-20 EB On-Ramp at Chapel Hill Road	-0.5%
I-20 WB On-Ramp at Chapel Hill Road	2.7%
I-20 EB Off-Ramp at Chapel Hill Road	2.4%
I-20 WB Off-Ramp at Bill Arp Road/SR-5	0.6%
I-20 WB On-Ramp at Bill Arp Road/SR-5	0.8%
I-20 EB On-Ramp at Bill Arp Road/SR-5	0.9%
I-20 EB Off-Ramp at Bill Arp Road/SR-5	1.0%
Campbellton Street	0.9%
Bill Arp Road/SR-5	0.4%
Douglas Boulevard	2.1%
Post Road South of I-20	2.3%
I-20 WB Off-Ramp at Post Road	1.0%
I-20 WB On-Ramp at Post Road	2.3%
I-20 EB On-Ramp at Post Road	0.9%
I-20 EB Off-Ramp at Post Road	2.2%
Post Road North of I-20	1.1%
Average Annual Growth Rate	**1.3%**

HCM Methodologies

Intersection Analysis Methodology

In this study, the methodology used for evaluating traffic operations at intersections is based on the criteria that is set forth in the Transportation Research Board's *Highway Capacity Manual 2000* (HCM). The HCM is the standard recognized manual for conducting traffic analysis throughout the country. The 2000 version of the HCM methodology was chosen as the preferred type for analyzing traffic operations due to the fact that the 2010 methodology version has limitations on analyzing multiple signals controlled by one cabinet, which can be present at closely spaced freeway ramp termini intersections. Trafficware Synchro 8 software, which emulates the HCM methodology, was used for the analysis. The following is a description of the methodology employed for the analysis of unsignalized and signalized intersections.

Level of Service (LOS) is an indication used to describe the operations of an intersection. For unsignalized intersections, the LOS is determined by control delay for the turning movements at the intersection and minor street crossing movements. Several factors affect the control delay including lane geometry, the availability and distribution of gaps in the conflicting traffic stream, critical gaps, and follow-up time for a vehicle in the queue.

Unsignalized Intersections

LOS is assigned a letter designation from A through F. LOS A indicates excellent operations with little delay to motorists, while LOS F exists at unsignalized intersections when there are insufficient gaps of acceptable size to allow vehicles on the side street to cross or turn safely. This condition will result in extremely long control delays and long queues. The LOS criteria for unsignalized intersections, as defined in the HCM, are given in Table B-4.

Table B-4

Level of Service (LOS)	Control Delay (s/veh.)
A	0 - 10
B	>10 - 15
C	>15 - 25
D	>25 - 35
E	>35 - 50
F	>50

Source: *Highway Capacity Manual 2000*

Signalized Intersections

Level of service (LOS) for a signalized intersection is a qualitative measure and is defined in terms of control delay per vehicle (in seconds per vehicle). Control delay refers to the portion of total delay that can be attributed to the traffic signal operation for signalized intersections. Control delay depends upon a number of variables including traffic volumes, lane configuration, the quality of progression of traffic from adjacent intersections, the cycle length, and the ratio of green time to the cycle length. The level of service criteria for signalized intersections, based on control delay, is shown in Table B-5. Level of service A indicates operations with very low control delay while level of service F describes operations with extremely high control delay. Level of service F is considered to be unacceptable by most drivers. Level of service D is typically considered to be the limit of acceptable delay in urbanized areas.

Table B-5

Level of Service (LOS)	Control Delay (s/veh.)
A	< 10
B	>10 - 20
C	>20 - 35
D	>35 - 55
E	>55 - 80
F	>80

Source: Highway Capacity Manual 2000

Freeway Capacity Analysis Methodology

In this study, the methodology used for evaluating traffic operations on freeway segments is based on the criteria that is set forth in the Transportation Research Board's *Highway Capacity Manual 2000* (HCM). The HCM is the standard recognized manual for conducting traffic analysis throughout the country. HCS+ software, which emulates the HCM methodology, was used for the analysis. The following is a description of the methodology employed for the analysis of uninterrupted freeway road sections.

Basic Freeway Segments

The HCM 2000 defines basic freeway segments as those segments that are outside of the influence of merging, diverging, or weaving maneuvers. Freeway segment operations are defined in terms of density, or the number of passenger cars present within one mile of freeway. This variable is dependent upon the effective free flow speed of vehicles within the traffic stream and the hourly flow rate on the freeway. Generally, free flow speed will remain constant until a breakpoint flow rate is reached, at which time the free flow speed tends to decrease and will continue this trend to a point when the road becomes saturated and speed reaches zero. A LOS of A indicates a very low density of cars which theoretically implies that a driver could travel at whatever speed felt comfortable while a LOS of F indicates a very dense condition in which the demand exceeds the capacity of the roadway and free flow speed becomes very low. The level of service criteria for basic freeway segments, based on density, is shown in Table B-6.

Table B-6

Level of Service (LOS)	Density (pc/mi/ln)
A	≤ 11
B	>11 - 18
C	>18 - 26
D	>26 - 35
E	>35 - 45
F	>45

Source: Highway Capacity Manual 2000

Merge/Diverge Segments

The HCM 2000 states that merge/diverge segments occur primarily at on-ramp and off-ramp junctions with the freeway mainline. Merge and diverge operations are defined by the density of the segment within the merge or diverge point's influence area. This influence area density value is dependent upon factors such as adjacent on/off ramps, ramp lane geometry, accel/decel lane length, and the total number of freeway lanes. A LOS of A indicates a very low density of cars which implies there are no restrictions to operations while a LOS of F indicates a very dense condition where freeway and ramp queues may form. The level of service criteria for merge/diverge segments, based on density, is shown in Table B-7.

Table B-7

Level of Service (LOS)	Density (pc/mi/ln)
A	≤ 10
B	>10 - 20
C	>20 - 28
D	>28 - 35
E	>35
F	Demand exceeds capacity

Source: Highway Capacity Manual 2000

Roundabout Capacity Analysis Methodology

A number of proposed roundabout improvements were considered at intersections along Bright Star Road. The roundabout analyses for these intersections were conducted using GDOT's Roundabout Analysis Tool, Version 2.1.

The GDOT Roundabout Analysis Tool provides results for roundabout capacity and LOS based on two methodologies. These methodologies are the HCM 2010 model, which is intended for use in analysis of the roundabout's build year, and a calibrated HCM 2010 model which is intended for use in design year analyses. Generally, the HCM 2010 model methodology provides a lower capacity for the roundabout while the calibrated model takes into consideration driver familiarity and increases the capacity to account for the improved driver expectancy. The GDOT Roundabout Analysis Tool describes these two methodologies in the following way:

> *The HCM 2010 Model is based on an analytical method based on gap acceptance behavior on roundabouts in the United States. The formula yields a lower value for capacity because of source data taken from US roundabouts where driver familiarity is lower. The calibrated HCM model adjusts the entry capacity formula based on empirical data collected from Bend, Oregon and various roundabouts in California. Each of these studies use site specific values for critical headway and follow up headway to calibrate the capacity models for the appropriate lane configurations. The calibrations typically yield a higher value for capacity because the source data taken is from roundabouts that have been in service and the familiarity is higher. This type of calibration should be used for future year scenarios where driver familiarity is expected to increase over time.*

Level of service for roundabouts, based on control delay, is shown in Table B -8. A LOS of A is indicative of very low control delay implying conflicting volumes within the roundabout are very low or nonexistent. A LOS of F is indicative of long delay times for each vehicle entering the roundabout and can be attributed to high crossing volumes, high left turn volumes, and lack of bypass lanes. Queuing on at least one approach is expected in LOS F conditions.

Table B-8

Level of Service (LOS)	Control Delay (s/veh.)
A	≤ 10
B	>10 – 15
C	>15 – 25
D	>25 – 35
E	>35 – 50
F	>50

Source: Highway Capacity Manual 2010

Appendix C: Operational Analysis and Scenario Level of Service

This section contains detailed information about the results of the operational analysis for each individual alternative and for each of the four scenarios. The methodologies used are described in a previous section and include highway capacity analysis of basic freeway segments and merge/diverge segments and HCM 2000 intersection level of service analysis. In addition to these HCM analyses, further consideration is given to other factors that contribute to congestion and its mitigation like alternative intersection designs (roundabouts, continuous green "T"s, etc.), freeway weaving segments, intersection spacing on the Bright Star Road and SR 5 corridors, and queue length for potential spillback.

Basic Freeway Segment Analysis

The freeway analysis that was conducted for this study ranged from east of the interchange with Chapel Hill Road to west of the interchange with Post Road. Within this segment of I-20 were seven basic freeway segments. A capacity analysis for each segment was conducted with 2014 existing volumes and 2040 volumes for each individual scenario. Figure C-1 illustrates the 2014 volumes used in the capacity checks.

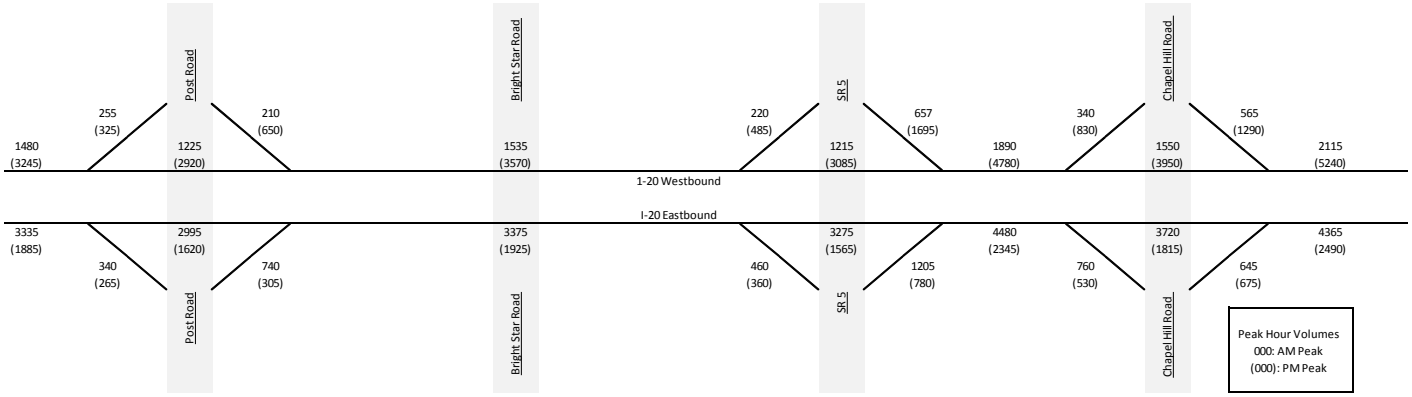


Figure C-1: Capacity Analysis, 2014 Volumes

As evidenced by the volumes on the freeway, the peak direction of traffic during the morning is east towards the city of Atlanta and the peak direction during the afternoon is west towards suburban areas. The two interchanges at SR 5 and Chapel Hill Road have higher peak hour use than the interchange at Post Road.

Existing volumes were grown at a rate of 1% per year to forecast demand by year 2040 on the highway and arterial systems. Figure C-2 illustrates the 2040 volumes used in capacity checks for Scenario 1-3. Due to the modification and addition of ramp junctions required in Scenario 4, a separate diagram for peak hour volumes was developed for this scenario.

For uninterrupted freeway segments, the level of service for operation is defined by the density of vehicles occupying a given segment of road. Therefore, the lower the volume of traffic in a given hour, the lower the density and conversely, the higher the speed, the lower the density. Basic freeway segment LOS for existing conditions, no-build, and Scenarios 1-4 is found in ***Table 11*** later in this chapter.

Merge/Diverge Segment Analysis

The merge and diverge sections at each interchange were investigated to identify critical areas where density may be approaching unacceptable levels for traffic entering or exiting the I-20 mainline. These segments are locations where a given volume of vehicles enter or exit the traffic stream and can be very sensitive to changes in ramp volume, distance be-

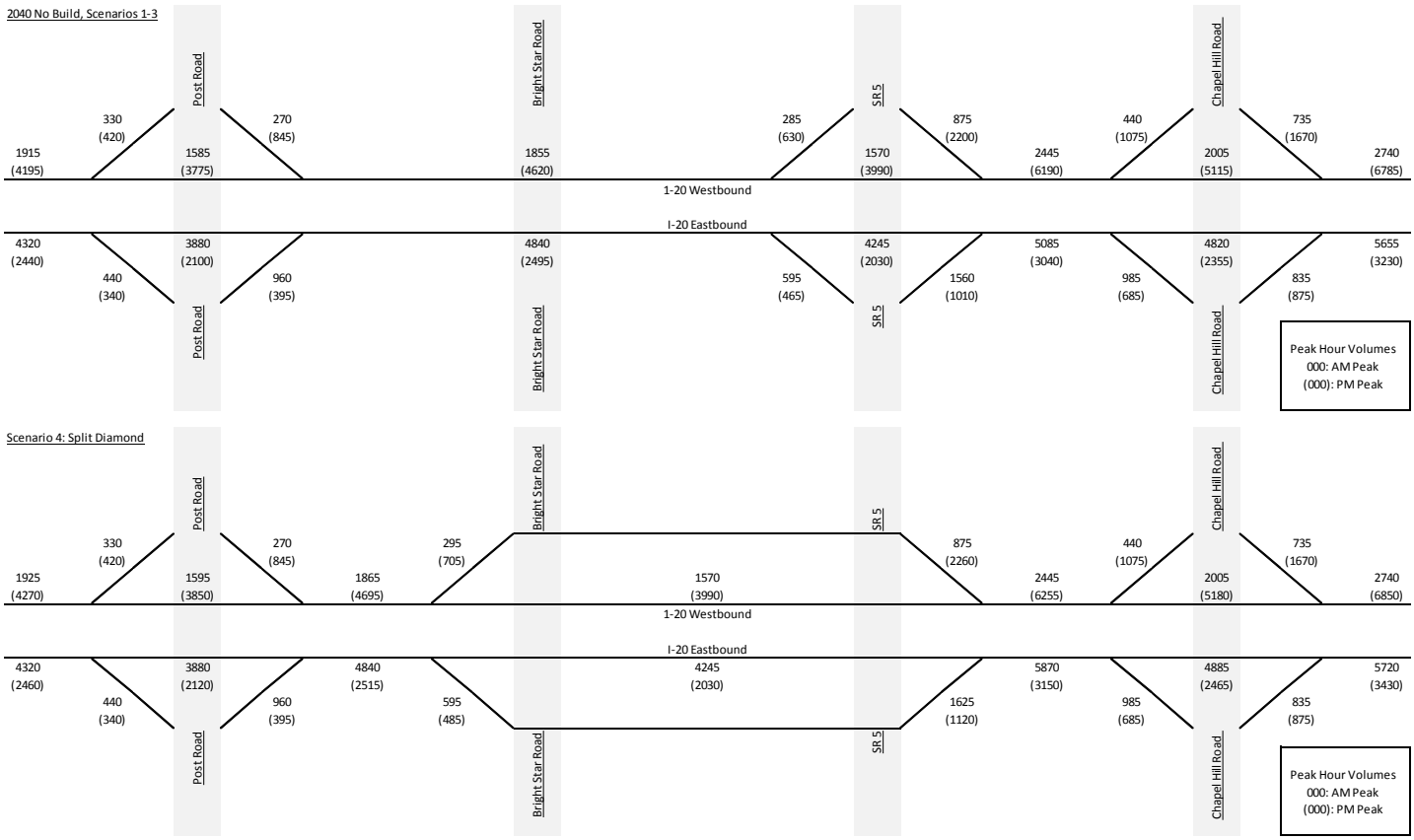


Figure C-2: Capacity Analysis, Scenario 1-3, 2040 Volumes

tween upstream and downstream ramp locations, and auxiliary lane length. In addition to the junction point of the ramp and the mainline, a 1,500' area of influence exists where factors at the ramp junction tend to affect upstream traffic at diverge points and downstream traffic at merge points.

Note that the segment of I-20 between SR 5 and Chapel Hill Road is technically an elongated weaving segment in both directions. The ramp junctions at the freeway do not have acceleration/deceleration lanes; rather, the on-ramps lead into auxiliary lanes that extend the entire length of the freeway segment from on-ramp to off-ramp. The length of this auxiliary lane from gore to gore is approximately 3,500 feet. This distance between ramps is too far for this segment to be appropriately analyzed as a freeway weave, per guidance in the 2010 Highway Capacity Manual, and therefore the on-ramps and off-ramps within this segment were checked to determine the extent of vehicular demand to capacity (V/C). This topic of weaving analysis versus ramp capacity analysis is discussed further in a later section. ***Table 11*** illustrates the LOS for each of the individual freeway and ramp segments along I-20 under the various scenarios.

From Table C-1, results indicate that levels of service along I-20 within the study area is acceptable at both AM and PM peak times in the design year of 2040. The No Build volumes remain the same for Scenarios 1-3 and are only modified slightly under Scenario 4. As a result, there is no change in freeway capacity between the No Build scenario and Scenarios 1-3 and only slight differences between the No Build scenario and the fourth Scenario.

Levels of service on I-20 east of the study area between Chapel Hill Road and SR 92 reach "F" during the afternoon peak. This suggests that the volume of cars exiting I-20 West at Chapel Hill Road is high enough to reduce the overall freeway density to a more manageable level farther west. This statement may be skewed slightly by the fact that the elongated weaving section of I-20 between Chapel Hill Road and SR 5 is a three lane section with an additional auxiliary lane between ramp junctions that runs the entire length of the freeway segment. The guidance that is offered by the 2010 Highway Capacity Manual recommends conducting a basic freeway analysis as if the auxiliary lane were a fourth through

AM

Table C-1

Existing Cond.	A	B	A	B	A	n/a	A	n/a	A	A	A	A	A	B	A	B	B
No Build	A	B	A	B	A	n/a	A	n/a	A	B	A	B	A	B	B	C	B
Scenario 1	A	B	A	B	A	n/a	A	n/a	A	B	A	B	A	B	B	C	B
Scenario 2	A	B	A	B	A	n/a	A	n/a	A	B	A	B	A	B	B	C	B
Scenario 3	A	B	A	B	A	n/a	A	n/a	A	B	A	B	A	B	B	C	B
Scenario 4	A	B	A	B	A	B	A	n/a	A	n/a	A	B	A	B	B	C	B
	Freeway Segment	Ramp Merge/Diverge	Freeway Segment	Ramp Merge/Diverge	Freeway Segment	Ramp Merge/Diverge	Freeway Segment	Ramp Merge/Diverge	Freeway Segment	Ramp Merge/Diverge	Freeway Segment	Ramp Capacity Check	Freeway Segment	Ramp Capacity Check	Freeway Segment	Ramp Merge/Diverge	Freeway Segment
WESTBOUND																	
			POST ROAD			BRIGHT STAR ROAD			SR 5						CHAPEL HILL ROAD		
EASTBOUND																	
	Freeway Segment	Ramp Merge/Diverge	Freeway Segment	Ramp Merge/Diverge	Freeway Segment	Ramp Merge/Diverge	Freeway Segment	Ramp Merge/Diverge	Freeway Segment	Ramp Merge/Diverge	Freeway Segment	Ramp Capacity Check	Freeway Segment	Ramp Capacity Check	Freeway Segment	Ramp Merge/Diverge	Freeway Segment
Existing Cond.	C	C	B	C	C	n/a	C	n/a	C	C	B	C	C	C	C	C	C
No Build	C	D	C	D	D	n/a	D	n/a	D	D	C	D	C	C	D	D	D
Scenario 1	C	D	C	D	D	n/a	D	n/a	D	D	C	D	C	C	D	D	D
Scenario 2	C	D	C	D	D	n/a	D	n/a	D	D	C	D	C	C	D	D	D
Scenario 3	C	D	C	D	D	n/a	D	n/a	D	D	C	D	C	C	D	D	D
Scenario 4	C	D	C	D	D	D	C	n/a	C	n/a	C	E	C	C	D	D	D

PM

Existing Cond.	C	C	B	D	C	n/a	C	n/a	C	C	C	B	C	C	C	E	E
No Build	C	C	C	D	D	n/a	D	n/a	D	D	C	C	D	C	D	F	F
Scenario 1	C	C	C	D	D	n/a	D	n/a	D	D	C	C	D	C	D	F	F
Scenario 2	C	C	C	D	D	n/a	D	n/a	D	D	C	C	D	C	D	F	F
Scenario 3	C	C	C	D	D	n/a	D	n/a	D	D	C	C	D	C	D	F	F
Scenario 4	D	D	C	D	D	D	C	n/a	C	n/a	C	C	D	C	D	F	F
	Freeway Segment	Ramp Merge/Diverge	Freeway Segment	Ramp Merge/Diverge	Freeway Segment	Ramp Merge/Diverge	Freeway Segment	Ramp Merge/Diverge	Freeway Segment	Ramp Merge/Diverge	Freeway Segment	Ramp Capacity Check	Freeway Segment	Ramp Capacity Check	Freeway Segment	Ramp Merge/Diverge	Freeway Segment
WESTBOUND																	
			POST ROAD			BRIGHT STAR ROAD			SR 5						CHAPEL HILL ROAD		
EASTBOUND																	
	Freeway Segment	Ramp Merge/Diverge	Freeway Segment	Ramp Merge/Diverge	Freeway Segment	Ramp Merge/Diverge	Freeway Segment	Ramp Merge/Diverge	Freeway Segment	Ramp Merge/Diverge	Freeway Segment	Ramp Capacity Check	Freeway Segment	Ramp Capacity Check	Freeway Segment	Ramp Merge/Diverge	Freeway Segment
Existing Cond.	A	B	A	B	A	n/a	A	n/a	A	B	A	B	A	B	A	B	B
No Build	B	B	B	B	B	n/a	B	n/a	B	B	B	C	B	B	B	C	B
Scenario 1	B	B	B	B	B	n/a	B	n/a	B	B	B	C	B	B	B	C	B
Scenario 2	B	B	B	B	B	n/a	B	n/a	B	B	B	C	B	B	B	C	B
Scenario 3	B	B	B	B	B	n/a	B	n/a	B	B	B	C	B	B	B	C	B
Scenario 4	B	B	B	B	B	B	B	n/a	B	n/a	B	C	B	B	B	C	C

lane, which may reduce the vehicular flow per lane to a lower rate than what would naturally occur. However, the dual-lane exit ramp at SR 5 is expected to relieve some of this congestion potential by providing a high-capacity egress point for peak afternoon traffic. Steps to relieve the potential overcapacity conditions on I-20 east of Chapel Hill Road are recommended but are outside of the scope of this study.

The effects of the split-diamond interchange are seen on the segments of freeway between Bright Star Road and SR 5. In the direction of peak travel, the split diamond is successful in reducing density from "D" to "C" levels in both the morning and afternoon. Additionally, the AM on-ramp capacity check from SR 5 to I-20 East reveals that the ramp is operating between a "D" and an "E" level of service. The degradation in LOS between Scenario 4 and the other Scenarios at this on-ramp is a result of additional latent demand that was assumed due to an increase in development potential that the split-diamond Scenario provides. This additional demand is minimal, however, and serves to illustrate that the ramp is potentially operating right at the threshold between LOS "D" and "E". This alternative also has significant impacts to the level of service on the Bright Star Road corridor which will be discussed in greater detail in the section of this report regarding intersection levels of service.

Intersection LOS

The corridors that received operational analysis within the study are:

- Intersections on Post Road between Mason Creek Road and the Park and Ride lot
- Intersections on Bright Star Road between Douglas Boulevard and Bright Star Connector
- Intersections on Douglas Boulevard between Bright Star Road and Chapel Hill Road
- Intersections on SR 5 between Douglas Boulevard and Bright Star Connector
- Intersections on Chapel Hill Road between Douglas Boulevard/Timber Ridge Drive and Elizabeth Drive

The existing, no huild, scenarios 1-4 level of service for each intersection is illustrated in Table C-2. Synchro summary reports to support these results.

No Build

Results from the 2040 No Build Synchro intersection analysis reveal that Post Road experiences significant AM and PM failure which suggests the road is in need of widening and may require additional auxiliary lanes for turns at ramp termini.

Table C-2

SR 5/Bright Star Connector Improvements Comparison of AM Peak Hour

Intersection	Existing		2040 No-Build [2]		Scenario 1: Widen SR 5 to 6 lanes			Scenario 2: SPUI			Scenario 3: Widen SR 5 and			Scenario 4: Split Diamond		
	LOS	Delay	LOS	Delay	Improvement	LOS	Delay	Improvement	LOS	Delay	Improvement	LOS	Delay	Improvement	LOS	Delay
Post Road & Mason Creek Road	E	57.8	F	190.2	N-1	D	40.1	N-1	D	40.1	N-1	D	40.1	N-1	D	40.1
Post Road & I-20 East	F	*Err*	F	*Err*	N-1	D	46.3	N-1	D	46.3	N-1	D	46.3	N-1	D	46.3
Post Road & I-20 West	B	17.9	F	88.1	N-1	B	14.8	N-1	B	14.8	N-1	B	14.8	N-1	B	14.8
Post Road & Park and Ride	C	22.2	E	36.5	N-1	C	21.0	N-1	C	21.0	N-1	C	21.0	N-1	C	21.0
Bright Star Road & Douglas Blvd	F	139.5	F	666.3	PA-004	A [3]	9.5 [3]	PA-004	A [3]	9.5 [4]	PA-004	A [3]	9.5 [4]	**	D	27.4
Bright Star Road & I-20 EB Off-Ramp/Frontage Road	n/a	-	n/a	-	-	n/a	-	-	n/a	-	-	n/a	-	PA-020	C	23.8
Bright Star Road & I-20 WB On-Ramp/Frontage Road	n/a	-	n/a	-	-	n/a	-	-	n/a	-	-	n/a	-	PA-020	B	17.0
Bright Star Road & John West Road	C	24.6	F	124.2	PA-038	B [3]	10.0 [3]	PA-038	B [3]	10.0 [4]	PA-038	B [3]	10.0 [3]	***	A	8.8
Stewart Parkway & Douglas Blvd	A	6.0	A	6.1	-	B	10.9	-	B	10.5	-	B	10.3	-	B	13.3
Bright Star Road & Cherry Lane	C	17.9	D	27.9	-	D	27.9	-	D	27.9	-	D	27.9	****	F	61.2
Bright Star Road & Bright Star Connector	C	16.8	D	27.6	PA-037	A [3]	5.4 [3]	PA-037	A [3]	5.4 [3]	PA-037	A [3]	5.4 [3]	PA-037	A [3]	8.2 [3]
Bill Arp Road & Bright Star Connector/Rose Avenue	C	30.9	C	34.3	PA-014	C	26.9	-	D	39.0	PA-001	C	26.2	PA-020	C	28.7
Bill Arp Road & Concourse Parkway	B	11.6	B	12.4	PA-014	B	10.5	-	B	12.2	PA-001	B	10.0	PA-020	B	13.9
Bill Arp Road & I-20 West	B	18.1	B	19.4	PA-014	C	17.4	-	n/a	-	PA-001	C	26.1	PA-020	B	17.7
Bill Arp Road & I-20 East	B	16.2	D	38.5	PA-014	C	33.9	-	n/a	-	PA-001	C	33.0	PA-020	B	18.5
Proposed Single Point (I-20 & SR 5)	n/a	-	n/a	-	-	n/a	-	PA-036	D	38.2	-	n/a	-	-	n/a	-
Bill Arp Road & Douglas Blvd	C	34.5	D	35.3	PA-014	C	27.1	PA-001(a)	C	32.8	PA-001	C	31.0	PA-001(a)	C	31.3
Home Depot/Garden Ridge & Douglas Blvd	A	8.4	A	8.8	-	A	9.6	-	A	9.5	-	B	10.1	-	B	11.8
Yale Cir/Lowe's & Douglas Blvd	A	4.3	A	5.0	-	A	4.1	-	A	4.1	-	A	9.4	-	A	6.8
Arbor Place West & Douglas Blvd	A	2.4	A	2.6	-	A	3.6	-	A	2.7	-	A	2.9	-	A	3.0
Arbor Place East & Douglas Blvd	B	18.1	B	18.3	-	C	21.5	-	B	19.8	-	C	21.1	-	B	15.4
Chapel Hill Road & Douglas Blvd/Timber Ridge Dr	C	28.1	E	57.6	N-3	D	39.6	N-3	D	39.6	N-3	D	39.9	N-3	D	39.2
Chapel Hill Road & I-20 East	B	19.0	C	34.7	-	C	26.8	-	C	26.8	-	C	26.8	-	C	26.8
Chapel Hill Road & I-20 West [1]	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Chapel hill Road & Elizabeth Dr/Hospital Dr	C	29.9	C	33.6	N-4	B	12.9	N-4	B	12.9	N-4	B	12.9	N-4	B	12.9

*** Denotes need for signalization & modified intersection geometry*
**** Deonotes need for continuous green "T" and modified intersection geometry*
*****Denotes need for additional turn lanes at unsignalized intersection*
Err - Volume exceeds capacity and delay cannot be calculated.

PA-036: SPUI
PA-037: Roundabout at Bright Star and Bright Star Connector intersection
PA-038: Roundabout
N-1: Post Road improvements including widen to 4 lanes north of Mason Creek, Longer Cycle Lengths, Signalize I-20 East Ramp,
N-3: Add dedicated NB and SB left turn lanes at Chapel Hill & Timber Ridge
N-4: Coordinate Chapel Hill & Elizabeth Drive signal with signals south of I-20

SR 5/Bright Star Connector Improvements Comparison of PM Peak Hour

Intersection	Existing		2040 No-Build [2]		Scenario 1: Widen SR 5 to 6 lanes			Scenario 2: SPUI			Scenario 3: Widen SR 5 and			Scenario 4: Split Diamond		
	LOS	Delay	LOS	Delay	Improvement	LOS	Delay	Improvement	LOS	Delay	Improvement	LOS	Delay	Improvement	LOS	Delay
Post Road & Mason Creek Road	A	9.0	B	10.4	N-1	B	17.3	N-1	B	17.3	N-1	B	17.3	N-1	B	17.3
Post Road & I-20 East	F	414.8	F	Err	N-1	B	17.8	N-1	B	17.8	N-1	B	17.8	N-1	B	17.8
Post Road & I-20 West	E	62.7	F	170.5	N-1	D	37.2	N-1	D	37.2	N-1	D	37.2	N-1	D	37.2
Post Road & Park and Ride	A	0.0	A	0.0	N-1	A	0.0	N-1	A	0.0	N-1	A	0.0	N-1	A	0.0
Bright Star Road & Douglas Blvd	F	107.2	F	311.1	PA-004	E [3]	37.3 [3]	PA-004	E [3]	37.3 [3]	PA-004	E [3]	37.3 [3]	**	D	35.5
Bright Star Road & I-20 EB Off-Ramp/Frontage Road	n/a	-	n/a	-	-	n/a	-	-	n/a	-	-	n/a	-	PA-020	B	18.5
Bright Star Road & I-20 WB On-Ramp/Frontage Road	n/a	-	n/a	-	-	n/a	-	-	n/a	-	-	n/a	-	PA-020	C	24.6
Bright Star Road & John West Road	D	32.0	F	208.4	PA-038	C [3]	16.1 [3]	PA-038	C [3]	16.1 [3]	PA-038	C [3]	16.1 [3]	***	A	8.2
Stewart Parkway & Douglas Blvd	A	7.6	A	8.9	-	B	11.0	-	B	13.5	-	B	10.9	-	B	17.6
Bright Star Road & Cherry Lane	C	22.0	E	38.1	-	E	38.1	-	E	38.1	-	E	38.1	****	F	99.1
Bright Star Road & Bright Star Connector	D	29.9	F	129.4	PA-037	A [3]	8.2 [3]	PA-037	A [3]	8.2 [3]	PA-037	A [3]	8.2 [3]	PA-037	B [3]	13.1 [3]
Bill Arp Road & Bright Star Connector/Rose Avenue	C	22.2	C	32.3	PA-014	D	36.3	-	D	35.2	PA-001	C	34.1	PA-020	C	24.2
Bill Arp Road & Concourse Parkway	B	18.4	C	25.8	PA-014	C	21.3	-	C	23.0	PA-001	C	22.7	PA-020	C	24.9
Bill Arp Road & I-20 West	D	37.5	D	51.5	PA-014	C	34.5	-	n/a	-	PA-001	C	23.7	PA-020	C	31.1
Bill Arp Road & I-20 East	B	13.9	C	20.0	PA-014	B	16.0	-	n/a	-	PA-001	C	20.9	PA-020	B	17.0
Proposed Single Point (I-20 & SR 5)	n/a	-	n/a	-	-	n/a	-	PA-036	D	51.8	-	n/a	-	-	n/a	-
Bill Arp Road & Douglas Blvd	D	43.0	E	74.2	PA-014	D	41.2	PA-001(a)	D	51.2	PA-001	D	41.4	PA-001(a)	D	47.0
Home Depot/Garden Ridge & Douglas Blvd	A	7.7	A	7.8	-	A	9.0	-	A	9.9	-	B	10.4	-	A	9.8
Yale Cir/Lowe's & Douglas Blvd	A	8.0	B	12.2	-	B	12.6	-	B	15.8	-	B	13.4	-	B	12.9
Arbor Place West & Douglas Blvd	A	6.5	A	7.6	-	A	7.8	-	A	7.9	-	A	7.9	-	A	10.0
Arbor Place East & Douglas Blvd	B	19.5	C	25.2	-	C	28.1	-	C	31.0	-	C	28.6	-	C	29.1
Chapel Hill Road & Douglas Blvd/Timber Ridge Dr	C	34.0	E	73.6	N-3	D	50.0	N-3	D	50.0	N-3	D	50.0	N-3	D	49.9
Chapel Hill Road & I-20 East	B	14.4	B	19.0	-	C	23.7	-	C	23.7	-	C	23.7	-	C	23.5
Chapel Hill Road & I-20 West [1]	n/a	n/a	n/a	n/a	-	n/a	n/a	-	n/a	n/a	-	n/a	n/a	-	n/a	n/a
Chapel hill Road & Elizabeth Dr/Hospital Dr	D	49.3	F	101.7	N-4	D	54.0	N-4	D	54.0	N-4	D	54.0	N-4	D	54.1

(1) Interchange design includes multiple free-flow movements and cannot be analyzed utilizing HCM methodology
(2) Assumes no infrastructure changes or signal timing improvements
(3) Utilized Calibrated Model results from GDOT Roundabout Analysis Tool
*** Denotes need for signalization & modified intersection geometry*
**** Deonotes need for continuous green "T" and modified intersection geometry*
*****Denotes need for additional turn lanes at unsignalized intersection*
Err - Volume exceeds capacity and delay cannot be calculated.

PA-001(a): Dual EB & WB Lefts, WBR turn lane, SBR turn lane, additional WB through lane
PA-001: Widen SR 5 to 6 lanes from Arbor Pkwy to Concourse Pkwy., construct DDI, dual EB & WB lefts, WBR turn lane, additional
PA-004: Roundabout at Bright Star and Douglas intersection
PA-014: Widen SR 5 to 6 lanes from Arbor Pkwy. To Bright Star Connector/Rose Ave.
PA-020: Split Diamond Interchange
PA-036: SPUI
PA-037: Roundabout at Bright Star and Bright Star Connector intersection
PA-038: Roundabout at Bright Star and John West intersection
N-1: Post Road improvements including widen to 4 lanes north of Mason Creek, Longer Cycle Lengths, Signalize I-20 East Ramp,
N-3: Add second dedicated NB and SB left turn lanes at Chapel Hill & Timber Ridge
N-4: Coordinate Chapel Hill & Elizabeth Drive signal with signals south of I-20

Intersections on the Bright Star Road corridor are stop controlled on the side streets with the exception of the intersection at Douglas Boulevard, which is signalized. This signal is currently failing at peak times during 2014 and delays will become worse with additional demand from developmental growth. The side street approaches at John West Road and at the Bright Star Connector are also expected to fail and require some type of improved traffic control to the existing two way stop sign.

The SR 5 corridor is currently undergoing improvements at three intersections. Two of these projects are located at two of the most congested intersections on the corridor and are attempts to improve immediate capacity. The third project is designed to make the I-20 westbound ramp more accessible for traffic turning right from Concourse Road. These projects were modeled in the No Build scenario and Scenarios 1-4 when appropriate. These projects are:

- Second southbound left turn lane on SR 5 at Douglas Boulevard
- Second westbound right turn lane on the I-20 West off-ramp at SR 5
- Single right turn lane from Concourse Road that leads into the southbound right turn lane on SR 5 at the I-20 West on-ramp

With the addition of the second turn lane at Douglas Boulevard and at the I-20 West off-ramp, future No Build conditions are expected to operate acceptably, although the SR 5 at Douglas Boulevard intersection will reach LOS "E" during the afternoon peak. This is an indicator that the improvements currently being designed will extend the life of the congested intersection for several more years, but that conditions will reach a point when widening either in the north-south direction or in the east-west direction will be necessary.

On Chapel Hill Road, the intersections at Timber Ridge Drive/Douglas Boulevard and at Elizabeth Drive/Hospital Drive both experience LOS "E" or worse at varying peak times of the day, indicating that the current geometry is not sufficient and that minor lane modifications may be needed.

Scenario 1: Widen SR 5 and Other Improvements

Project N-1 provides much needed improvements to the Post Road corridor by reducing LOS at all four intersections to a "D" or better. Note that N-1 calls for the signalization of the I-20 East ramp intersection which would be dependent upon a signal warrant analysis study and subsequent approval by GDOT and any other applicable review agencies. N-1 is a recommended improvement regardless of any other improvements that take place at Bright Star Road and SR 5.

On Bright Star Road, proposed roundabouts PA-004, PA-037, and PA-038 successfully address the overall capacity of the intersections by improving side-street delays. The proposed roundabout at Bright Star Road at Douglas Boulevard (PA-004) operates at a LOS "E" in the afternoon peak with an average vehicle delay of approximately 37 seconds. A traffic signal may be a more appropriate means of control at this location in the event that development occurs at a greater pace than expected. As with all proposed signals, a signal warrant analysis would need to be reviewed and approved by GDOT before installation.

Project PA-014 (widening SR 5) improves AM operations at each intersection with SR 5 to no worse than LOS C and PM operations to no worse than LOS D. However, due to the three intersection improvements planned for short-term construction on the highway, the only intersection that is at risk of being overcapacity is SR 5 at Douglas Boulevard in the afternoon peak. The widening may produce minimal positive operational impacts to the corridor if the most congested locations are addressed by smaller scale intersection improvements. More discussion on the impacts that widening the state route has on right-of-way and project cost can be found in the next section.

The Chapel Hill Road projects address poor peak hour LOS of "E" or worse at intersections with Douglas Boulevard/ Timber Ridge Drive and Hospital Drive/Elizabeth Drive by improving conditions to LOS "D" or better at both locations and at both peak hours. Retiming the signal at Hospital Drive/Elizabeth Drive and coordinating it with other signals to the south will reduce average PM delays by almost half without any geometric modifications to the intersection. These two improvements are recommended regardless of any other improvements that take place at Bright Star Road and SR 5.

Scenario 2: Single Point Urban Interchange and Other Improvements

Scenario 2 consists of the same projects on Post Road, Bright Star Road, and Chapel Hill Road as Scenario 1 and Scenario 3. The improvements at these locations provide similar benefits across all three scenarios and only fluctuate slightly between them due to changes in progression of traffic with coordination and random arrival rates near roundabouts.
The SPUI operates at a "D" during both peak periods at the I-20 interchange. While the SPUI does not necessarily reduce individual intersection delay, its benefit lies in the fact that it removes a signal from the SR 5 corridor which would aid in coordination and simplify the ramp control measures.

With Scenario 2, the need exists for additional capacity at SR 5 at Douglas Boulevard, since a widening of SR 5 is not part of the scenario. The recommended improvements include additional east- and westbound left turn lanes and the addition of a westbound through lane. These modifications will result in a design year LOS of "D" or better during each peak.

Scenario 3: Widen SR 5, Construct DDI at I-20, and Other Improvements

Scenario 3 consists of the same projects on Post Road, Bright Star Road, and Chapel Hill Road as Scenario 1 and Scenario 2. The improvements at these locations provide similar benefits across all three scenarios and only fluctuate slightly between them due to changes in progression of traffic with coordination and random arrival rates near roundabouts.
The third scenario includes a widening of SR 5 from Concourse Parkway to Arbor Parkway along with a diverging diamond at the I-20 interchange. The results from the Synchro analysis suggest that the DDI will operate well, with LOS at the ramp termini never falling below a "C" at peak times. The direction of traffic at this location is heavily dependent on the time of day, with the eastbound traffic on I-20 reaching a peak in the morning and the westbound traffic peaking in the afternoon. As a result, this configuration does have a tendency to improve the ramp termini intersection with the heaviest turning movements at the expense of capacity at the other intersection, although this effect is minimal. As with Scenario 1, consideration of impacts to existing businesses and project cost must take place before a determination of preferred treatment within this study area is made. Signal spacing also becomes a consideration with the DDI due to the proximity of adjacent intersections. his topic is discussed further in the scenario comparison section of this report.

Scenario 4: Construct a Split Diamond Interchange and Other Improvements

Scenario 4 consists of the same projects on Post Road and Chapel Hill Road as Scenario 1, 2 and 3. Tested improvements on Bright Star Road have been tailored to meet intersection spacing requirements and additional demand requirements of this scenario.

Some modification to the intersections of Bright Star Road with Douglas Boulevard and John West Road will be necessary to provide for minimum FHWA intersection spacing. To meet intersection requirements, it is proposed that Douglas Boulevard be realigned to intersect Bright Star Road further south and John West Road be realigned to intersect Bright Star Road adjacent to Bright Star Connector. The existing John West Road intersection will be converted to a right-in/right-out intersection. Finally, to reduce neighborhood cut-through traffic, the connection from Cherry Lane to

Bright Star Road will be closed. Residents from Cherry Lane will have the option of accessing Bright Star via the right-in/right-out at the existing John West Road intersection or at the proposed, newly aligned John West Road. The following paragraphs further discuss design and operations at the relocated intersections.

The roundabout at Bright Star Road at Douglas Boulevard will not be feasible in Scenario 4 due to the additional demand generated by diverted traffic from SR 5. The preferred design for this intersection improvement in Scenario 4 is to widen to two northbound through lanes south of the intersection. The two-lane segment of Bright Star Road would end at Douglas Boulevard with one of the southbound lanes becoming a dedicated left-turn lane. Signalization would be necessary and therefore Douglas Boulevard would need to be realigned to the south to meet GDOT and FHWA signal spacing requirements and a signal warrant analysis would need to be conducted and approved. This design is expected to reduce delay to 31.1 seconds per vehicle in the AM peak hour and 39.1 seconds per vehicle in the PM peak hour. This results in a LOS of C for the AM peak and LOS of D for the PM peak. Douglas Boulevard would also need to be realigned to the south to increase the distance between the proposed signal here and the proposed signal at the I-20 East off-ramp to Bright Star Road.

As with the intersection of Bright Star Road at Douglas Boulevard, the additional demand expected in Scenario 4 would require a widening to four lanes of Bright Star Road from Douglas Boulevard to Bright Star Connector. Initially, a multi-lane roundabout was proposed for the intersection of Bright Star Road, Bright Star Connector, and the realigned John West Road. However, this roundabout will not be feasible in Scenario 4 due to the high turning volumes from the northbound and westbound approaches and future traffic volume growth along Bright Star Connector. This intersection will instead be signalized, with a delay of 16.8 seconds per vehicle in the AM peak hour and 23.5 seconds per vehicle in the PM peak hour. This results in a LOS of B for the AM peak hour and C for the PM peak hour.

With Scenario 4, the need exists for additional westbound capacity at SR 5 at Douglas Boulevard. By making these improvements, LOS will reach “D” in the afternoon and “C” in the morning.

Other Considerations

Roundabouts

Single lane roundabouts can operate very well in place of a traffic signal when daily volumes on the intersecting roads are less than 25,000 vehicles per day and traffic is distributed such that, at most, 90% of the total entering traffic comes from the major road. Roundabouts have been selected as feasible alternatives within each scenario at various intersections on Bright Star Road because these criteria are met or nearly met. The corresponding level of service for each proposed roundabout can be seen in Table C-2 and individual approach volumes at each proposed roundabout can be seen in ***Table 13***. HCM 2010 analysis sheets can be found in the appendix of this document.

Notably, these same roundabout configurations must be reevaluated in Scenario 4 due to the additional demand placed on Bright Star Road. The resulting levels of service with the proposed single lane roundabouts PA-004 and PA-037 were failing under Scenario 4 volumes. Table C-3 also reflects the LOS under Scenario 4 volumes for the proposed single lane roundabouts. Additional north- and southbound through lanes on Bright Star Road will provide the necessary capacity to accommodate the additional traffic at the proposed traffic signals at the I-20 ramp termini, and therefore, multi-lane roundabouts were considered as an option at PA-004 and PA-037. Refer to ***Table 13*** for the multi-lane roundabout results. Ultimately, multi-lane roundabouts could conceivably work well at these two locations but were not preferred over signalization due to the fact that multi-lane roundabouts can create potential challenges with safety and ease of navigation if drivers are unaccustomed to them.

Table C-3

Potential Roundabout	Approach	Scenario 1-3				Scenario 4			
		AM Peak		PM Peak		AM Peak		PM Peak	
		LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)
Douglas Boulevard at Bright Star Road (PA-004)	***Single Lane***								
	Northbound Approach w/ RT Bypass	A	6.5	A	6.1	E	38.1	C	21.1
	Southbound Approach	B	13.0	F	78.0	C	17.0	F	285.0
	Westbound Approach w/ RT Bypass	A	9.4	C	15.6	C	19.8	F	50.6
	Multi-Lane								
	Northbound Approach w/ Thru & Shared Thru-Right Lane					B	14.7	B	13.3
	Southbound Approach w/ Shared Thru-Left & Thru Lane					A	6.4	C	20.9
	Westbound Approach w/ Left Only & Right Only Lane					B	10.4	C	15.7
Bright Star Road at John West Road (PA-037)	***Single Lane***								
	Northbound Approach	B	10.0	B	13.0	B	15.0	E	47.0
	Southbound Approach	B	10.0	C	21.0	C	19.0	E	42.0
	Eastbound Approach	B	10.0	B	11.0	B	14.0	B	13.0
	Multi-Lane								
	Northbound Approach					A	5.8	A	7.2
	Southbound Approach					A	7.0	A	8.6
	Eastbound Approach					B	10.5	B	10.7
Bright Star Road at Bright Star Connector (PA-038)	***Single Lane***								
	Northbound Approach w/ RT Bypass	A	4.1	A	5.0	A	6.0	B	10.7
	Southbound Approach	A	7.0	B	12.0	B	11.0	C	17.0
	Westbound Approach w/ RT Bypass	A	6.0	A	6.9	A	7.0	B	10.8
	Multi-Lane								
	Northbound Approach w/ RT Bypass								
	Southbound Approach								
	Westbound Approach w/ RT Bypass								

Freeway Weaving

Weaving movements are defined by the HCM "as the crossing of two of more traffic streams traveling in the same general direction along a significant length of highway without the aid of traffic control devices." In turn, weaving segments on freeways "are formed when a merge area is closely followed by a diverge area, or when an on-ramp is closely followed by an off-ramp and the two are joined by an auxiliary lane. Weaving segments require intense lane-changing maneuvers as drivers must access lanes appropriate to their desired exit points. Thus, traffic in a weaving segment is subject to turbulence in excess of that normally present on basic freeway segments."

The segments on I-20 in both the eastbound and westbound directions utilizing weaving segment designs between SR 5 and Chapel Hill Road due to the presence of auxiliary lanes formed by the on-ramp of each respective interchange terminating at the off-ramp of the other interchange. Currently, this segment is approximately 3,500 feet which means a specific HCM analysis methodology is not applicable (research on LOS in weaving segments is limited to 2,500 foot sections). However, a review of existing and future traffic demand and the likely weaving movements suggest that the increased length along these segments make normal operations more likely. While not explicitly recommended as part of any of the scenarios being considered at this time, as further study and design is contemplated for the study area, sensitivity should be made to the possible effect of shortening the weaving segments on I-20.

Queues

Queue length between intersections was considered at key locations where the risk of spillback into adjacent upstream signals was present. A road with coordinated signals can break down operationally when capacity becomes restricted by queue blockage.

Intersection spacing becomes critical in Scenario 3 due to the fact that the DDI is very sensitive to downstream conditions. If traffic throughput is improved by the DDI, the adjacent downstream signals can have additional pressure placed on them in the form of elevated V/C ratios. This problem can become exacerbated when signals are placed closely to one another because queue lengths can build at the downstream intersection and spill back into the DDI, thereby reducing its overall capacity and negating operational benefits.

The intersections of SR 5 at Concourse Parkway and at the I -20 West ramp termini are approximately 530' apart and only 390' exists between the I-20 West off-ramp right turn lane yield point and the stop bar of the northbound movement at Concourse Parkway. The reported 95th percentile queue length at this location during the PM peak exceeds 480' suggesting that Scenario 3 may be susceptible to queue blocking and should be investigated further through micro-simulation before making a determination on its effectiveness.

Figure C-3: Intersection spacing, SR 5

Scenario 4 also presents a condition where queuing could potentially impact adjacent signals. The proposed split diamond ramp termini on Bright Star Road are positioned between John West Road and Douglas Boulevard. To the south, at Douglas Boulevard, there is approximately 200' between the existing intersection and the proposed ramp signal. Heavy peak hour left turns from Bright Star Road onto Douglas Boulevard have the potential to queue and conflict with the ramp signal. Synchro 95th percentile queue lengths for both the southbound through movement and left turn movement exceed 200'. As a result, Scenario 4 requires a realignment of Douglas Boulevard to the south to ensure a minimum spacing between intersections of 1,000' to satisfy GDOT signal spacing requirements and avoid blockage.

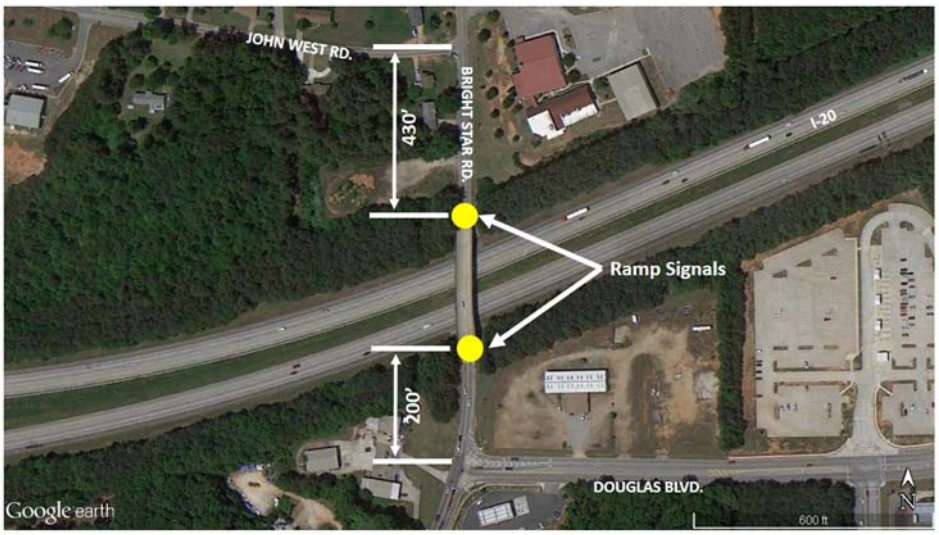


Figure C-4: Intersection spacing, Bright Star Road

To the north, Scenario 4 proposes to relocate John West Road to intersect at Bright Star Connector. Prior to proposing a relocation of the intersection, several options were tested. These options included a signalized intersection and a continuous "T" intersection. A standard signal was not feasible because it could produce blockage by queue during peak times due to the fact that the spacing would only reach approximately 430'. Furthermore, the intersection would not meet GDOT signalized intersection spacing requirements. The continuous "T" intersection was also not feasible due to design requirements. The "T" intersection