

**The Forum Shopping Center at Peachtree Corners Circle
Peachtree Corners, Georgia**

Gwinnett County
Concept & Feasibility Study

March 2023

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1.0 Introduction

The Forum Shopping Center has two entrances located on Peachtree Corners Circle. Both entrances are within the operational influence of the traffic signal at Peachtree Parkway (the Parkway) and Peachtree Corners Circle. Each entrance to the Forum development on Peachtree Corners Circle has a private driveway across the street. Kimley-Horn was asked to analyze the intersection of Peachtree Corners Circle at the Forum's major driveway and Crème de la Crème Early Learning Center for intersection improvements such as a modern roundabout. The minor Forum entrance is across from a QuikTrip gas station driveway. Peachtree Corners Circle west of the Parkway has a 4-lane wide cross-section with a two-way left-turn lane. As demonstrated in the analysis of the data collected, the combination of the unsignalized driveways and the Parkway traffic signal creates a complicated, crash-prone corridor for drivers during peak and off-peak conditions.

An intersection control feasibility study was performed by Jacobs in January 2022 to determine if a roundabout would improve intersection safety, alleviate queuing and improve the level of service (LOS) at the intersections of Peachtree Corners Circle at the Forum/ Crème de la Crème and Peachtree Corners Circle at Peachtree Parkway. Further analyses were recommended by Jacobs and addressed in this report, namely:

- Develop a preferred roundabout lane configuration to maximize performance.
- The feasibility of roundabout construction considering existing conditions including right-of-way, topography, and property impacts.
- The effects of platoons released from the signalized intersection of Peachtree Corners Circle at Peachtree Parkway.
- The impact of weaving traffic between the Parkway's signalized intersection and the Forum Driveway.

Kimley-Horn was asked to expand on the previous analysis and provide recommendations for improvements at the intersection of Peachtree Corners Circle and the Forum/ Crème de la Crème driveway while considering the influence of surrounding intersections and existing topography. During our analyses, particular attention was given to the following elements:

- Documentation of the intersection's AM and PM peak hour trends, conflicts, and congestion tendencies using vehicle drone video to source vehicle tracking.
- Assessing the interaction between Peachtree Parkway platoons and the Forum's main driveway on Peachtree Corners Circle.
- Analyzing historical crash data and correlation with existing traffic patterns
- Clear definition of access and egress problems relating to the entire Peachtree Corners Circle corridor.
- Performing an in-depth analysis of operational effects on driver performance and intersection capacity, identifying various practical intersection and corridor control solutions and a preferred package of improvements.
- Developing a preliminary concept design for each of the practical solutions and alternatives.

2.0 Study Methodology

The study phases documented in this report are as follows:

1. Reviewing previous documentation and identifying operational effects on conflicts and crash patterns.
2. Documentation of existing geometric corridor operational and safety deficiencies
3. Develop and evaluate practical intersection control and corridor solutions.
4. Develop a preferred concept design alternative to account for roadway profile, driveway spacing and operational effects between the Parkway and the main Forum driveway.

2.1 Reviewing Previous Documentation and Identifying Conflicts and Crash Patterns

A review of previous analyses and recommendations provides a baseline for the identification of problem areas and potential conflict patterns. Further evaluation of existing conflicts involved the following tasks:

- Utilizing vehicle tracking software, site visits, and overhead video footage, to identify near-misses, driver interactions, and other unique behaviors
- Collecting and reviewing crash data for a 5-year period; looking for trends and patterns that are attributable to access control spacing and effects of the Parkway on the nearby driveways.

Elaborating on driver behavior using vehicle tracking and conflict analysis as a surrogate provides depth to an analysis which would otherwise prioritize crash data to determine conflict patterns. Crash data alone does not capture the microscopic operations and complications of an area.

2.2 Documentation of Existing Geometric Conditions and Deficiencies

The method of documenting the problem involves evaluating three aspects of the corridor:

- A geometric design assessment (conformance and deficiencies)
- Assessment of the levels of congestion, e.g., queue spillback to driveways
- Correlation between geometric deficiencies, crash history and congestion effects

By correlating recorded conflicts with reported crashes produces insights into the problems with geometry and driveway access control that are overshadowed by the Parkway intersection.

2.3 Develop and Evaluate Practical Solutions

The development of potential alternatives will focus on the problems identified in previous stages and correcting them while improving the functionality of the Peachtree Corners Circle corridor. The solutions will be analyzed using the following methodology:

- Applying updated turning movement counts to the alternatives and evaluate the changes in capacity
- Analyzing the alternatives by utilizing traffic simulation software
- Providing a reasonable traffic projection and lifespan for each alternative

2.4 Identifying a Preferred Alternative

A preferred alternative was selected from the list of alternatives based on cost, functionality, safety, and congestion relief associated with each. The preferred concept design is detailed in terms of horizontal and vertical geometry and performance expectations.

3.0 Problem Documentation

3.1 Geometric Design of Peachtree Corners Circle at the Forum

The geometric design of Peachtree Corners Circle from the main Forum Driveway/ Crème de la Crème to Peachtree Parkway was reviewed to identify conformance deficiencies or inefficiencies that result from access control spacing and excess pavement width without positive guidance. Figure 1 on the following page illustrates the obvious physical deficiencies that contribute to traffic conflict patterns in the context of access control spacing and queue spillback. An overview of the existing conditions is shown in Appendix A, Exhibit 1.0.

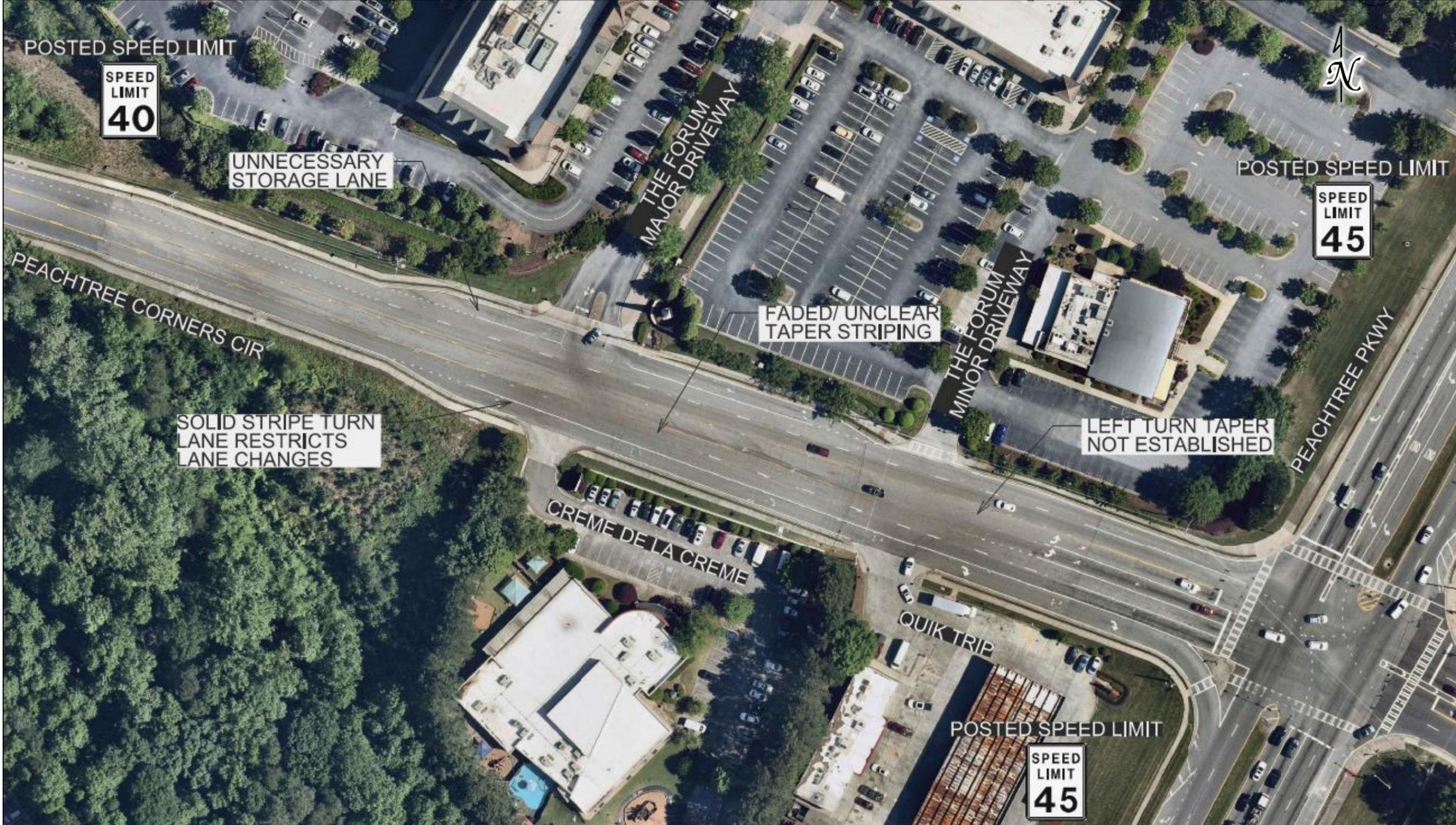


Figure 1: Existing Conditions Overview

Table 1: Five-Year Crash Summary by Severity

	2017	2018	2019	2020	2021	Total
K	0	0	0	0	0	0
A	0	0	1	0	0	1
B	0	0	2	1	0	3
C	0	1	3	3	0	7
O	1	8	11	3	2	25
Total	1	9	17	7	2	36

Crashes were also evaluated based on manner of collision. Approximately 83% of the total reported crashes within the study area were either angle or rear end type crashes. Each had 15 occurrences. Sideswipes and single-vehicle crashes were also reported within the analysis window. Table 2 below summarizes the total reported crashes (36) by manner of collision.

Table 2: Five-Year Crash Summary by Manner of Collision

	2017	2018	2019	2020	2021	Total
Angle	0	2	11	1	1	15
Rear End	1	4	5	4	1	15
Sideswipe	0	3	1	1	0	5
Not a Collision with Motor Vehicle	0	0	0	1	0	1
Total	1	9	17	7	2	36

Crashes were then spatially documented on a crash diagram, which includes date, weather conditions, and resulting injuries. Figure 3 on the following page illustrates the crashes reported along Peachtree Corners Circle between the Forum's major driveway and Peachtree Parkway during the five-year period.

An analysis of the spatial clusters revealed the following:

- The highest crash frequency occurred in the right-turn lane approaching Peachtree Parkway. 7 rear end type crashes occurred within the turn lane.
- The second highest crash frequency occurred at the Forum's main driveway, where 6 crashes were caused by drivers turning left from the Forum crashing with westbound through traffic on Peachtree Corners Circle.
- Three sideswipes occurred in the westbound lanes of Peachtree Corners Circle just west of Peachtree Parkway.

Of the total reported crashes within in the study location (36), 12 occurred at the intersection of Peachtree Corners Circle and the Forum's major driveway. All the reported crashes are represented in Figure 3 on the following page.

As summarized in Table 2, the two most common types of crashes were rear end and angle. However, of the 15 reported rear-end crashes, 10 of them occurred at the intersection of Peachtree Parkway and Peachtree Corners Circle. Of the 14 crashes reported at the Forum's major driveway nine were angle crashes, and six of the eight QuikTrip reported crashes at the Forum's minor driveway/ QuikTrip driveway were angle crashes. One of these reported angle crashes involved a bicyclist, who was seriously injured. Because angle crashes cause the greatest number of fatalities and injuries of all crash types, safety improvements are a high priority in this intersection control study.

3.2 Five-Year Crash History on Peachtree Corners Circle between the Forum's Major Driveway and Peachtree Parkway

Crash data was obtained along Peachtree Corners Circle between the Forum's major driveway and Peachtree Parkway for the five-year period between January 1, 2017 and December 31, 2021. Preliminary data was collected from the Numetric online crash database, and crash reports were accessed through the Georgia Electronic Accident Reporting System (GEARS). An overview of the Numetric crash selection window is shown in Figure 2. Crashes that occurred on private property were not considered in this analysis, and crashes at Peachtree Parkway were only included if they occurred on Peachtree Corners Circle between its intersections with the Forum minor driveway and Peachtree Parkway.



Figure 2: Five-Year Crash Selection Window (2017-2021)

Crash records were validated and reviewed using crash reports obtained through the GEARS database. Crashes are defined using the KABCO rating scale to describe the severity of crashes that result in an injury. The categories of crash severity are K-Fatal, A-Suspected Serious Injury, B-Suspected Minor/Visible Injury, C-Possible Injury/Complaint, O-No Injury. Approximately 69% of the crashes reported in the area were property damage only, and just one crash resulted in a suspected serious injury. Table 1 summarizes the total crashes (36) based on the KABCO crash severity scale.

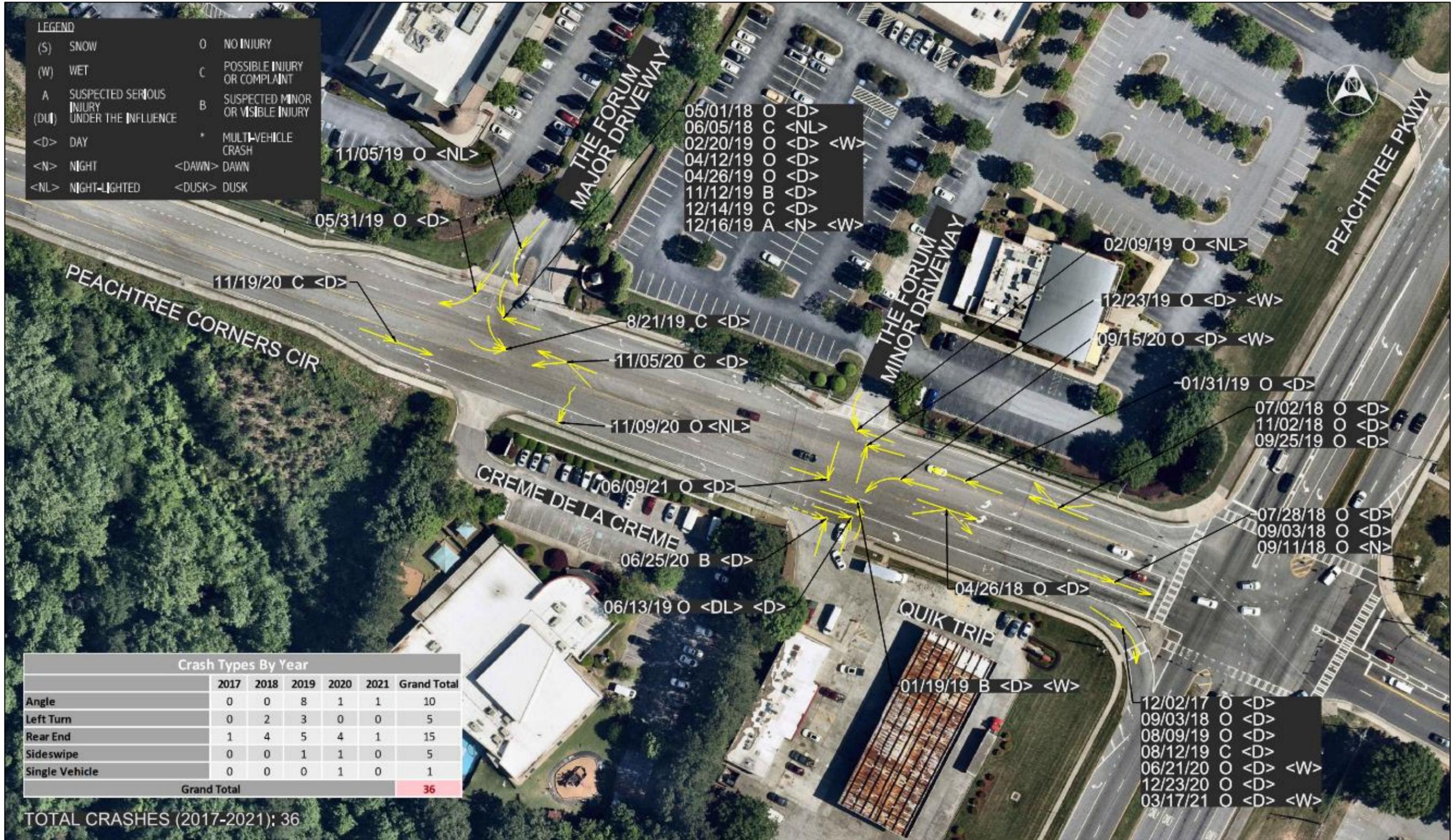


Figure 3: Crash History 2017 - 2021

3.3 Drone Video Footage and Conflict Analysis

A drone video recording was taken in 15-to-20-minute intervals between 8:40 AM to 10:00 AM to capture morning traffic, 11:20 AM to 1:00 PM for midday traffic, and 4:50 PM to 6:20 PM for evening traffic. The video was uploaded and processed using TrafficSurvey AERIAL- the DataFromSky cloud-based video-analytics software. TrafficSurvey analyses use AI (artificial intelligence) and video image processing (pixel tracking) to develop a traffic log of all vehicles as well as their speeds, accelerations, and trajectories. The traffic log also records driver behavior patterns, near-misses, and collision risks within the provided scope. Figure 4 and Figure 5 provide illustrations of pixel tracking and traffic patterns documented along the Peachtree Corners Circle corridor. Upon careful inspection, lane changes, weaving and conflict patterns were noted.

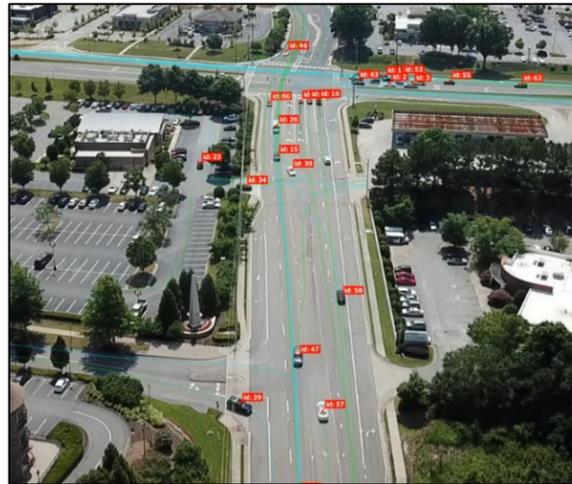


Figure 4: Data from Sky Pixel Tracking Overview

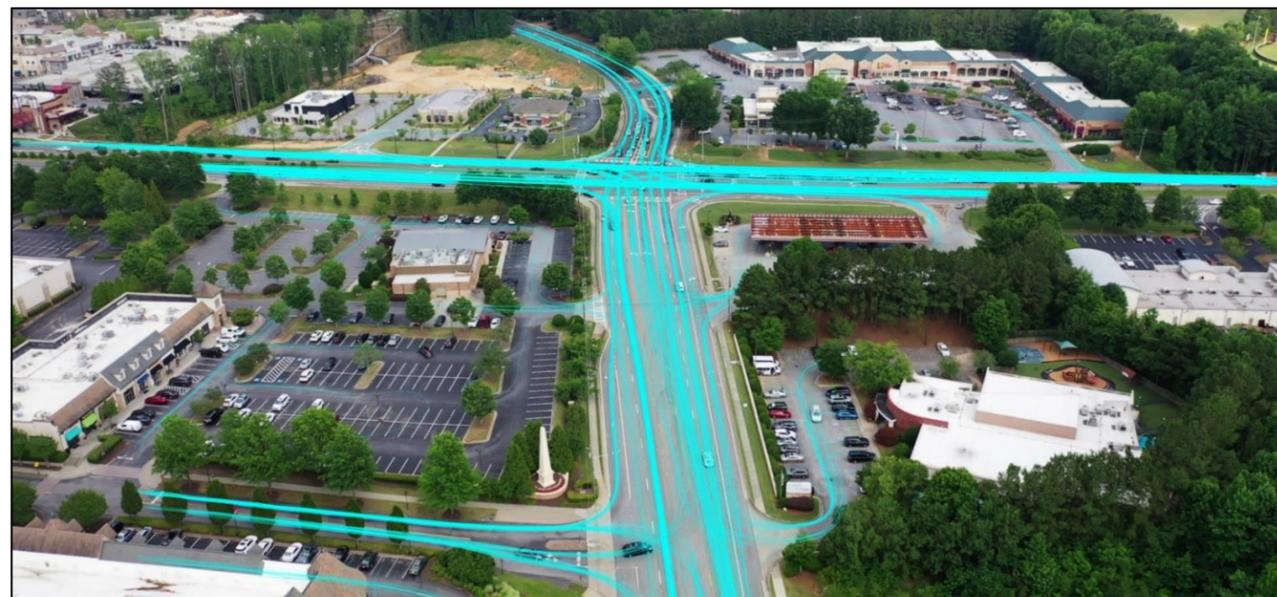


Figure 5: Data from Sky Traffic Pattern Overview

3.3.1 Driveway Left Turn Assessment

Left turns from driveways were analyzed to assess the impacts and benefits of a raised median along Peachtree Corners Circle between the Forum's major driveway and Peachtree Parkway. A raised median would restrict all left and through movements from the QuikTrip driveway and the Forum's minor driveway, resulting in a right-in/ right out scenario for each. The addition of a raised median would eliminate all but one of the reported crashes between 2017 to 2021 at the intersection of Peachtree Corners Circle at the QuikTrip driveway and the Forum minor driveway. The remaining crash was an angle crash with a vehicle exiting QuikTrip right-turn striking a bicyclist.

Table 3: The Forum Minor Driveway Left Turn Assessment

The Forum Minor Driveway Left Turn Assessment			
	Left Turns	Total Vehicles	Left Turns (%)
AM	3	7	43%
MID-DAY	17	29	59%
PM	7	23	30%
TOTAL	27	59	46%

Table 3 presents the results of the left turn assessment at the Forum's minor driveway. Across all observed hours, the driveway had a total of 59 vehicles exiting onto Peachtree Corners Circle. Of the 59 vehicles, 27 turned left out of the driveway.

Table 4: QuikTrip Driveway Left Turn Assessment

QuikTrip Driveway Left Turn Assessment			
	Left Turns	Total Vehicles	Left Turns (%)
AM	34	143	24%
MID-DAY	28	155	18%
PM	27	156	17%
TOTAL	89	454	20%

Table 4 presents the results of the left turn assessment at the QuikTrip driveway. Across all observed hours, the driveway had a total of 454 vehicles exiting to Peachtree Corners Circle. Of the 454 vehicles, 89 turned left out of the driveway.

The video tracking analysis revealed that most of these left turns were directly linked to conflicts. Further evaluation demonstrated that 42% of left turning vehicles from the QuikTrip driveway perform stepwise left turns utilizing the two-way left turn lane. Approximately 19% of the observed lefts from the Forum's minor driveway utilized the two-way left turn lane before proceeding through onto Peachtree Corners Circle westbound. Additional conflicts associated with the two driveways include line of sight distance deficiency to the Parkway and near misses when performing left-turns.

The access evaluation shows ample evidence that although the minor driveway volumes are not heavy, there is sufficient basis to recommend restricting the two accesses to right-in and right-out movements. In Section 3.7 an expanded examination of the alternatives for access are compared and contrasted.

3.3.2 Left Turn Weaving Assessment

Video tracking was used to quantify the number of northbound vehicles turning left from Peachtree Parkway that weaved into the right lane to enter the Forum's major driveway. This assessment was performed to identify existing weaving conflicts and better understand how they will translate to the recommended improvements. Figure 6 below illustrates the movement captured by video tracking.

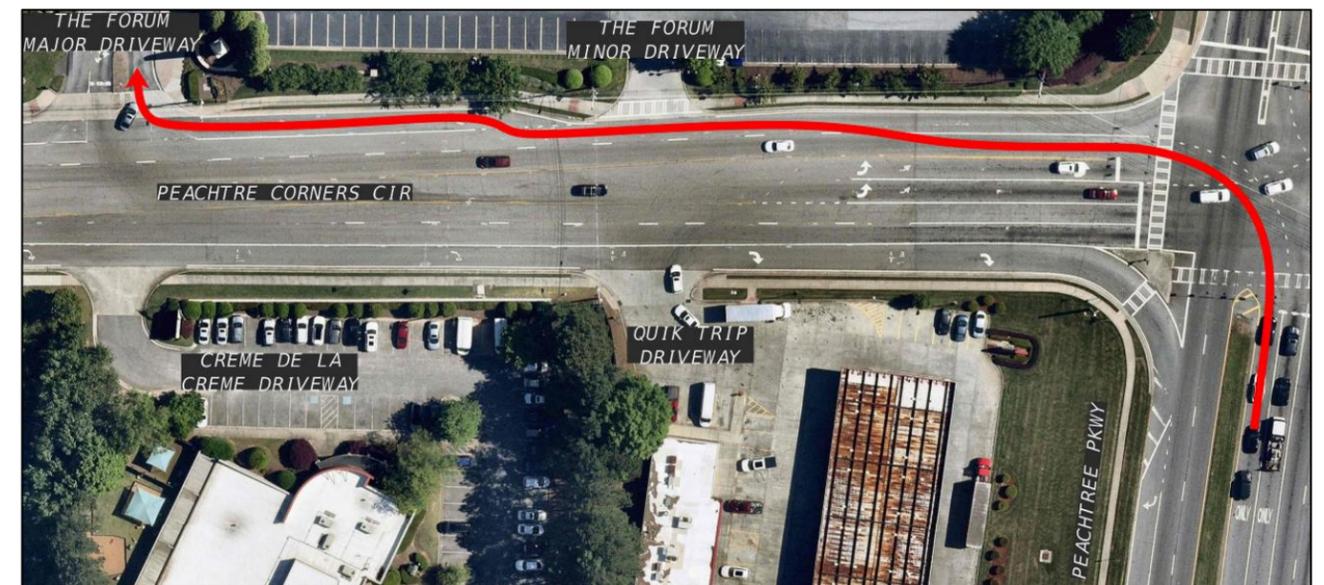


Figure 6: Northbound Peachtree Parkway Left Turn Weaving Maneuver

Table 5: Peachtree Parkway Left Turn Weaving Statistics

Northbound Peachtree Parkway Left Turns Weaving Movement Trends			
	Total Left Turns	Weaving Maneuvers	Weaving (%)
AM	103	0	0%
MID-DAY	171	8	5%
PM	111	3	3%
TOTAL	385	11	3%

Table 5 presents the total number of weaving maneuvers as a percentage of the left turns from Peachtree Parkway for all observed hours. There were 11 weaving movements (3%) out of a total of 385 left turns. Because drivers are pre-selecting the correct left-turn lanes to reach the Forum efficiently, the current lane configuration is proving to be reasonable for any recommended alternative.

3.3.1 Westbound Peachtree Corners Circle Lane Utilization

Table 6: Peachtree Parkway Left-Turn Weaving Statistics

Westbound Peachtree Corners Circle Lane Utilization			
	Total Westbound Vehicles	Right Through Lane (%)	Left Through Lane (%)
AM	473	7%	93%
MID-DAY	506	5%	95%
PM	481	8%	92%
TOTAL	1460	7%	93%

Existing conditions at the intersection of Peachtree Corners Circle at the Forum's Major Driveway and Crème de la Crème include two westbound through lanes and a westbound right-turn only lane. Video analytics were used to observe westbound lane utilization as it approaches the subject intersection (See Table 6). Downstream of the intersection, the right/through lane ends, and

drivers are required to merge to the left. Because drivers expect this termination, they are merging prior to passing the Forum's major driveway.

The results of the lane utilization assessment confirm that drivers are familiar with the existing lane configurations and are successfully merging left before they reach the Forum's Major Driveway and Crème de la Crème. This assessment in conjunction with the crash analysis results, which show no indication of severe conflict patterns, confirms that for the purpose of lane continuity, two westbound through lanes are not required at the Forum driveway. The conversion of the existing right/through lane to a right-turn only lane would not significantly affect current driver behavior or expectations.

Table 7: Existing Through Speed Analysis – Peachtree Corners Circle

Existing Through Speed Analysis		
	Westbound Through Vehicles	Eastbound Through Vehicles
Average	36mph	38mph
85 th Percentile	45mph	43mph

3.3.2 Existing Speed Analysis

A speed evaluation was undertaken using the data from sky pixel tracking technology to determine the average and 85th percentile speeds of vehicles traveling past the Forum's major driveway along Peachtree Corners Circle. The results of this speed analysis are shown in Table 7.

3.4 Existing Traffic Volume (Previous Study – 2021)

Jacobs performed a roundabout traffic study for Peachtree Corners Circle at the Forum and Crème de la Crème. Turning movement counts were collected by Traffic Data Services on December 9, 2021. Counts were also collected at the intersection of Peachtree Corners Circle and Peachtree Parkway.

Figure 7 and Figure 8 summarize the AM and PM peak hour turning movement counts for Peachtree Corners Circle at the Forum and Crème de la Crème. Figure 9 and Figure 10 summarize the AM and PM peak hour turning movement counts for Peachtree Corners Circle at Peachtree Parkway. Counts were not collected at the Forum's minor driveway or the QuikTrip driveway.

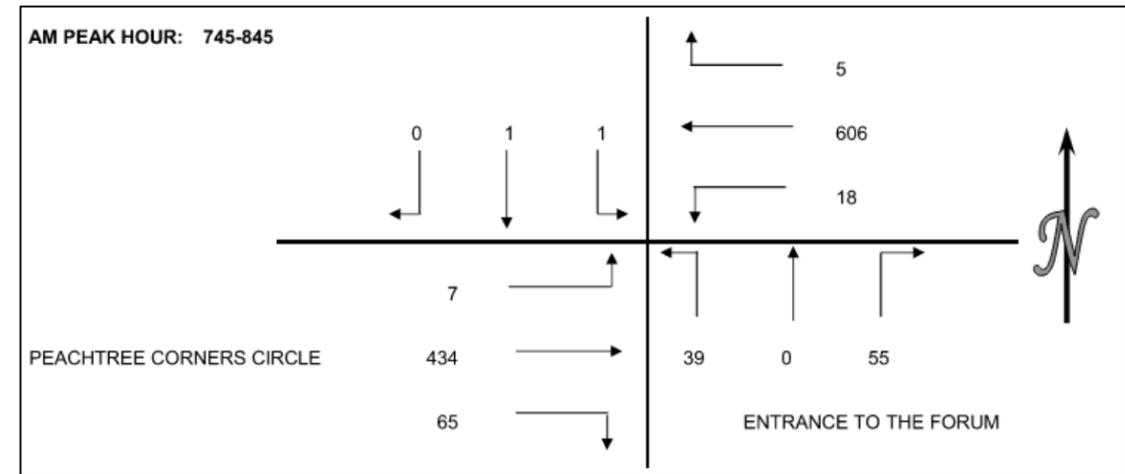


Figure 7: Previous Study – Peachtree Corners Circle at The Forum and Crème de la Crème – 2021 AM Peak Hour

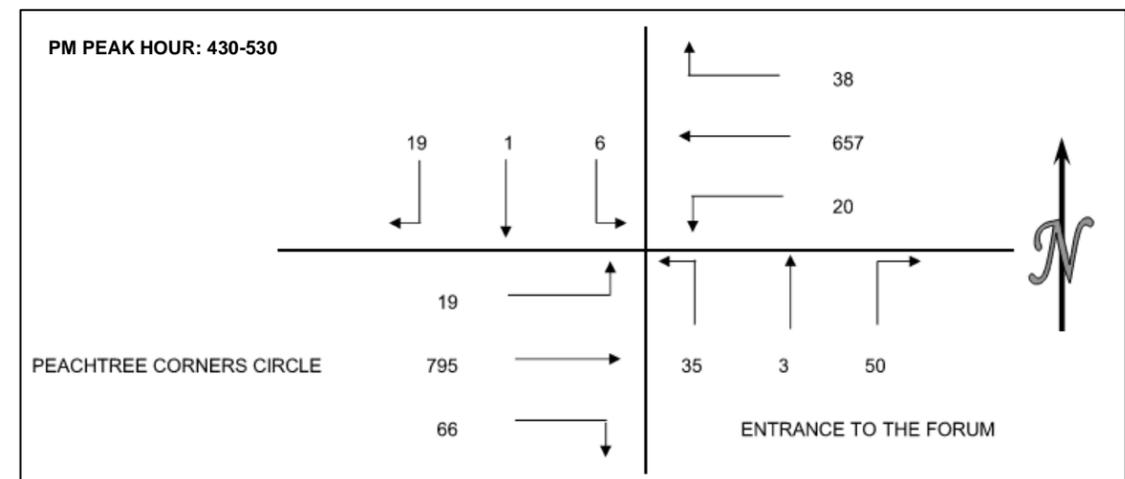


Figure 8: Previous Study – Peachtree Corners Circle at The Forum and Crème de la Crème – 2021 PM Peak Hour

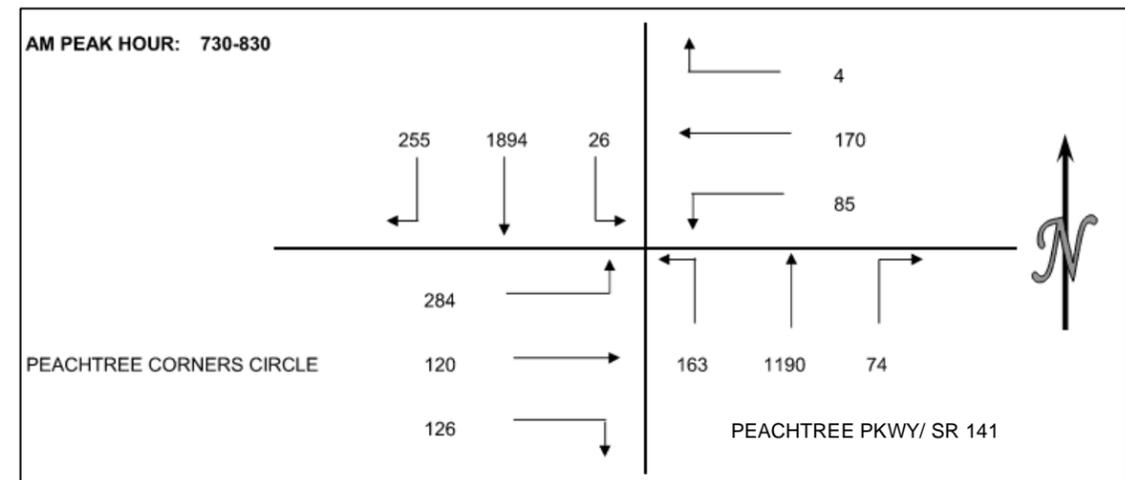


Figure 9: Previous Study – Peachtree Corners Circle at Peachtree Parkway – 2021 AM Peak Hour

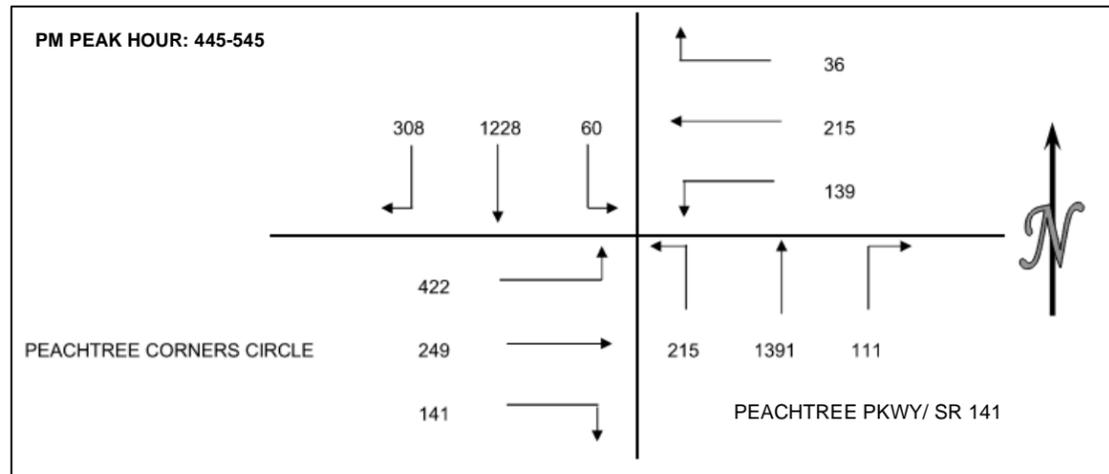


Figure 10: Previous Study – Peachtree Corners Circle at Peachtree Parkway – 2021 PM Peak Hour

3.5 Supplemental Traffic Volume Data (*Streetlight*)

Streetlight is a web-based traffic data service that sources vehicle digital location signatures for automakers. The capture rate is >90% of the vehicles on U.S. roads and is virtually instantaneous. *Streetlight* data was obtained using 10 unique zones encompassing all three intersections and the three links between them. The zones were analyzed to obtain Origin-Destination (OD) data, which was interpreted to develop turning movement counts at each intersection. The origin and destination zones are illustrated in Figure 11.

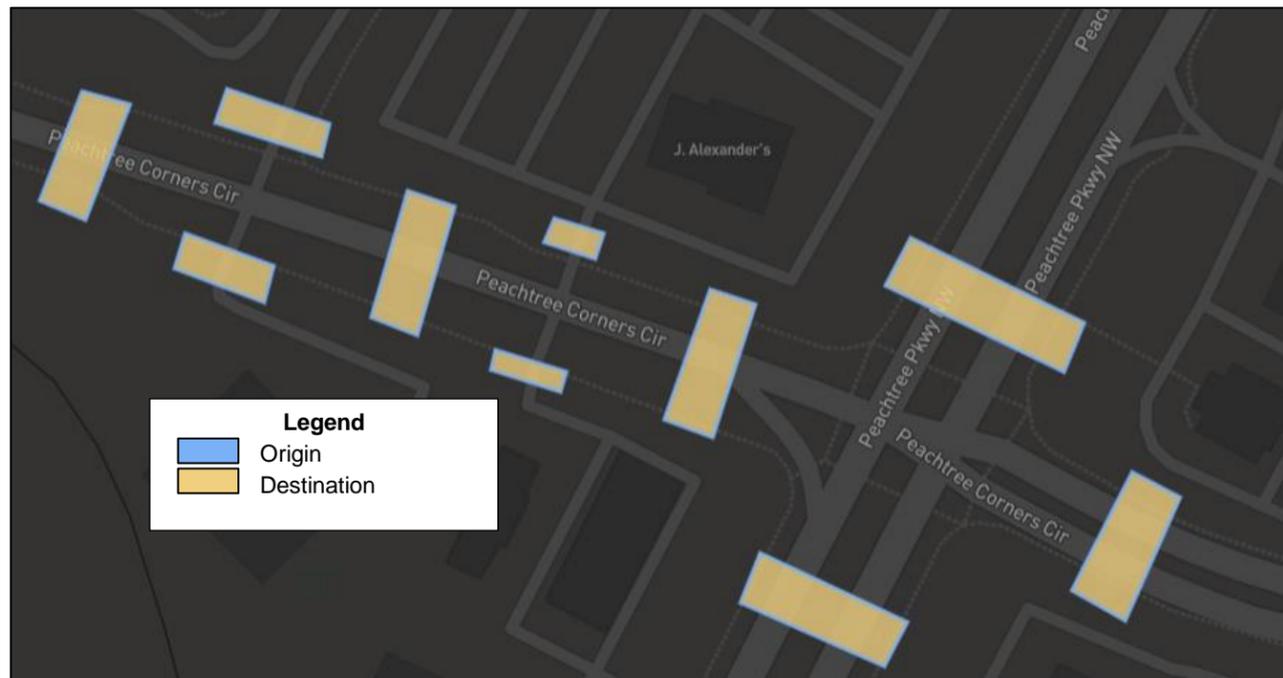


Figure 11: Origin-Destination Analysis Zones

Because *Streetlight* uses digital location services, some smaller driveways are not readily available. Such was the case for the Crème de la Crème driveway. To refine the collected *Streetlight* data, 2021 All Traffic Data Services turning movements into and out of the Crème de la Crème driveway were used in the Kimley-Horn analyses.

The *Streetlight* Origin-Destination data was most recently available for the year 2021. However, due to the social impacts of COVID-19, 2019 traffic data was utilized for the analyses. OD data was evaluated by analyzing data from 10 unique zones, shown in Figure 11, during March, April, and May of 2019 on typical weekdays (Tuesday, Wednesday, Thursday) for all times of day. Peak hours were identified at the intersection of Peachtree Corners Circle at the Forum's major driveway and Crème de la Crème and applied to the remaining intersections. The OD analysis

was performed to quantify the trips (all vehicle types) that passed through each selected origin zone to all selected destination zones. Zones were broken into the three main intersections. Average turning movement counts for 2019 AM and PM peak hours are shown in Figure 12 and Figure 13.

AM PEAK: 7:15-8:15	FORUM MAJOR DRIVEWAY			FORUM MINOR DRIVEWAY			PEACHTREE PKWY		
	PEACHTREE CORNERS CIR	8	1	3	6	2	6	381	2360
PEACHTREE CORNERS CIR	16	618	18	18	616	22	200	122	137
PEACHTREE CORNERS CIR	11	469	65	2	423	40	77	861	40
PEACHTREE CORNERS CIR	39	0	55	12	0	22			
	CRÈME DE LA CRÈME DRIVEWAY			QT DRIVEWAY			PT PKWY		

Figure 12: Peachtree Corners Circle Corridor AM Peak Hour Turning Movements (2019)

PM PEAK: 17:15-18:15	FORUM MAJOR DRIVEWAY			FORUM MINOR DRIVEWAY			PEACHTREE PKWY		
	PEACHTREE CORNERS CIR	66	1	30	17	5	27	273	1001
PEACHTREE CORNERS CIR	48	490	20	86	511	18	521	267	90
PEACHTREE CORNERS CIR	139	829	66	28	785	46	199	1508	70
PEACHTREE CORNERS CIR	35	3	50	12	3	30			
	CRÈME DE LA CRÈME DRIVEWAY			QT DRIVEWAY			PEACHTREE PKWY		

Figure 13: Peachtree Corners Circle Corridor PM Peak Hour Turning Movements (2019)

3.6 Existing Conditions Analysis Results

SimTraffic microsimulation software within *Synchro 11* was used to analyze the network of 3 intersections along Peachtree Corners Circle, during the AM and PM peak hours. The simulation seeding settings are detailed in Figure 14. Reports for *SimTraffic* are included in Appendix B.

SimTraffic Parameters			
Vehicles	Drivers	Intervals	Data Options
	0	1	
Interval Name	Seeding	Recording	—
Start time (hhmm)	07:00 A	07:30 A	—
Duration (min)	30	60	—
Record Statistics	No	Yes	—
Growth Factor Adjust	No	No	—
PHF Adjust	No	Yes	—
AntiPHF Adjust	Yes	No	—
Percentile Adjust	No	No	—
Percentile Adjust (%ile)	—	—	—
Timing Plan ID	—	—	—
Random Number Seed: 1			

Figure 14: *SimTraffic* Parameters

Five (5) runs for each scenario were performed and the averages of these results are summarized in the table below:

Table 8: No-Build (Existing Conditions) Network Delay

	Base Year 2024		Design Year 2044	
	AM Peak	PM Peak	AM Peak	PM Peak
Total Network Delay (sec/veh)	54.5	86.5	57.5	92.6

Note: There is no LOS assignment for network delay. The existing conditions network delay was later compared to the network delay of the alternatives to provide a direct measurement of anticipated improvement.

3.7 Driveway Access Considerations

Existing conditions provide full access to both the Forum’s minor driveway and the QuikTrip. These conditions, as evaluated in Section 3.3, result in driver confusion, crash risks, sight distance issues, and illegal stepwise left turns. For all proposed Improvements, a raised median should be considered to reduce both access and safety risks at the two driveways. To evaluate the effectiveness of a proposed raised median, three alternative scenarios are reviewed based on the access provided to the driveways and the safety risks or benefits of each. The three alternatives include:

1. A raised median with right-in/ right-out conditions at each driveway (Figure 16)
2. A raised median with a break to provide full access to each driveway (Figure 17)
3. No build/ preservation of existing conditions (Figure 18)

An overview of each alternative with access or safety pros and cons are provided below in Table 9 and shown on Figure 16 to Figure 18. Based on the examination of safety factors and trade-offs, the recommended access configuration is the divided roadway with right-in/ right-out access for the two minor driveways near the Parkway. The sub-sections that follow provide a full explanation of the pros and cons of each alternative.

Table 9: Access and Safety Evaluation at QuikTrip and The Forum’s Major Driveway

Access and Safety Evaluation at QuikTrip and The Forum’s Major Driveway				
	Access	Access Comments	Safety	Safety Comments
Right-In/ Right-Out	✓	<ul style="list-style-type: none"> ➢ Restricted left turns at driveways ➢ Westbound left-turns can utilize U-turn at intersection with the Forum’s major driveway ➢ Reduces some left turn storage at Peachtree Parkway 	✓✓✓	<ul style="list-style-type: none"> ➢ No sight distance interferences ➢ No crossing distances ➢ Elimination of left-turn conflicts
Median with Break*	✓✓	<ul style="list-style-type: none"> ➢ Full access to/ from driveways ➢ Single maneuver left turns with extended decision times (Con due to inadequate sight) ➢ Reduces additional left turn storage at Peachtree Parkway 	✓	<ul style="list-style-type: none"> ➢ Poor sightline to conflicting westbound traffic ➢ Minimum of 46-ft crossing distance and no stepwise lefts (Con)
No Build*	✓✓✓	<ul style="list-style-type: none"> ➢ Full access to/ from driveways ➢ Illegal stepwise left turns persist ➢ Preserves left turn capacity at Peachtree Parkway 	✓✓	<ul style="list-style-type: none"> ➢ Poor Sightline to conflicting westbound traffic ➢ Approximately 34’ crossing distance ➢ Driver confusion, stepwise lefts and increased crash risks ➢ Risk for weaving maneuvers approaching the roundabout

*Despite the preceding safety arguments for a median break or a no build condition, GDOT does not typically approve an unrestricted driveway near a major intersection.

3.7.1 Right-In/ Right-Out (Figure 16)

A raised median alternative with right-in/ right-out conditions at each driveway provides the least access but the most safety benefits. The trade-offs are reduced by the creation of U-turn opportunities at the roundabout. Drivers are only required to utilize gaps from one direction along Peachtree Corners Circle and do not have a significant crossing distance when turning right out of the driveways. Additionally, sight distance considerations are only required to the driver’s left when turning right out of one of the driveways. The addition of a median reduces some of this left turn capacity at the Parkway (eastbound lefts). Figure 16 illustrates the right-in/ right-out raised median alternative as it applies to the QuikTrip driveway.

The raised median condition provides the least amount of direct access, but the restricted turns may be mitigated with U-turns at the proposed roundabout or at Peachtree Parkway. Larger trucks wishing to turn left out of the QuikTrip driveway may utilize the station’s east exit along Peachtree Parkway and U-turn as shown in Figure 15 below.

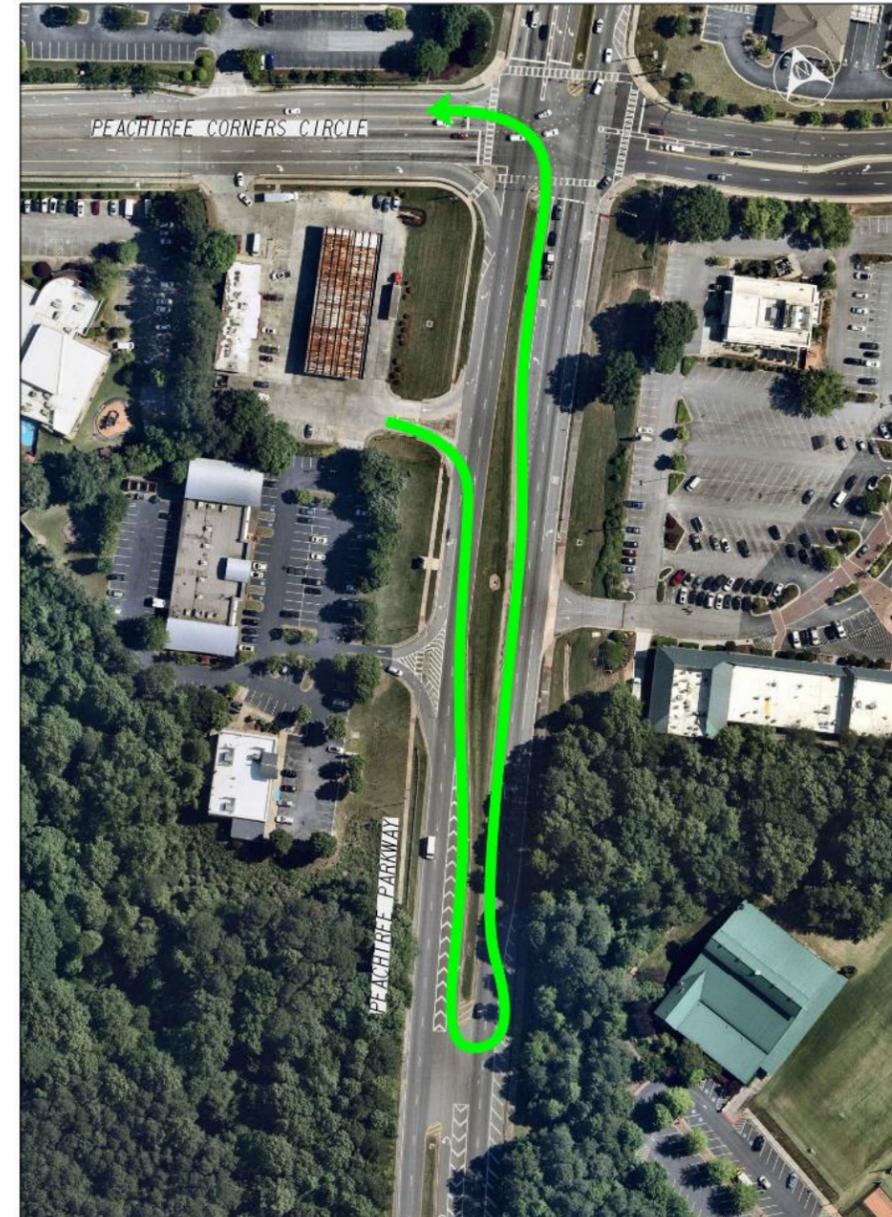


Figure 15: Non-Passenger Vehicle Route for Right-In/ Right Out Driveway Access

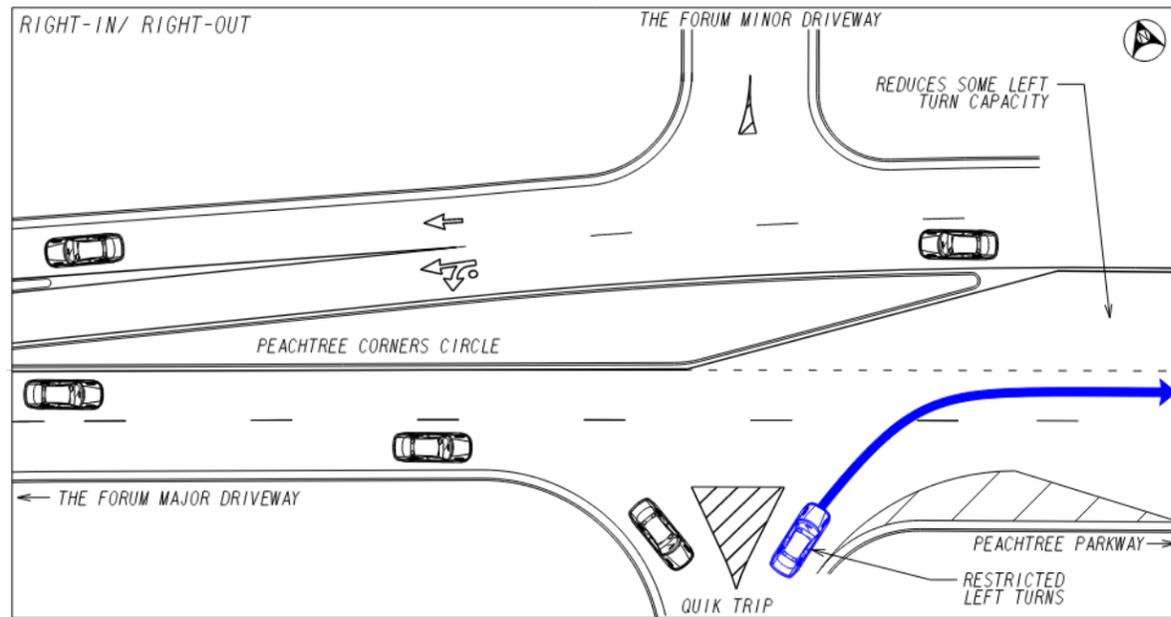


Figure 16: Peachtree Corners Circle - Raised Median with Right-In/ Right-Out Driveway Access

3.7.2 Median with Break (Figure 17)

A raised median with a break for driveway access allows vehicles exiting The Forum or QuikTrip to turn left, turn right, or continue through to the opposite driveway. It also permits vehicles along Peachtree Corners Circle to turn left into the desired driveways. This condition provides a moderate amount of access but has hidden safety issues. Drivers exiting either driveway must evaluate gaps in both eastbound and westbound traffic along Peachtree Corners Circle. The existing seven-lane cross section is approximately 84-ft wide at the driveway access which, in conjunction with the existing grade along Peachtree Corners Circle, creates sight distance deficiencies at each driveway approach. Drivers may reduce this crossing width to approximately 46-ft by utilizing the median break as a refuge, but this condition risks interference with eastbound and westbound traffic if left turning vehicles obstruct through lanes. To avoid using the break as a refuge, left turners must navigate across three or four lanes of conflicting traffic to make a single maneuver left turn. This condition is less safe than utilizing the existing two-way left turn lane for stepwise left turns.

The incorporation of a median break also reduces the storage length the eastbound left turn lanes approaching Peachtree Parkway from Peachtree Corners Circle by approximately 40-ft when compared to the right-in/ right-out alternative. Reducing the left turn storage length will reduce capacity and cause any overflow of vehicles to block both the through lanes and the median break between the Forum's minor driveway and the QuikTrip. Figure 17 illustrates the raised median with a break for driveway access as it applies to the QuikTrip driveway.

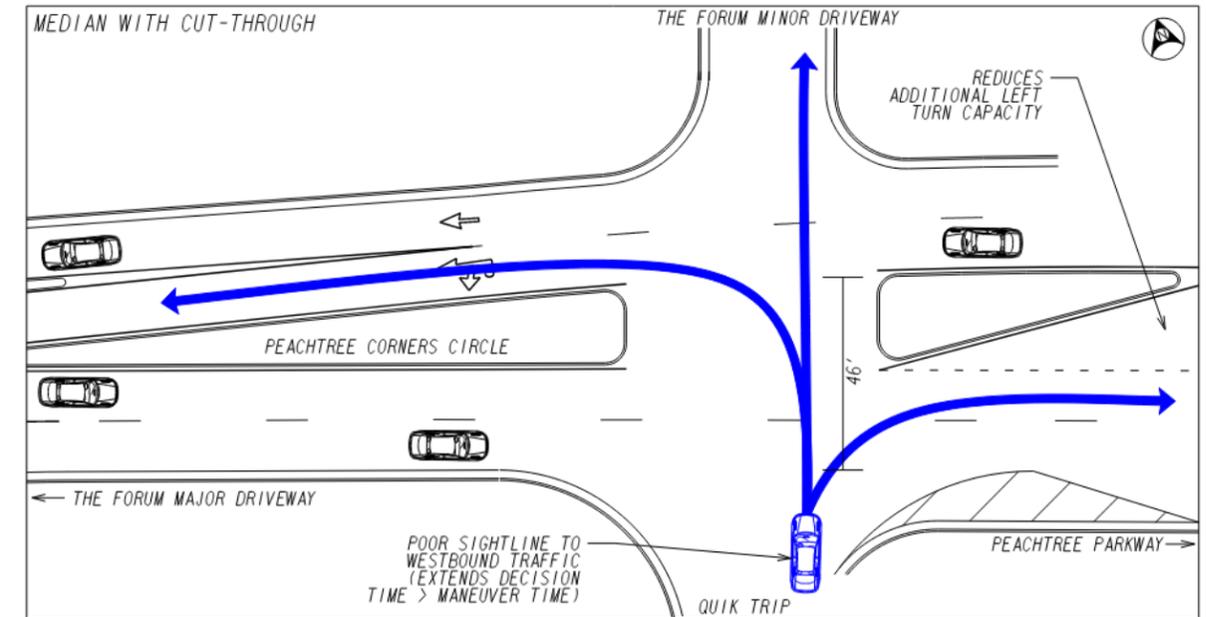


Figure 17: Peachtree Corners Circle - Raised Median with Cut-Through Driveway Access

3.7.3 No Build (Figure 18)

The do-nothing alternative, which does not include a raised median, maintains existing conditions at each driveway. This condition allows vehicles exiting The Forum or QuikTrip to turn left, turn right, or continue through to the opposite driveway. Left turns from the driveway will utilize the existing two-way left turn lane to perform illegal stepwise left turns onto Peachtree Corners Circle. It also permits vehicles along Peachtree Corners Circle to turn left into the desired driveways. This condition has all existing conflicts mentioned in Section 3.3.1 plus an increased risk of weaving maneuvers for stepwise left-turners out of the QuikTrip driveway. Figure 18 illustrates the full-access and pavement marking condition as it applies to the QuikTrip driveway.

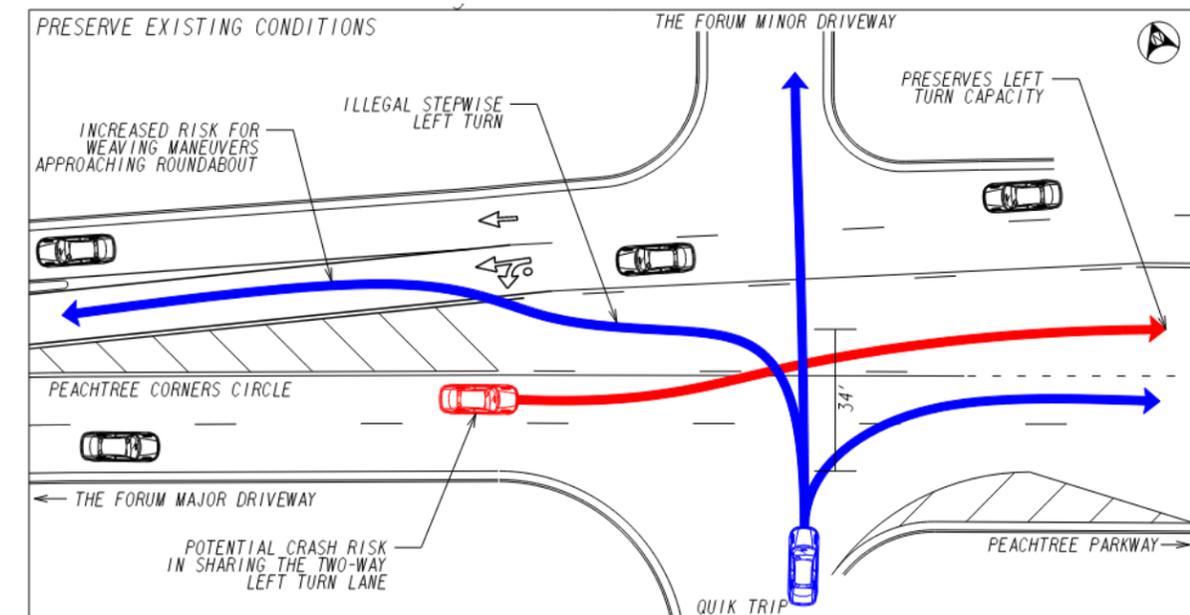


Figure 18: Peachtree Corners Circle - No Raised Median with Full Driveway Access

4.0 Intersection Control Evaluation (ICE)

Intersection Control Evaluation (ICE) procedures, as set out by GDOT, represent a traceable and transparent procedure to streamline the evaluation of intersection control alternatives and to leverage the safety and congestion reduction benefits of intersection improvements. The GDOT ICE Tool v2.22 was used to evaluate the most reasonable and practical alternatives for the intersection of Peachtree Corners Circle at The Forum's major driveway and Crème de la Crème: a multilane roundabout, a single lane roundabout, and a signalized intersection. RCUTs (restricted crossing U-turns) and median U-turns (indirect lefts) were also considered but did not prove to be practical solutions for the intersection. ICE procedure is broken down into two stages: Screening and Alternative Selection.



4.1 ICE Stage 1: Screening

Stage 1 is used to eliminate non-competitive improvement alternatives and progresses only the most practical solutions worthy of further evaluation in Stage 2. Each alternative was evaluated based on a series of “yes” or “no” questions which were each given due consideration and evaluated using engineering judgement.

Many of the Stage 1 intersection alternatives were rejected based on the need and context of the project. Solutions, such as Right-in/out and an Reduced conflict U-Turn (RCUT) with median U-turns, were rejected based on the real and perceived impact to the existing land uses and the absence of benefit to Peachtree Corners Circle, given the high rate of speed affecting inbound and exiting traffic, even with restriction to outbound lefts. These solutions would restrict access to a major traffic generator, the Forum. The goal of the project is to provide a safer alternative to current conditions while maintaining access to the Forum and the Crème de la Crème daycare driveways. The RCUT and median U-turn options displace turning movements to other minor intersections and eliminates the availability of existing left-turns that those developments depend upon. This also creates more circuitous site circulation. Given the scale of the development and its mixed-use nature, it is unreasonable to restrict full movements at a key point of access.

4.2 ICE Stage 2: Alternative Selection

Stage 2 of the GDOT ICE Tool utilizes various inputs to rank the remaining control type alternatives. These inputs include construction costs, operational analysis results, and crash history as documented in the following sections.

After evaluating the results of the operational analyses, costs and crash reduction benefits, a roundabout was favored, but the single lane roundabout was found to not satisfy the decision criteria and is not reported in Stage 2 of the ICE procedure (see Appendix G). A roundabout will mitigate the high operating speeds in the vicinity of the driveways while not degrading capacity for all users. The options carried into stage 2 were: roundabouts, single lane and multilane; and, a signalized intersection.

Three short-listed alternatives were considered to improve safety and operations throughout the Peachtree Corners Circle corridor at the Forum/La Crème accesses. They include: a single roundabout, a multilane roundabout, and a signalized intersection. Each alternative is coupled with a median dividing Peachtree Corners Circle to restrict access to the QuikTrip and minor Forum driveway. Each feasible alternative was compared using the GDOT Intersection. Concept designs are found in Appendix C.

In the sections that follow the short-listed alternatives were compared on the basis of safety, capacity and cost and to a lesser degree environmental considerations. Safety and cost benefits for the multilane roundabout shows a final ICE Stage 2 score of 7.4, and an ICE Stage 2 score of 6.5 for the signalized intersection, despite the signal warrants not being met. Based on these scores, the GDOT ICE Tool indicates that a multilane roundabout is the preferred intersection control alternative. The GDOT ICE Tool v2.22 decision record is viewable in Appendix G.

4.2.1 Single Lane Roundabout (Exhibit 2.1)

A single lane roundabout alternative for the intersection of Peachtree Corners Circle at The Forum's Major Driveway and the Crème de la Crème driveway includes a westbound right-turn bypass lane from the east leg of Peachtree Corners Circle. The roundabout ICD (inscribed circle diameter) measures a very compact 102-ft. Entry widths vary from 12-ft to 19-ft and the circulating width is 18-ft. The truck apron is 11-ft and a landscaped central island is provided with a 45-ft diameter. The eastbound exit widens from one lane to two lanes just before the QuikTrip driveway, using the existing lane configuration. GDOT standard mountable raised dividers are provided on the westbound approach to channelize the right turn lane and provide the minimum required speed control for westbound through traffic. Figure 19 provides an overview of the proposed alternative.



Figure 19: Schematic of a Single Lane Roundabout at the Forum Driveway

4.2.2 Multilane Roundabout (Exhibit 2.2)

A multi lane roundabout alternative for the intersection of Peachtree Corners Circle at The Forum's Major Driveway and the Crème de la Crème driveway includes two through lanes for the east and west legs of Peachtree Corners Circle. The roundabout has two different ICDs which measure 90-ft and 102-ft. Entry widths vary from 12-ft to 15-ft and the circulating width is 18-ft for single lanes circulating and 12-ft per lane for two lanes circulating. The two circulating lanes are separated by 2-ft buffers. The truck apron is 7.5-ft, and a landscaped central island is provided with a 33-ft diameter. The west leg of Peachtree Corners Circle flares from 1 to 2 lanes as it approaches the roundabout. The westbound exit lane merges from 2 to 1 lane as it exits the roundabout, using the existing lane configuration.

GDOT standard mountable raised dividers are provided for eastbound and westbound approaches to provide the maximum required speed control for a multilane roundabout. 2-ft striped buffers within the circle should be supplemented with rumble strips. Additional speed control may be necessary in the future. This can be retrofitted with the addition of raised dividers between circulating lanes. Figure 20 provides an overview of the proposed alternative.

Later in the report we discuss the steep grade of Peachtree Corners and how it affects the passage of trucks on the low side of the circle. Additional signage, e.g., W1-13L (truck rollover warning), with an advisory speed tab of 10mph. It is not unusual to tip the circle of a roundabout. There are several examples in the Atlanta area where the low side of the circle, the side where a steep cross slope affects truck stability, has been graded at greater than 2%. One site in Lilburn has a cross slope of 8%, which defies guidelines yet has not generated any truck rollovers. Nevertheless, that aspect of design is given added attention in this study. See Exhibit 2.2.A for design vehicle turning movements and Exhibit 2.2.A for fastest paths.

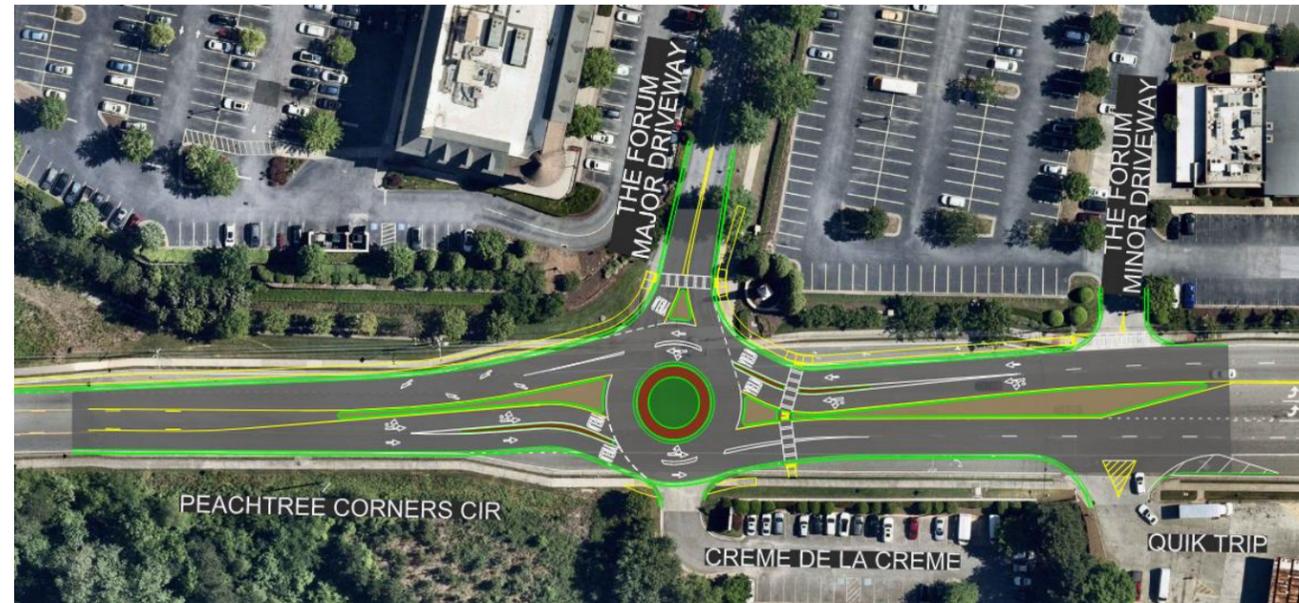


Figure 20: Schematic of a Multilane Roundabout at the Forum Driveway

4.2.3 Signalized Intersection (Exhibit 2.3)

A signalized alternative for the intersection of Peachtree Corners Circle at the Forum's Major Driveway and the Crème de la Crème driveway predominantly utilizes the existing conditions. Medians are included on the east and west legs to restrict left-turns at the Forum's minor driveway and the QuikTrip driveway. Medians restricting access/egress are also included for left turns from Peachtree Corners Circle at the signalized intersection. The signalized alternative provides four westbound lanes – two through lanes, a right-turn lane, and a left-turn lane. It also includes three westbound lanes – one through lane, one left-turn lane, and one right-turn lane. The Forum's major driveway and the Crème de la Crème driveway match the existing lane configurations, but the Forum's driveway median and stop bar extend farther into the intersection. Figure 21 on the following page provides an overview of the proposed alternative.

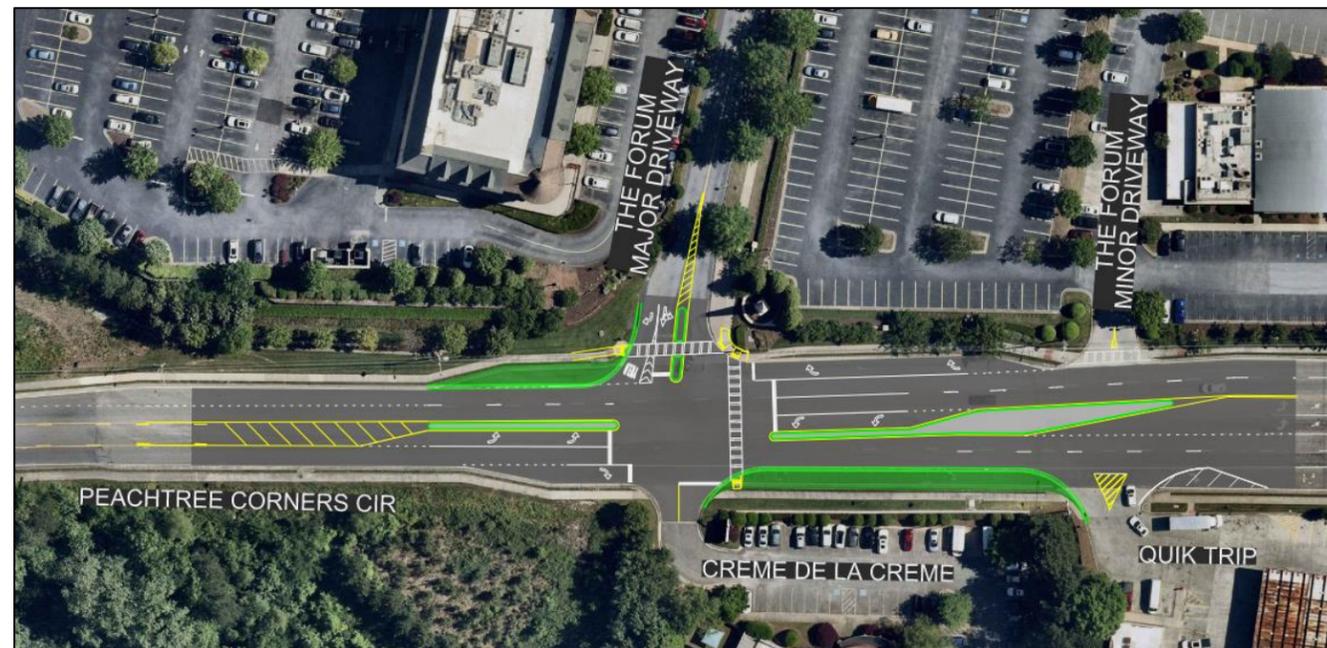


Figure 21: Schematic of Traffic Signal Control at the Forum Driveway

5.0 Operational Evaluation of Alternatives and Improvements

5.1 Traffic Forecasting

The GDOT count station data (TADA) in the area showed an historical growth rate of 1.5%. We chose to lower that to 1% after running several scenarios and noticing that the future traffic exceeds the link capacity of Peachtree Corners Circle, i.e., that much traffic growth requires four lanes for the whole corridor, which is unrealistic.

The Forum site is an existing shopping center with approximately 415,350 SF of retail and 99,050 SF of office. As currently envisioned, this block of commercial development will ultimately include approximately 380 multifamily units (multi-story) and a hotel. A sizeable proportion of the new development traffic will be internalized, either site-linked trips or captive trips. The proposed Forum redevelopment is projected to generate 211 AM peak hour trips, and 214 PM peak hour trips. An additional 250 multifamily units (multi-story) development is projected to generate 102 AM peak hour project trips, and 101 PM peak hour project trips. New trips will be oriented toward the three (3) east frontage driveways on the Parkway and the north driveway onto E. Jones Bridge Road. New development traffic growth assigned to the south Forum driveways was accounted for with the compound growth factor applied to the driveways and Peachtree Corners Circle.

5.2 Single Lane Roundabout

Two different models were used to find the expected queues and delays for a single lane roundabout: the GDOT Roundabout Analysis Tool (v4.2) and ARCADY10 (Assessment of Roundabout Capacity and Delay, version 10). The GDOT Roundabout Analysis Tool is based on the Highway Capacity Manual 2010 Edition and 6th Edition Methodologies, NCHRP Report 672, and the FHWA's Roundabout Informational Guide. ARCADY 10 is a program based on U.K. empirical research into geometry-capacity relationships. Two features that ARCADY provides are its ability to consider horizontal geometric design sensitivity and its ability to be calibrated. The combination of using ARCADY with calibration allows for consideration of the U.S. data and horizontal geometric design sensitivity. Queue, delay, and level of service (LOS) is reported for each leg and the intersection. *SimTraffic* microsimulation software within *Synchro 11* was also used to assess total network delay and LOS.

Roundabout traffic volumes are illustrated in Figure 22 and were projected from the supplemental counts for 2019, using a 1.0% compound growth rate to generate 2024 (base year) and 2044 (20 year) traffic estimations.

Left turning vehicles from the Forum's minor driveway and from Peachtree Corners Circle turning into the minor driveway were rerouted to the Forum's major driveway. These traffic modifications are reflected in Figure 22.

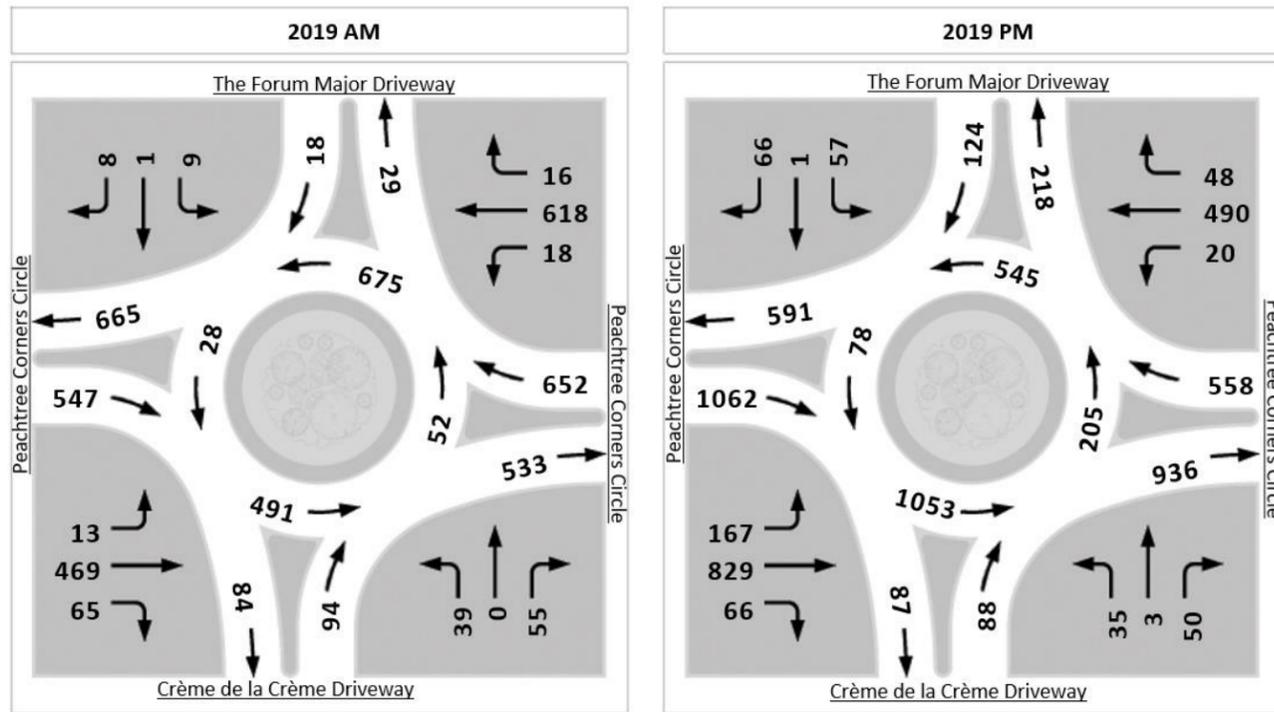


Figure 22: 2019 AM & PM Peak Hour Roundabout Volume Diagram

5.2.1 Single Lane Roundabout Analysis Results

The operational analysis results for a single lane roundabout indicate that the west leg (eastbound) will not have sufficient capacity for the current and future traffic demands. Table 10 provides results from the GDOT Roundabout Tool for a single lane roundabout. Table 11 provides results from ARCADY. GDOT Roundabout Tool reports are found in Appendix D, and ARCADY Roundabout analysis reports are shown in Appendix E.

Table 10: Single Lane Roundabout Configuration - GDOT Roundabout Analysis Tool Results

GDOT Roundabout Analysis Tool - AM & PM Peak Hour Single Lane Roundabout Analysis Results						
2024		North Leg The Forum	West Leg Peachtree Corners Cir	South Leg Crème de la Creme	East Leg Peachtree Corners Cir	Intersection
AM Peak Hour	DELAY (s)	6.3	7.6	6.2	9.4	8.4
	LOS	A	A	A	B	A
PM Peak Hour	DELAY (s)	7.3	41.3	13.5	10.1	28.6
	LOS	A	E	B	A	D
2044		North Leg The Forum	West Leg Peachtree Corners Cir	South Leg Crème de la Creme	East Leg Peachtree Corners Cir	Intersection
AM Peak Hour	DELAY (s)	7.3	9.0	7.2	11.8	10.2
	LOS	A	A	A	B	B
PM Peak Hour	DELAY (s)	8.9	100.2	19.7	13.5	46.8
	LOS	A	F	C	B	F

Table 11 : Single Lane Roundabout Configuration - ARCADY 10 Results

ARCADY 10 - AM & PM Peak Hour Single Lane Roundabout Analysis Results						
2024		North Leg The Forum	West Leg Peachtree Corners Cir	South Leg Crème de la Creme	East Leg Peachtree Corners Cir	Intersection
AM Peak Hour	DELAY (s)	5.1	7.0	4.9	8.9	7.8
	LOS	A	A	A	A	A
PM Peak Hour	DELAY (s)	5.4	155.9	8.0	7.9	93.5
	LOS	A	F	A	A	F
2044		North Leg The Forum	West Leg Peachtree Corners Cir	South Leg Crème de la Creme	East Leg Peachtree Corners Cir	Intersection
AM Peak Hour	DELAY (s)	3.6	8.6	5.3	12.3	10.2
	LOS	A	A	A	B	B
PM Peak Hour	DELAY (s)	3.7	628.3	8.5	9.9	367.9
	LOS	A	F	A	A	F

5.3 Multilane Roundabout

Two different models were used to find the expected queues and delays for a multilane roundabout: the GDOT Roundabout Analysis Tool (v4.2) and ARCADY10 (Assessment of Roundabout Capacity and Delay, version 10). Queue, delay, and level of service (LOS) is reported for each leg and the intersection. *SimTraffic* microsimulation software within *Synchro 11* was also used to assess total network delay and LOS. Roundabout traffic volumes for 2019 are illustrated in Figure 22 on the previous page. These volumes were projected using a 1.0% compound growth rate to generate 2024 (base year) and 2044 (20 year) traffic estimations.

5.3.1 Multilane Roundabout Analysis Results

Table 12 provides results from the GDOT Roundabout Tool for a single lane roundabout and Table 13 provides results from ARCADY 10. Results indicate that adding the second eastbound lane to the west leg of Peachtree Corners Circle at the Forum driveway resolves the short- and long-term capacity deficiency and matches up with the current lane configuration best. GDOT Roundabout Tool and ARCADY Roundabout analysis reports are shown in Appendix D and Appendix E.

Table 12: Multilane Roundabout Configuration - GDOT Roundabout Analysis Tool Results

GDOT Roundabout Analysis Tool - AM & PM Peak Hour Multilane Roundabout Analysis Results						
2024		North Leg The Forum	West Leg Peachtree Corners Cir	South Leg Crème de la Creme	East Leg Peachtree Corners Cir	Intersection
AM Peak Hour	DELAY (s)	5.3	4.6	6.2	5.2	5.0
	LOS	A	A	A	A	A
PM Peak Hour	DELAY (s)	6.2	8.1	10.2	6.1	7.4
	LOS	A	A	B	A	A
2044		North Leg The Forum	West Leg Peachtree Corners Cir	South Leg Crème de la Creme	East Leg Peachtree Corners Cir	Intersection
AM Peak Hour	DELAY (s)	6.0	5.0	7.2	5.8	5.6
	LOS	A	A	A	A	A
PM Peak Hour	DELAY (s)	7.3	9.7	13.4	6.9	8.9
	LOS	A	A	B	A	A

Table 13: Multilane Roundabout Configuration - ARCADY 10 Results

ARCADY 10 - AM & PM Peak Hour Multilane Roundabout Analysis Results						
2024		North Leg The Forum	West Leg Peachtree Corners Cir	South Leg Crème de la Crème	East Leg Peachtree Corners Cir	Intersection
AM Peak Hour	DELAY (s)	5.1	3.1	4.9	2.4	2.9
	LOS	A	A	A	A	A
PM Peak Hour	DELAY (s)	5.4	6.5	9.0	2.5	5.3
	LOS	A	A	A	A	A
2044		North Leg The Forum	West Leg Peachtree Corners Cir	South Leg Crème de la Crème	East Leg Peachtree Corners Cir	Intersection
AM Peak Hour	DELAY (s)	5.7	3.4	5.4	2.6	3.2
	LOS	A	A	A	A	A
PM Peak Hour	DELAY (s)	6.1	9.9	12.6	2.7	7.6
	LOS	A	A	B	A	A

5.4 Signalized Intersection

5.4.1 Signal Warrant Analysis

The Federal highway Administration's (FHWA) *Manual of Uniform Traffic Control Devices (MUTCD)* specifies 9 signal warrants. Existing conditions warranted a signal based on crash history. No other signal warrants were met (See Figure 23).

Warrant 1 – Eight-Hour Vehicular Volume: **Not Met**

Warrant 1 includes two conditions. Condition A - the Minimum Vehicular Volume - requires a high volume of intersecting traffic between both the minor and major streets. The major street (Peachtree Corners Cir) meets the required volume for all 8 hours, but the minor road (The Forum's minor driveway) does not meet the minimum for any of the 8 hours.

Condition B - Interruption of Continuous Traffic - requires a heavy volume along the main road. The minor roadway may have a lower volume so long as the main roadway meets the minimum volume as established by Warrant 1, Condition B. Peachtree Corners Circle does not meet this minimum for any eight hours, so this warrant is not met.

Warrant 1 also includes a combination alternative for Condition A and Condition B. For each of any 8 hours, conditions A and B must both be met, but the combination uses a reduced threshold for each condition. The Forum's major driveway does not meet the minimum for any of the 8 hours.

The MUTCD calls for engineering judgment to determine the effects of right turns on the minor road. Because the minor road includes a right-turn-only lane, they were removed from the analysis. See Figure 23 on the following page for more details.

Warrant 2 – Four-Hour Vehicular Volume: **Not Met**

Figure 4C-1 from Section 4C.03 from the MUTCD provides a graph based on both major and minor approach hourly volumes and lane configurations. The minimum threshold was not met for this warrant for any of the 4 hours.

Warrant 3 – Peak-Hour Volume: **Not Met**

Warrant 3 requires conditions such that for 1 hour the minor street traffic is impeded by heavy volumes on the major road, causing extreme delay. Figure 4C-3 from Section 4C.04 from the MUTCD provides a graph based on both major and minor approach hourly volumes and lane configurations. The minimum threshold was not met during any peak hours.

Warrant 4 – Pedestrian Volume: **Not Met**

The pedestrian Volume warrant requires a minimum of 107 pedestrians per hour to warrant a signal. The intersection does not meet this minimum for any hour of the day.

Warrant 5 – School Crossing: **Not Met**

There are no substantial school crossings present at the intersection.

Warrant 6 – Coordinated Signal System: **Not Met**

The Coordinated Signal System was not considered because the spacing of traffic control signals would be less than the MUTCD minimum required distance of 1,000-ft.

Warrant 7 – Crash Experience: **Met**

The crash experience warrant requires 5 or more crashes involving types susceptible to correction by a traffic control signal to occur within a 12-month period. In 2019, nine crashes occurred at the intersection of Peachtree Corners Circle at the Forum's major driveway and Crème de la Crème. Seven of the nine reported crashes were angle type crashes.

Warrant 8 – Roadway Network: **Not Met**

The Roadway network warrant is used when the implementation of a signal encourages concentration and organization on a roadway network. This warrant was not considered.

Warrant 9 – Intersection Near a Grade Crossing: **Not Met**

No railroads are present near the subject intersection. This warrant was not considered.

5.4.2 Signalized Intersection Analysis Methodology

Based on the traffic signal warrants, a traffic signal is not warranted. However, in order to compare to the roundabout options, a traffic signal was considered. The intersection was modeled with the lane configuration shown in Concept 2.3. Additionally, the eastbound and westbound left-turns were modeled under protected-permissive phasing (Flashing Yellow Arrow), with leading left-turns during the AM and PM peak hours. Because this is an off-system route, GDOT standards of warranting a dedicated left-turn phase were not performed.

The intersection of Peachtree Parkway (SR 141) at Peachtree Corners Circle currently operates with a cycle length of 160 seconds in the AM and PM peak hours. To coordinate the proposed signal with a signal at the Forum driveway, the study intersection was also modeled with a 160 second cycle length as well as a half-cycled, 80 seconds. The half-cycled model was considered to investigate the possible increase in efficiency because the side-street would run more often, and queues would be theoretically shorter. A potential drawback to half-cycling would be the inability to cover the pedestrian crossing times without taking the signalized system out of coordination for a brief period. To conservatively model this, the half-cycle intersection was set to "Pedestrian Recall" and an assumption of 5 pedestrian calls per hour was used. This setting ensures that pedestrians would be given sufficient time to cross the street.

TRAFFIC SIGNAL VOLUME WARRANT ANALYSIS - Existing Conditions

Based on 2009 MUTCD

Remove RT			Yes	Yes	WARRANT 1, Condition A			WARRANT 1, Condition B			WARRANT 1, Combination Warrant						WARRANT 2	WARRANT 3
			EB+WB	SB	MAJOR STREET	MINOR STREET	BOTH MET	MAJOR STREET	MINOR STREET	BOTH MET	CONDITION A			CONDITION B				
THRESHOLD VALUES			PEACHTREE CORNERS CIR	THE FORUM MAJOR DRIVEWAY							MAJOR STREET	MINOR STREET	BOTH MET	MAJOR STREET	MINOR STREET	BOTH MET		
			600	150				900	75		480	120		720	60			
06:00 AM	TO	07:00 AM	459	0														
07:00 AM	TO	08:00 AM	982	1	Y			Y			Y			Y				
08:00 AM	TO	09:00 AM	917	5	Y			Y			Y			Y				
09:00 AM	TO	10:00 AM	733	11	Y						Y			Y				
10:00 AM	TO	11:00 AM	566	21							Y							
11:00 AM	TO	12:00 PM	715	33	Y						Y							
12:00 PM	TO	01:00 PM	893	47	Y						Y			Y				
01:00 PM	TO	02:00 PM	780	52	Y						Y			Y				
02:00 PM	TO	03:00 PM	843	47	Y						Y			Y				
03:00 PM	TO	04:00 PM	923	40	Y			Y			Y			Y				
04:00 PM	TO	05:00 PM	1,219	41	Y			Y			Y			Y				
05:00 PM	TO	06:00 PM	1,435	32	Y			Y			Y			Y				
06:00 PM	TO	07:00 PM	1,165	32	Y			Y			Y			Y				
			11,630	362			0			0			0			0	0	
					8 HOURS NEEDED			8 HOURS NEEDED			8 HOURS OF BOTH CONDITION A AND CONDITION B NEEDED						4 HRS NEEDED	1 HRS NEEDED
					NOT SATISFIED			NOT SATISFIED			NOT SATISFIED						NOT SATISFIED	NOT SATISFIED

Figure 23: Peachtree Corners Circle/Forum Major Driveway - Signal Warrants 1 and 2

5.4.1 Signalized Intersection Analysis Results

Table 14 provides HCM 6th Edition results from the 160-second cycle signalized intersection analysis. The results of the 160-second cycle length show that the signal is projected to operate acceptably during the AM and PM peak hours under Base Year 2024 and Design Year 2044 conditions.

Design Year 2044 conditions are due to an increase in the mainline volume to the eastbound and westbound approaches that are operating efficiently under Base Year 2024 conditions. An increase in volume to an efficient movement causes the approaches to operate more efficiently, and results in a decrease in delay. It can also be observed that the side-street approaches experience an increase in delay. This explains why the 2024 west leg LOS is lower than the 2044 results.

Table 14: HCM 6th Results for Signalized Intersection (160-second Cycle)

HCM 6th - AM & PM Peak Hour						
160-Second Cycle -Signalized Intersection Analysis Results						
2024		North Leg The Forum	West Leg Peachtree Corners Cir	South Leg Crème de la Creme	East Leg Peachtree Corners Cir	Intersection
AM Peak Hour	DELAY (s)	14.1	55.8	15.2	24.3	36.6
	LOS	B	E	B	C	D
PM Peak Hour	DELAY (s)	35.7	38.5	38.2	1.9	27.1
	LOS	D	D	D	A	C
2044		North Leg The Forum	West Leg Peachtree Corners Cir	South Leg Crème de la Creme	East Leg Peachtree Corners Cir	Intersection
AM Peak Hour	DELAY (s)	17.7	51.5	19.3	16.9	31.5
	LOS	B	D	B	B	C
PM Peak Hour	DELAY (s)	47.4	34	54.2	1.3	26.0
	LOS	D	C	D	A	C

The results of the 160-second cycle length show that the signal is projected to operate acceptably during the AM and PM peak hours under Base Year 2024 and Design Year 2044 conditions. The improved LOS evident observed under

Table 15: HCM 6th Edition Results for Signalized Intersection (80-second Cycle)

HCM 6th - AM & PM Peak Hour						
80-Second Cycle - Signalized Intersection Analysis Results						
2024		North Leg The Forum	West Leg Peachtree Corners Cir	South Leg Crème de la Creme	East Leg Peachtree Corners Cir	Intersection
AM Peak Hour	DELAY (s)	11.2	28.5	12.2	30.1	27.9
	LOS	B	C	B	C	C
PM Peak Hour	DELAY (s)	22.5	29.9	23.1	22	26.6
	LOS	C	C	C	C	C
2044		North Leg The Forum	West Leg Peachtree Corners Cir	South Leg Crème de la Creme	East Leg Peachtree Corners Cir	Intersection
AM Peak Hour	DELAY (s)	13.5	27.6	14.9	28.8	27.1
	LOS	B	C	B	C	C
PM Peak Hour	DELAY (s)	24.3	57.6	25.2	17.5	41.6
	LOS	C	E	C	B	D

The results of the half 80-second cycle are summarized in Table 15 above. Similarly, a half-cycled (80-second) cycle length is projected to operate acceptably during the AM and PM peak hours under the Base Year 2024 and Design Year 2044 conditions.

5.5 System Considerations

For the multilane roundabout and signalized intersection alternatives, *SimTraffic* microsimulation software within *Synchro 11* was used to analyze the network of 3 intersections along Peachtree Corners Circle, during the AM and PM peak hours. Reports for each alternative's *SimTraffic* results are included in Appendix F.

5.5.1 Multilane Roundabout

Based on the concept layout, the multilane roundabout was analyzed in a system context with the adjacent signalized and unsignalized intersections. The adjacent unsignalized intersection was modified to a right-in/right-out, per the concept, and traffic was rerouted accordingly. There are no anticipated changes to the intersection of Peachtree Parkway (SR 141) at Peachtree Corners Circle. The results of the network analysis are summarized in the table below:

Table 16: Multilane RAB Network Delay

Multilane Roundabout & Existing Conditions Total Network Delay				
	Base Year 2024		Design Year 2044	
	AM Peak	PM Peak	AM Peak	PM Peak
Proposed Roundabout and Adjacent Intersections Total Network Delay (Sec/Veh)	55.3	76.0	57.9	78.3
Existing Conditions Total Network Delay (sec/veh)	54.5	86.5	57.5	92.6

Overall, the network delay generally decreases during the PM when compared to the no-build scenario for all times of day. A negligible increase in delay during the AM was observed due to the mainline operating as free flow under existing conditions and being modified to a controlled approach. Ultimately, the side-street traffic is driving the delay under no-build (existing conditions) during the PM because the left-turns need adequate gaps in mainline traffic in order to enter the system. When modeled as a multilane roundabout, this side-street traffic only yields to the traffic in the roundabout, increasing the likelihood of adequate gaps.



Figure 24: Multilane Roundabout AM Peak Queueing

The model indicates that moderate eastbound queuing is projected during the AM peak (See Figure 24). Although the queue reaches the proposed multilane roundabout, it is not projected to queue through the roundabout or otherwise affect the performance of the roundabout. The eastbound left turns at Peachtree Corners Circle at Peachtree Parkway exceed the storage length provided and spill out into the adjacent through lanes, as shown in Figure 24. Left turn lanes may be extended to provide additional storage.



Figure 25: Multilane Roundabout PM Peak Queueing

The model indicates that considerable eastbound queuing is projected during the PM peak (See Figure 25). The queue is anticipated to queue through the roundabout. However, it should be noted that the eastbound volumes are higher than the westbound volumes. This means that the southbound side-street traffic has adequate gaps and is able to enter the system, decreasing side-street delay when compared to the no-build (existing conditions). It is also important to note that default *SimTraffic* settings result in less aggressive driver behavior, meaning that eastbound traffic that ultimately turns left at the downstream signal, is not utilizing the additional through lane of the roundabout regardless of the balanced lane utilization settings at the approach. Realistically, motorist behavior will adapt to the system, which will result in more even lane distribution at the roundabout.

5.5.2 Traffic Signal

Based on the concept layout, a traffic signal was analyzed at the intersection. The adjacent unsignalized intersection was modified to a Right-In/Right-Out, per the concept, and traffic was rerouted accordingly. There were no anticipated changes to the traffic signal timings or lane configuration of Peachtree Parkway (SR 141) at Peachtree Corners Circle. The results of the network analysis are summarized in the table below:

Table 17: Traffic Signal Network Delay (160-second Cycle)

Signalized Intersection (160-Second Cycle) & Existing Conditions Total Network Delay				
	Base Year 2024		Design Year 2044	
	AM Peak	PM Peak	AM Peak	PM Peak
Alternative Traffic Signal Total Network Delay (sec/veh)	66.3	72.9	68.3	75.6
Existing Conditions Total Network Delay (sec/veh)	54.5	86.5	57.5	92.6

Overall, the network delay is projected to increase when compared to the no-build (existing conditions) scenario during the AM and decrease during the PM. An increase in delay can be expected due to the mainline operating as free-flow under existing conditions and being modified to a controlled approach. When compared to the single-lane and hybrid roundabouts, this alternative reflects an increase in delay.



Figure 26: AM Peak Hour Traffic Signal (160-second Cycle) Queue

As illustrated above, the traffic signal is projected to create queues along Peachtree Corners Circle in the eastbound and westbound directions during the AM Peak hour. Due to coordinating the system, a direct impact with the downstream signal was not observed.



Figure 27: PM Peak Hour Traffic Signal (160-second Cycle) Queue

During the PM Peak hour, side-street queuing was observed along the southbound (Forum Driveway) approach. This is likely due to the full 160-second cycle being run during this peak hour, which would indicate the side-street phases operate less frequently than the mainline. To increase efficiency of the signal and better serve the side-street traffic while minimally impacting the mainline, this intersection was modeled and observed under half-cycle conditions (80-seconds) per Table 18 results.

Table 18: Traffic Signal (80-second Cycle) Network Delay

Signalized Intersection (80-Second Cycle) & Existing Conditions Total Network Delay				
	Base Year 2024		Design Year 2044	
	AM Peak	PM Peak	AM Peak	PM Peak
Alternative Traffic Signal Total Network Delay (sec/veh)	58.6	69.5	60.2	73.6
Existing Conditions Total Network Delay (sec/veh)	54.5	86.5	57.5	92.6

Overall, the network delay is projected to increase during the AM when compared to the no-build (existing conditions) scenario. An increase in delay can be expected due to the mainline operating as free-flow under existing conditions and being modified to a controlled approach. When compared to the full cycle (160 seconds) this alternative reflects a decrease in delay during all times of day. When compared to the multilane roundabout, it shows a decrease in delay during the PM, but an increase in the AM.

No concerns due to queuing were observed for the 80 second cycle scenario therefore images from the model are not included. It should be noted that while half-cycled, the proposed signal does not create a demand-starvation scenario with the downstream intersection. The demand-starvation scenario can be described as eastbound vehicles that are stopped at the proposed traffic signal while the downstream eastbound approach is green. Additionally, half-cycling better enables the mainline traffic to not stop longer than necessary while the signal serves the side-street volumes.

5.5.3 Summary of Systems Conditions

The table below summarizes the results of the network delay for the no-build (existing conditions) scenario, the multilane roundabout, and the traffic signal. According to the Synchro modeling of the two intersections and minor driveways, the multilane roundabout would generate the least amount of delay as compared to other traffic control solutions and the existing conditions.

Table 19: Summary of Systems Conditions Analysis

Summary of All System Conditions				
	Base Year 2024		Design Year 2044	
	AM Peak	PM Peak	AM Peak	PM Peak
No-Build (Existing Conditions)	54.5	86.5	57.5	92.6
Multilane Roundabout	55.3	76.0	57.9	78.3
Traffic Signal (160-second)	66.3	72.9	68.3	75.6
Traffic Signal (80-second)	58.6	69.5	60.2	73.6

6.0 Cost Estimates

6.1 Signalized Intersection

A construction cost estimate for the signalized intersection alternative was developed in August 2022 utilizing GDOT's AASHTOWare Estimation database. The estimated cost for a signalized intersection is **\$948,000**. Because of recent trends in inflation and supply availability, construction costs are anticipated to increase by approximately 10%. Appendix G provides an itemized cost estimation for a signalized intersection.

6.2 Multilane Roundabout

A construction cost estimate for the multilane roundabout alternative was developed in August 2022 utilizing GDOT's AASHTOWare Estimation database. The estimated cost for a multilane roundabout is **\$2,425,000**. Because of recent trends in inflation and supply availability, construction costs are anticipated to increase by approximately 10% by the time construction begins. Associated grading costs are included in this total as a component of the "Grading Complete" lump sum item. Appendix G provides an itemized cost estimation for a multilane roundabout.

6.2.1 Cost-Related Considerations

Truck Stability and Road Profile Changes

The profile grade of Peachtree Corners Circle is 7.5% where the roundabout would be placed. The crash history at the Forum intersection does not indicate any past problems with truck stability under the current conditions. However, because roundabouts are more prone to truck rollovers than conventional intersections for reasons not clear yet, we have investigated the effect of the existing grades on truck stability if the intersection is converted to a roundabout.

In road design, it is assumed that the lateral force is a function of speed, circular curve radius, and superelevation. In design of roundabouts, we have some control over curve radius and superelevation, but rely on the driver to control speed according to experience and expectations. Since the driver is the most important control factor in the assessment of crash risk, designing for a margin of safety and making the driving condition predictable to match driver expectations is vitally important in designs like this, where prevailing profile grades are above normal for typical roundabouts (2% cross slope on the low side of the circle).

We undertook an investigation into the rollover factors to provide design parameters of the profile of a proposed roundabout that would have a comfortable factor of safety against truck rollover. In a recent paper on the subject, the calculation formula of the rollover threshold was derived from a theoretical model and simulation tests. For the Peachtree Corners Circle and Forum driveway location we selected a 4-axle truck with a total weight of 30 tons similar to an SU-30 that might exit the Forum driveway and make a left-turn to proceed east along Peachtree Corners Circle.

By analyzing the steering principle of the vehicle, the safe speed threshold and the limit speed threshold of the truck in a sharp turn we were able to use the model for truck stability to relate the profile of the circle to its radius and the cross-slope of the low side of the circle – the side most prone to tipping trucks.

Speed corresponding to radii were calculated according to the lateral acceleration corresponding to the rollover risk levels. The results show that when the rollover margin is reduced to about 0.15g, the truck just reaches the risk level of critical rollover. Figure 28 illustrates the truck stability model assuming a SU-30 as the design vehicle for left-turns out of the Forum driveway.

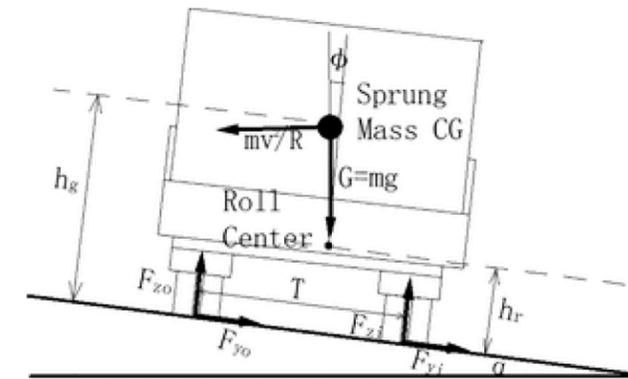


Figure 28: Truck Stability Model

(Source: Research on The Speed Thresholds of Trucks in A Sharp Turn Based on Dynamic Rollover Risk Levels, August 20, 2021 Tian Xin, Jinliang Xu , Chao Gao, Zhenhua Sun)

The results of our investigation into truck stability suggest that for a circle the size of the one proposed (102ft.), we need to have the truck turn left at a speed of 10mph or less to have a factor of safety of 0.45 against overturning, using a 4% cross slope on the low side of the circle.

For comparison, at a cross slope of 2% or normal crown the factor of safety would be 0.8 or 20% better than a grade of 3%. Using the actual intersection slope of 7.5% for the circle cross slope (low side) is feasible but has no factor of safety. A truck would be able to make a stable turn but at 10mph with no safeguard against other factors such as how the truck is loaded. Our assumption includes the possibility that the truck tracks onto the 4-inch-tall truck apron around the central island.

The implications of tipping the circle are that the intersection profile must be flattened. This adds significant cost to the project; hence, our interest to find the steepest slope of the low side of the circle that can accommodate a turning truck. The multilane roundabout will require additional grading on the east and west legs of Peachtree Corners Circle to comply with minimum grades and grade breakover rates for modern roundabout.

The substantial changes in grade to the existing roadway require full depth construction for most of the project with minor milling and inlay on far ends of each leg of the intersection. Kimley-Horn evaluated the anticipated grade change along the Peachtree Corners Circle corridor by developing a proposed construction centerline and comparing the resulting grades to Gwinnett County GIS contours.

The multilane roundabout will require additional grading on the east and west legs of Peachtree Corners Circle to comply with minimum grades and grade breakover rates for modern roundabouts. Figure 29 illustrates the multilane roundabout profile along the proposed centerline. Figure 30 provides a three-dimensional view from the proposed multilane roundabout's eastbound approach. The substantial changes in grade to the existing roadway require full depth construction for most of the project with minor milling and inlay on far ends of each leg of the intersection. Kimley-Horn evaluated the anticipated grade change along the Peachtree Corners Circle corridor by developing a proposed construction centerline and comparing proposed grades to the existing topography.

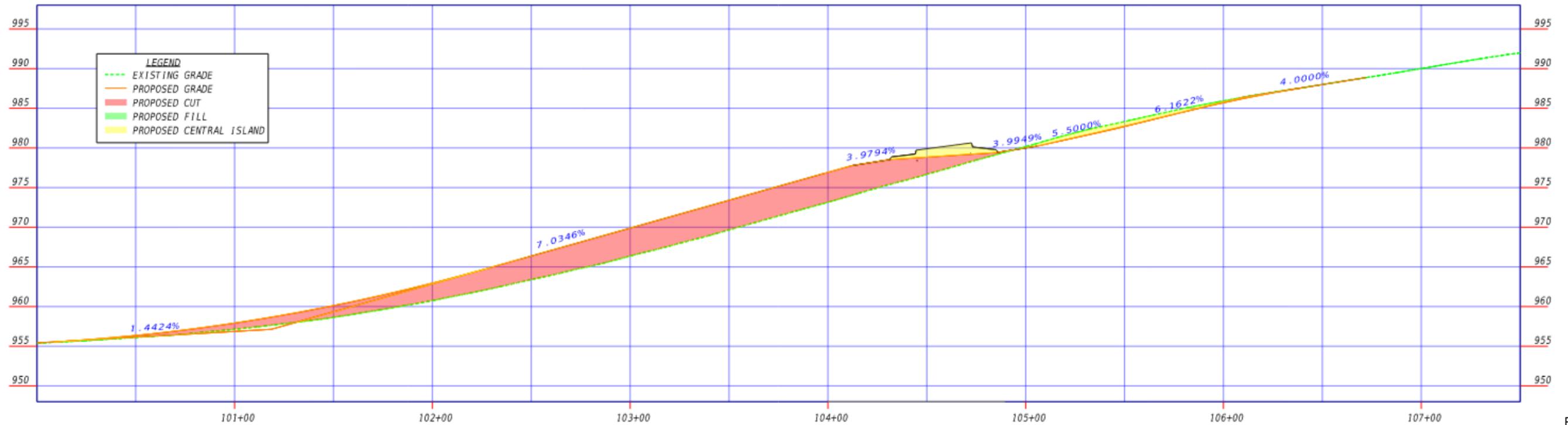


Figure 29: Multilane Roundabout Profile

Figure

Fill is required for about 494-ft and cut is required for approximately 116-ft. of Peachtree Corners Circle. This affords a maximum of 3.75-ft of fill and a maximum of 8-in of cut.

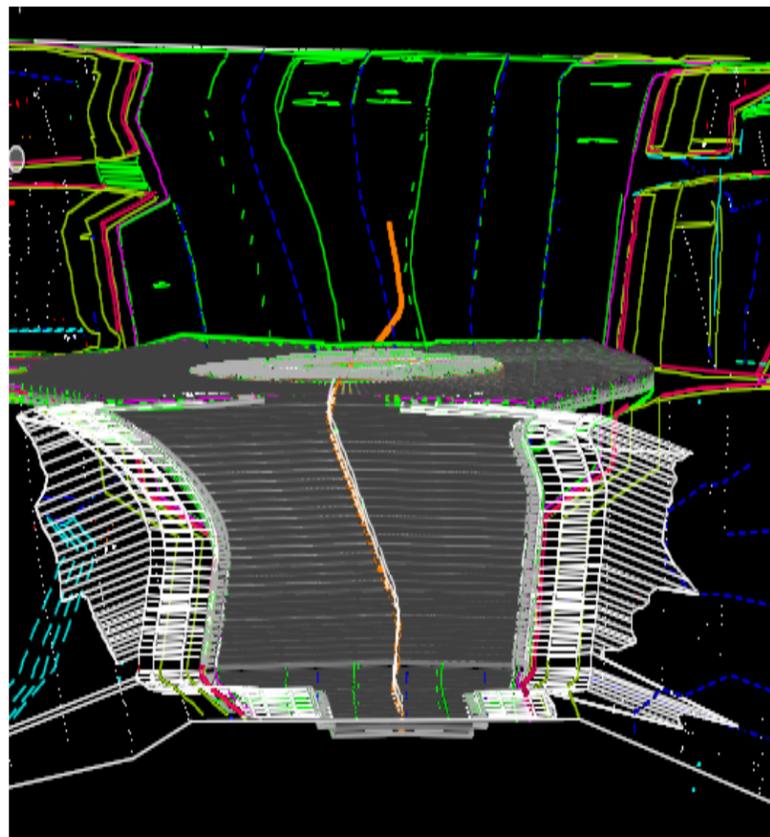


Figure 30: Multilane Roundabout Raised Circle Profile

Floodplain Considerations

Based on the location specified for end of fill (thick blue line in Figure 31), the change in profile of Peachtree Corners Circle would potentially be impacting the Future Conditions Floodplain (green in Figure 31) depending on the extents of the embankment fill. On Peachtree Corners Circle, we are not permitted to have fill in the future conditions floodplain if it causes a rise of 0.01 feet or greater. If the max fill at the roundabout is only 3-4 ft above existing, at the point where the profile grade ties back to the blue line, the necessary embankment fill would be minimal and may not impact the Future Conditions Floodplain. This will need to be confirmed in the detailed design phase of this project.

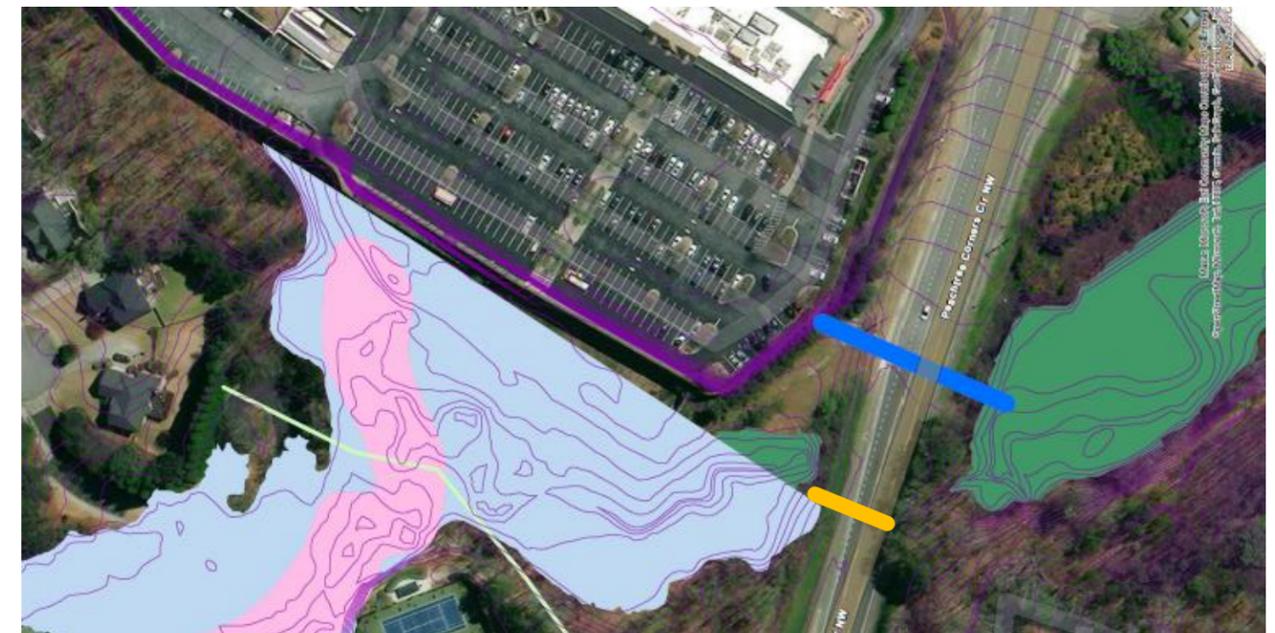


Figure 31: Future Floodplain Considerations (Blue line is the no-fill limits; Yellow line is current limit of construction)

7.0 Conclusions & Recommendations

An investigation into the type of intersection control that would be most appropriate for the Forum driveway was undertaken with sensitivity to the location context of a major nearby intersection at the Parkway, the wide cross-section of Peachtree Corners Circle midblock accesses to QuikTrip and a minor driveway to the Forum shops, and the profile of Peachtree Corners Circle. This investigation revealed the following:

- The second highest crash frequency occurred at the Forum's main driveway, where 6 crashes were caused by drivers turning left from the Forum crashing with westbound through traffic on Peachtree Corners Circle.
- The crash experience warrant requires 5 or more crashes involving types susceptible to correction by a traffic control signal to occur within a 12-month period. In 2019, 9 crashes occurred at the intersection of Peachtree Corners Circle at the Forum's major driveway and Crème de la Crème. 7 of the 9 reported crashes were angle type crashes, which are correctable by traffic signals or roundabouts.
- A conflict study sourced using video tracking showed a low degree of weaving or lane change conflicts between the Parkway and the Forum, but the wide pavement cross-section and speeds of traffic indicate a moderate risk of maintaining the existing access configuration. The two minor driveways to QuikTrip and the Forum, have sufficient conflicts within the functional area of the Parkway intersection to justify restricting movements as part of the package of improvements to the Forum's minor driveway. A further detailed examination of existing conditions and evaluating access alternatives analysis of the QuikTrip and minor Forum driveway is sufficient basis to recommend restricting those driveways to right-in/out movement in conjunction with the proposed roundabout.
- A raised median is recommended along Peachtree Corners Circle with right-in/ right-out conditions at the QuikTrip driveway and at the Forum's minor driveway. The median alternative is preferred over the do-nothing alternative, which has an increased risk of weaving maneuvers for stepwise left-turners out of the QuikTrip driveway. It is also preferred over the median with a break due to the risk of drivers utilizing the break as a refuge and the potential for turning vehicles to block eastbound and westbound traffic. The recommended raised median alternative removes sight distance interferences, crossing distances, and left-turn conflicts from each driveway.
- Operational analysis of a 2024 build year and 2044 design year traffic demands indicates a single lane roundabout, one lane entering from the west, does not provide sufficient capacity. A multilane roundabout will be required.
- A system level analysis of the Parkway traffic signal and the Forum driveway as a roundabout would have slightly less network delay compared to two traffic signals, but as a standalone intersection the Forum driveway would operate better as a roundabout. The Forum driveway traffic demands at present and in the near future do not exceed warrants for traffic signal installation.
- A multilane roundabout is recommended based on being the most practical and beneficial solution according to the evidence in this report and the GDOT Intersection Control Evaluation process that accounts for expected safety performance, operational or capacity performance and on the basis of benefits versus costs.
- The cost of constructing a roundabout at the Forum driveway is approximately \$2,425,000 and requires significant reprofiling of Peachtree Corners Circle profile to mitigate the 7.5% grade through the intersection. The effect of this may require consideration of future floodplain requirements.
- The roadway profile grade effects on a proposed roundabout can be mostly mitigated by flattening the grade of the roundabout on the low side of the roadway profile. An advisory warning sign indicating the safe turning speed for trucks making left turns out of the Forum driveway should be posted with installation of the roundabout. Although the concept design proposed has a margin of safety against overturning trucks, tipping the roundabout circle is inevitable and necessitates adding warning signs also.

The future development of the Forum warranted additional consideration for pedestrian access and safety. Pedestrians face potential multiple threat conflicts as they cross more than one lane of traffic at a time. Visually impaired pedestrians face a more complex auditory environment that may reduce the accessibility of the intersection without additional treatments. The design of a roundabout allows pedestrians to cross one direction of traffic at a time on each leg of the roundabout. This is significantly simpler than stop-controlled intersections, where pedestrians cross parallel with the major street and contend with potential conflicts in front of and behind them (e.g., major-street left and right turns). Although signalized intersections can provide indication of when pedestrians have the right-of-way (through a WALK indication), potential conflicts can come from multiple directions - left turns on green, right turns on green, right turns on red, and red-light-running vehicles.

At roundabout locations where pedestrian access is provided, pedestrians are accommodated at crosswalks around the perimeter of the roundabout. By providing space to pause on the splitter island, pedestrians can consider one direction of conflicting traffic at a time, which simplifies the task of crossing the street.

The roundabout as a traffic control solution is superior to traffic signals in all categories including benefit to cost. There is a safety case to be made for this improvement. The existing and near-term congestion of the Forum driveway is such that safety performance will continue to be low without correction using either a traffic signal or a roundabout; however, roundabouts provide superior safety performance, especially concerning injury-related crashes.

Next steps are as follows:

- Develop a more refined concept design plan including cross-sections and plan view.
- Refine the cost estimate in consideration of pavement design variables and construction staging/traffic management
- Further the investigation into possible floodplain impacts using the refined design and cross-sections to determine the fill limits more precisely.
- Engage directly affected stakeholders and present the findings to City staff and elected officials.