Kimley»Horn

MEMORANDUM

To: Adam Caracci

From: Kimley-Horn and Associates, Inc.

Date: November 4, 2020

Subject: *Drive-through Queuing Analysis at the Proposed Raising Cane's Project Located in the City of Roseville, California*

INTRODUCTION

This memorandum has been prepared to evaluate the drive-through queuing capacity of the proposed Raising Cane's restaurant located on the northeast corner of Galleria Boulevard and Creekside Road in the City of Roseville, California. The location of the proposed project is shown in Figure 1.

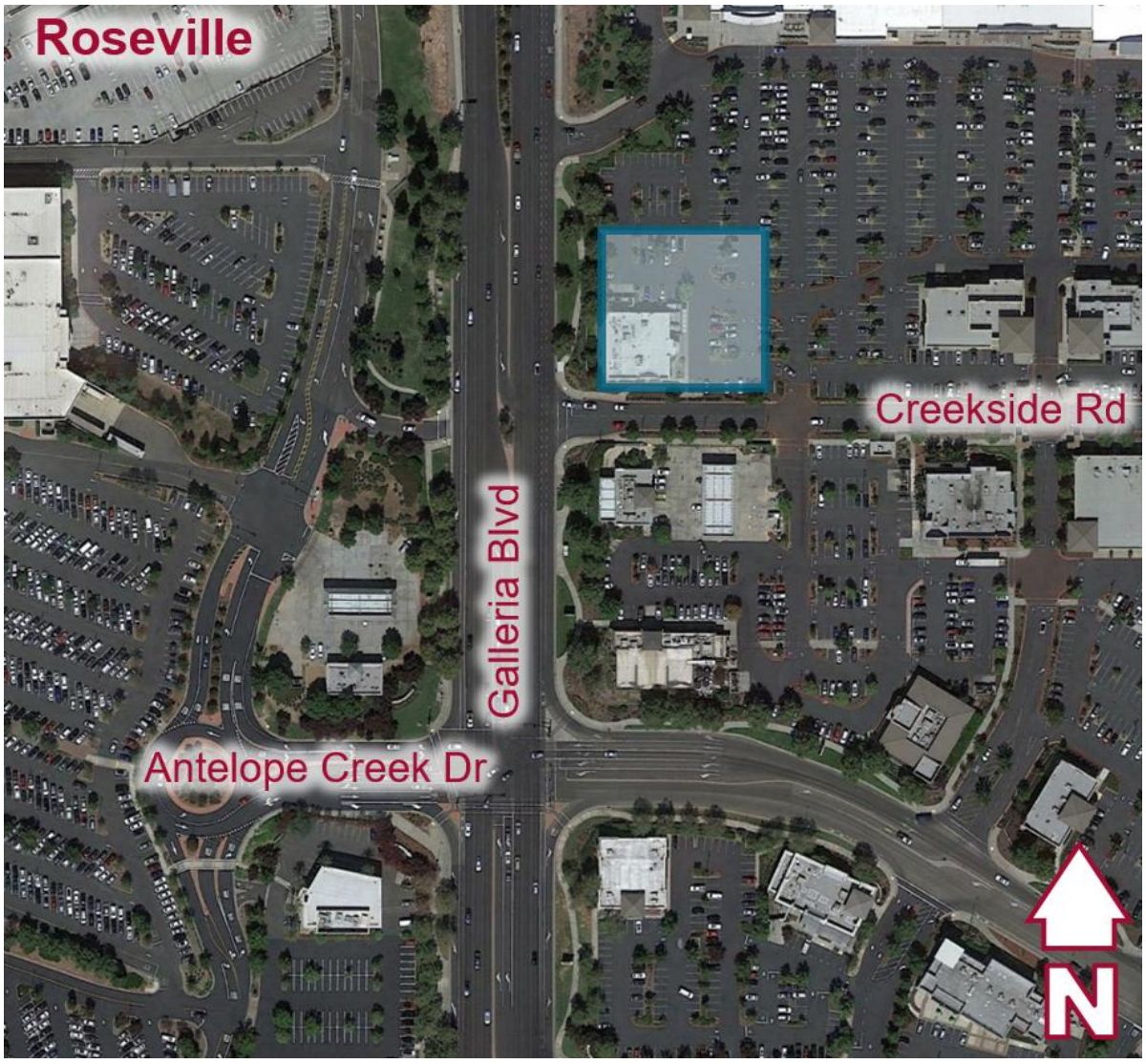

Figure 1: Project Location in Roseville, California

PROJECT DESCRIPTION

The project site is located on the northeast corner of Galleria Boulevard and Creekside Road in the City of Roseville, California. The site is bounded by Galleria Boulevard to the west, Creekside Road to the south, and commercial uses to the north and east. Raising Cane's proposes to redevelop the existing sit-down restaurant and parking lot into a 3,620-square-foot Raising Cane's drive-through restaurant building. Access to the Raising Cane's site will be provided via an existing full-movement driveway on Creekside Road and a right-in-right-out (RIRO) only driveway on Galleria Boulevard.

Proposed Drive-Through Operation

The opening to the drive-through lane is located at the northeast corner of the building and wraps around the building in a counter-clockwise direction. The drive-through provides two entry lanes and two order boards, which allows Raising Cane's to take orders from two customers at the same time. During off-peak periods the two lanes can merge into a single lane prior to the pay and pick-up window. During peak periods, an employee will be stationed at the outer lane to take orders and payment. Vehicles in the outer lane are then directed to queue in the outer lane and wait for their order, which is brought to their car by staff.

Assuming 22 to 25 feet per vehicle, the total queuing capacity is approximately:

- Outer lane from the entrance of drive-through to the order board: 140 feet (5 to 6 vehicles)
- Inner lane from the entrance of drive-through to the order board: 110 feet (4 to 5 vehicles)
- Outer lane between order board and pick-up area: 180 feet (7 to 8 vehicles)
- Inner lane between order board and pick-up window: 165 feet (6 to 7 vehicles)

The site provides a total drive-through queue length of approximately 595 feet (22 to 26 vehicles). The proposed site plan is included in Attachment A.

DRIVE-THROUGH QUEUING ANALYSIS

A drive-through queuing analysis was conducted to determine if the anticipated drive-through queue exceeds the available storage length and affect traffic operations of near-by land uses. The queuing analysis evaluated empirical data collected at three existing Raising Cane's sites and calculations based on Institute of Transportation Engineers (ITE) queuing methodology.

Pre-COVID-19 Empirical Queuing Data Collection and Observations

Drive-through queuing observations and counts were collected at the following existing Raising Cane's sites:

- Laguna Hills: Northeast corner of El Toro Road and Avenida De LaCarlota
- Orange: 2249 North Tustin Street
- Riverside: 11066 Magnolia Avenue

These sites were selected for queuing data collection because of site characteristics similar to the proposed project, such as being located adjacent to development or within a larger commercial center. It should be noted that these locations have single order board, which is less efficient compared to the proposed project which has dual order boards.

Data was collected prior to disruption by the novel coronavirus (COVID-19). The drive-through activity was observed during the following times on a weekday and Saturday:

- Laguna Hills & Riverside Sites:
  - 11:00 AM – 2:00 PM (lunch-time)
  - 4:00 PM – 7:00 PM (commute peak hour/dinner-time)
- Orange Site:
  - 12:00 PM – 2:30 PM (lunch-time)
  - 7:00 PM – 9:30 PM (dinner-time)

Weekday lunch-time and dinner-time peak operations are summarized in Table 1. Saturday lunch-time and dinner-time peak operation are summarized in Table 2. Supplemental data collection summary tables, as well as the data collection worksheets are provided in *Attachment B*. During the peak periods, average queue length ranged from 7 to 15 vehicles and the maximum queue ranged from 11 to 17 vehicles, which can be accommodated by the proposed 22-26 vehicle queuing capacity.

Table 1: Weekday Lunch-Time and Dinner-Time Peak Queuing Summary (Pre-COVID)

Site Location	Weekday Lunch-Time Peak			Weekday Dinner-Time Peak		
	Peak Period	Average Queue (vehicle)	Maximum Queue (vehicle)	Peak Period	Average Queue (vehicle)	Maximum Queue (vehicle)
Laguna Hills	12:15 PM-12:30 PM	**9**	15	6:45 PM-7:00PM	13	14
Orange	12:45 PM-1:00 PM	10	16	7:15 PM-7:30 PM	12	14
Riverside	12:30 PM-12:45 PM	8	12	6:00PM 6:15 PM	7	11

All site locations have a single order board which is less efficient compared to sites with dual order boards, like the proposed project.
Queues that exceed drive-through queuing capacity are bolded. Queuing capacity at each location are:
Laguna Hills = 170 feet (7-8 vehicles)
Orange = 180 feet (7-8 vehicles)
Riverside= 325 feet (13-14 vehicles)

Table 2: Saturday Lunch-Time and Dinner-Time Peak Queuing Summary (Pre-COVID)

Site Location	Saturday Lunch-Time Peak			Saturday Dinner-Time Peak		
	Peak Period	Average Queue (vehicle)	Maximum Queue (vehicle)	Peak Period	Average Queue (vehicle)	Maximum Queue (vehicle)
Laguna Hills	1:00 PM-1:15 PM	8	14	6:15 PM-6:30 PM	**9**	13
Orange	1:00 PM-1:15 PM	11	13	8:45 PM-9:00 PM	15	17
Riverside	1:30 PM-1:45 PM	10	12	6:45 PM-7:00 PM	8	11

All site locations have a single order board which is less efficient compared to sites with dual order boards, like the proposed project.
Queues that exceed drive-through queuing capacity are bolded. Queuing capacity at each location are:
Laguna Hills = 170 feet (7-8 vehicles)
Orange = 180 feet (7-8 vehicles)
Riverside= 325 feet (13-14 vehicles)

During-COVID Empirical Queuing Data Collection and Observations

Drive-through queuing observations and counts were collected at the following existing Raising Cane's sites:

- Huntington Beach: 101142 Adams Avenue
- Orange: 2249 North Tustin Street
- Foothill Ranch: 26782 Portola Parkway

These sites were selected for queuing data collection because of site characteristics similar to the proposed project, such as being located adjacent to development or within a larger commercial center. It should be noted that Orange site has a single order board, which is less efficient compared to sites with dual order boards like Huntington Beach, Foothill Ranch, and the proposed project.

Data was collected during disruption caused by COVID-19. The drive-through activity was observed during the following times on a weekday and Saturday:

- 11:00 AM – 2:00 PM (lunch-time)
- 4:00 PM – 7:00 PM (commute peak hour/dinner-time)

Weekday lunch-time and dinner-time peak operations are summarized in Table 3. Saturday lunch-time and dinner-time peak operation are summarized in Table 4. Supplemental data collection summary tables, as well as the data collection worksheets are provided in *Attachment C.* During the peak periods, average queue length ranged from 8 to 23 vehicles and the maximum queue ranged from 11 to 25 vehicles, which can be accommodated by the proposed 22-26 vehicle queuing capacity. Outside of the drive-through lane, the project site would be able to accommodate an additional 265 feet (10-12 vehicles) vehicles from the internal drive aisle on-site for additional drive-through queuing capacity before spilling onto Creekside Road.

While the COVID-19 pandemic has caused increases in drive-through queuing demand with the restriction of indoor dining, it should be noted that the current operations are not typical for drive-through operations, outside of COVID-19 pandemic restrictions. Under typical conditions, if there is

a back-up of vehicles in the drive-through lane, some customers are observed to park and go into the building, rather than join the existing drive-through queue. It is recommended that Raising Cane's coordinate with City staff to monitor to the peak operating conditions.

Table 3: Weekday Lunch-Time and Dinner-Time Peak Queuing Summary (During-COVID-19)

Site Location	Weekday Lunch-Time Peak			Weekday Dinner-Time Peak		
	Peak Period	Average Queue (vehicle)	Maximum Queue (vehicle)	Peak Period	Average Queue (vehicle)	Maximum Queue (vehicle)
Huntington Beach	12:15 PM-12:30 PM	9	14	5:30 PM-5:45PM	14	18
Orange	12:45 PM-1:00 PM	10	12	6:45 PM-7:45 PM	15	16
Foothill Ranch	1:30 PM-1:45 PM	8	11	6:30PM 6:45 PM	15	21
Orange site location has a single order board, which is less efficient compared to sites with dual order boards, like Huntington Beach, Foothill Ranch or the proposed project. Queues that exceed drive-through queuing capacity are bolded. Queuing capacity at each location are: Huntington Beach = 505 feet (20-23 vehicles) Orange = 180 feet (7-8 vehicles) Foothill Ranch = 385 feet (15-16 vehicles)						

Table 4: Saturday Lunch-Time and Dinner-Time Peak Queuing Summary (During-COVID-19)

Site Location	Saturday Lunch-Time Peak			Saturday Dinner-Time Peak		
	Peak Period	Average Queue (vehicle)	Maximum Queue (vehicle)	Peak Period	Average Queue (vehicle)	Maximum Queue (vehicle)
Huntington Beach	12:45 PM-1:00 PM	14	18	6:45 PM-7:00 PM	15	19
Orange	1:45 PM-2:00 PM	16	19	6:00 PM-6:15 PM	23	25
Foothill Ranch	1:15 PM-1:30 PM	20	23	5:15 PM-5:30 PM	20	23
Orange site location has a single order board, which is less efficient compared to sites with dual order boards, like Huntington Beach, Foothill Ranch or the proposed project. Queues that exceed drive-through queuing capacity are bolded. Queuing capacity at each location are: Huntington Beach = 505 feet (20 to 23 vehicles) Orange = 180 feet (7-8 vehicles) Foothill Ranch = 385 feet (15-16 vehicles)						

Drive-through Queue Length Calculation

To supplement the empirical data collected at the existing Raising Cane's restaurants in Laguna Hills, Orange, and Riverside, the drive-through queuing capacity was also analyzed using queuing analysis formulas published in the ITE *Transportation Planning Handbook, 3rd Edition*.

Raising Cane's typical service time in the drive-through is 2.5 minutes from the order board to the

pick-up window, with a vehicle being processed through the order board, pay window, and pick-up window every 35 to 40 seconds during the peak drive-through periods. Assuming the more conservative processing time of 40 seconds, and applying the ITE queuing formulas, the analysis indicated that the average queue length is estimated to be 9 vehicles, and the probability that the queue would be exactly 22 vehicles would be 1.00%. The probability of exceeding 22 vehicles during peak drive-through conditions is estimated to be 10.88%. The queuing calculation worksheet and formulas are provided as *Attachment D* of this report.

The ITE queuing analysis assumes a single-lane drive-through for a more conservative approach. The occurrence of the drive-through queue extending beyond the opening of the drive-through lane is expected to be an infrequent occurrence, and of short duration. The use of dual side-by-side drive-through lanes with dual order boards will improve the service rate and lower the number of vehicles queuing in the drive-through, as described in the following section.

Side-by-Side Operational Features

While regular customers who are familiar with the menu choices typically would complete the order part of the process is less that the average time, infrequent or new customers are more likely to dwell at the order board before making their choices, slowing down the process for everyone behind them. As a result, the order board is the most significant bottleneck in the drive-through process.

The side-by-side ordering configuration, as proposed by Raising Cane's, would provide two lanes with a separate order board for each lane. This will increase the number of customers processed through the order board portion of the drive-through, and "keep the line moving" even if one customer takes longer than average to order, allowing the restaurant to continue to take and complete orders from the other order lane. The newest customer to arrive at the drive-through entrance will naturally choose the empty lane or the shorter line, so that one customer who takes a longer time to order at one order board can be by-passed, thereby not holding up the entire drive-through line.

With the added efficiency of having two order boards and the ability to by-pass customers taking longer than average to order at the other order board, the service rate increases, compared to a single drive-through lane, as more orders can be processed. The cooks receive the orders at a more efficient rate, which allows them to continue cooking the food, rather than waiting for a slower customer to finish ordering. Because of added efficiency in the cooking area, the efficiency at the pick-up window increase, compared to a single drive-through lane, because the food is processed by the cooking area at a more efficient rate. The proposed dual pay and pick-up stations also improve the service rate under peak drive-through conditions as they service more drive-through vehicles than a single pick-up area of the drive-through.

The Roseville site will include additional features that will improve efficiency. The site will have enhanced kitchen features and additional fryers compared to the Laguna Hills, Orange and Riverside sites. These kitchen features are designed to increase cooking efficiency and decrease time needed to prepare orders. As mentioned previously, during peak periods staff will be deployed to take orders and payment on mobile tablets. This will allow Raising Cane's to take more orders and payments since staff can walk along the queue line.

CONCLUSION

The proposed Raising Cane's drive-through lane would provide a total queue length of approximately 595 feet, for a queuing capacity for 22 to 26 vehicles, assuming 22 to 25 feet per vehicle, from the beginning of the drive-through lanes to the pick-up window. Based on the drive-through queuing data collection and analysis presented in this memorandum, the overall average number of queued vehicles is estimated to be 9 (calculated at 8.97 and rounded up to 9) during the peak drive-through operations. The peak queue based on empirical data is 17 vehicles during the peak 15-minute time period.

The proposed two drive-through lane configuration will help address potential bottleneck issues at the order board, as well as reduce the service time at the drive-through as orders can be processed at a more efficient rate. The additional pay and pick-up lane will provide additional queue capacity and improve the service rate during peak drive-through conditions.

Attachments:

Attachment A – Proposed Site Plan
Attachment B – Supplemental Data (Pre-COVID-19)
Attachment C – Supplemental Data (During COVID-19)
Attachment D – Queuing Calculation

ATTACHMENT A

PROPOSED SITE PLAN

NORTH

GRAPHIC SCALE IN FEET
0 10 20 40

WHEN PRINTED AT 24" x 36"

GALLERIA BLVD.

65 ROAD AND UTILITY SERIES NO. 95-027035 OR (EX 5)

35' LANDSCAPE & PUE SERIES NO. 95-027035 OR (EX 7)

STOP

7-ELEVEN

CREEKSIDE

SHELL

PROTOTYPE 1S-M-HV
3,620 GROSS S.F. (BLDG)
192 GROSS S.F (CORRAL)
516 GROSS S.F. (PATIO)

DO NOT ENTER DO NOT ENTER

VAN

DRIVE THRU

DRIVE THRU

STOP

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TITLE: SITE BASE EXHIBIT

PROJECT: RC0569 - ROSEVILLE

LOCATION: GALLERIA & CREEKSIDE

JOB NUMBER:	0569
SCALE:	1" = 20'
DATE:	9/22/2020
SHEET:	1 OF 1

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ATTACHMENT B

SUPPLIMENTAL DATA (PRE-COVID)

ATTACHMENT B.1

SUMMARY OF DRIVE-THROUGH QUEUING DATA COLLECTION
RAISING CANE'S - TYPICAL WEEKDAY
AVERAGE, 85TH PERCENTILE, AND PEAK QUEUES

Time Period	Number of Drive-through Vehicles in the Queue								
	Average Queue			85th %-ile [1] Queue			Peak Queue		
	Laguna Hills	Orange	Riverside	Laguna Hills	Orange	Riverside	Laguna Hills	Orange	Riverside
Lunch									
11:00-11:15 AM	1.5		1.7	2.7		3.0	3		4
11:15-11:30 AM	1.7		3.1	2.0		5.0	3		6
11:30-11:45 AM	2.6		1.1	4.0		2.0	5		2
11:45-12:00 PM	4.1		3.0	7.2		4.0	11		5
12:00-12:15 PM	3.9	5.6	5.4	7.0	7.0	7.0	9	14	8
12:15-12:30 PM	9.0	6.6	4.9	13.0	8.0	7.9	15	13	9
12:30-12:45 PM	10.6	7.0	7.8	12.8	9.0	9.9	13	10	12
12:45-1:00 PM	7.0	9.7	5.6	9.0	13.0	6.9	9	16	7
1:00-1:15 PM	5.2	9.0	5.2	7.0	11.0	7.0	8	13	8
1:15-1:30 PM	5.8	6.6	6.6	8.0	9.0	9.0	10	11	10
1:30-1:45 PM	2.8	3.9	4.5	5.0	5.0	7.0	6	7	9
1:45-2:00 PM	3.5	3.6	5.0	4.5	5.0	6.0	6	6	7
2:00-2:15 PM		3.6			5.0			5	
2:15-2:30 PM		2.9			5.0			6	
Highest Value	10.6	9.7	7.8	13.0	13.0	9.9	15	16	12
Dinner									
4:00-4:15 PM	5.6		3.5	7.0		5.0	8		6
4:15-4:30 PM	6.2		2.0	8.0		3.0	9		4
4:30-4:45 PM	5.9		3.8	7.0		6.0	9		7
4:45-5:00 PM	5.5		6.2	7.0		9.0	9		10
5:00-5:15 PM	5.4		2.2	7.0		4.9	8		6
5:15-5:30 PM	5.8		3.6	7.0		6.0	9		8
5:30-5:45 PM	7.1		5.3	8.0		8.9	10		10
5:45-6:00 PM	10.9		2.7	12.0		4.0	13		6
6:00-6:15 PM	8.6		6.7	10.4		9.0	11		11
6:15-6:30 PM	10.8		6.3	12.0		7.9	13		9
6:30-6:45 PM	11.1		4.5	12.5		6.9	14		8
6:45-7:00 PM	12.8		3.1	14.0		4.0	14		5
7:00-7:15 PM		11.0			12.0			14	
7:15-7:30 PM		11.5			13.0			14	
7:30-7:45 PM		8.6			10.0			12	
7:45-8:00 PM		8.3			10.0			12	
8:00-8:15 PM		9.4			11.0			13	
8:15-8:30 PM		8.5			11.0			12	
8:30-8:45 PM		6.4			9.0			10	
8:45-9:00 PM		5.2			7.0			8	
9:00-9:15 PM		6.4			8.1			10	
9:15-9:30 PM		7.5			9.3			12	
Highest Value	12.8	11.5	6.7	14.0	13.0	9.0	14	14	11

Notes: [1] 85th percentile = The queue will be less than the queue shown 85% of the time.

ATTACHMENT B.2

SUMMARY OF DRIVE-THROUGH QUEUING DATA COLLECTION
RAISING CANE'S - SATURDAY
AVERAGE, 85TH PERCENTILE, AND PEAK QUEUES

Time Period	Number of Drive-through Vehicles in the Queue								
	Average Queue			85th %-ile [1] Queue			Peak Queue		
	Laguna Hills	Orange	Riverside	Laguna Hills	Orange	Riverside	Laguna Hills	Orange	Riverside
Lunch									
11:00-11:15 AM	3.0		2.3	4.3		5.8	5		6
11:15-11:30 AM	1.8		2.3	3.0		5.8	4		6
11:30-11:45 AM	5.3		4.9	8.0		6.0	12		9
11:45-12:00 PM	7.5		1.9	10.0		3.9	12		5
12:00-12:15 PM	4.7	5.5	8.0	5.0	8.0	10.0	6	9	11
12:15-12:30 PM	4.1	6.8	4.9	5.0	8.7	6.9	6	10	8
12:30-12:45 PM	8.2	5.8	6.7	12.0	7.1	7.9	13	9	9
12:45-1:00 PM	9.3	6.8	7.9	11.0	8.0	9.0	12	9	12
1:00-1:15 PM	7.2	10.4	8.6	9.0	12.0	9.9	14	13	11
1:15-1:30 PM	7.3	9.4	8.1	9.0	12.0	9.9	10	13	12
1:30-1:45 PM	6.9	8.5	9.5	9.0	11.0	10.0	10	13	12
1:45-2:00 PM	7.3	3.9	8.0	8.8	5.4	9.0	10	6	10
2:00-2:15 PM		5.0			7.0			8	
2:15-2:30 PM		6.4			8.0			10	
Highest Value	9.3	10.4	9.5	12.0	12.0	10.0	14	13	12
Dinner									
4:00-4:15 PM	6.2		5.8	8.5		8.9	11		10
4:15-4:30 PM	4.5		7.1	5.1		8.9	6		11
4:30-4:45 PM	2.0		4.9	3.0		6.0	4		9
4:45-5:00 PM	5.2		3.9	6.0		6.0	8		7
5:00-5:15 PM	5.6		4.7	7.0		7.0	9		8
5:15-5:30 PM	10.0		4.2	12.0		5.0	12		6
5:30-5:45 PM	6.1		3.7	7.3		5.0	11		6
5:45-6:00 PM	7.3		2.1	11.3		3.0	13		4
6:00-6:15 PM	8.7		2.9	11.0		6.0	12		7
6:15-6:30 PM	8.6		2.8	11.0		4.8	13		6
6:30-6:45 PM	6.0		7.2	7.3		9.0	10		10
6:45-7:00 PM	4.7		7.8	7.0		9.0	8		11
7:00-7:15 PM		9.2			10.5			13	
7:15-7:30 PM		11.6			13.0			13	
7:30-7:45 PM		10.8			13.0			16	
7:45-8:00 PM		4.2			6.0			11	
8:00-8:15 PM		5.4			8.0			10	
8:15-8:30 PM		8.9			11.0			12	
8:30-8:45 PM		8.8			11.0			13	
8:45-9:00 PM		15.0			17.0			17	
9:00-9:15 PM		12.4			16.0			17	
9:15-9:30 PM		9.3			11.4			15	
Highest Value	10.0	15.0	7.8	12.0	17.0	9.0	13	17	11

Notes: [1] 85th percentile = The queue will be less than the queue shown 85% of the time.

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ATTACHMENT C

SUPPLIMENTAL DATA (DURING COVID-19)

Attachment 2

TABLE 1

SUMMARY OF DRIVE-THROUGH QUEUING DATA COLLECTION
RAISING CANE'S - TYPICAL WEEKDAY
AVERAGE, 85TH PERCENTILE, AND PEAK QUEUES

Time Period	Number of Drive-through Vehicles in the Queue								
	Average Queue			85th %-ile [1] Queue			Peak Queue		
	Orange	Huntington Beach	Foothill Ranch	Orange	Huntington Beach	Foothill Ranch	Orange	Huntington Beach	Foothill Ranch
Lunch									
11:00-11:15 AM	3.3	1.7	1.1	4.0	3.0	2.0	8	3	3
11:15-11:30 AM	6.6	3.8	2.3	8.0	5.0	4.0	9	6	5
11:30-11:45 AM	5.0	3.4	4.0	5.5	4.2	4.0	7	7	6
11:45-12:00 PM	2.6	4.4	6.5	4.0	6.0	9.0	4	7	10
12:00-12:15 PM	6.4	5.0	4.3	7.5	7.0	6.0	8	8	7
12:15-12:30 PM	6.5	8.5	7.0	8.0	12.0	8.0	9	14	9
12:30-12:45 PM	4.8	4.9	7.3	8.2	7.2	9.0	9	9	10
12:45-1:00 PM	10.1	3.4	5.3	11.0	5.0	6.0	12	6	7
1:00-1:15 PM	7.0	7.9	4.2	9.0	10.0	10.0	9	11	7
1:15-1:30 PM	2.5	4.1	6.9	5.0	6.0	10.0	5	6	11
1:30-1:45 PM	4.4	5.1	8.3	6.7	7.0	10.0	7	9	11
1:45-2:00 PM	4.8	3.6	2.9	6.0	5.0	4.0	8	6	4
Highest Value	10.1	8.5	8.3	11.0	12.0	10.0	12	14	11
Dinner									
4:00-4:15 PM	1.5	4.8	2.5	2.3	6.0	3.0	3	7	5
4:15-4:30 PM	6.1	2.2	1.8	8.0	3.5	2.0	8	5	3
4:30-4:45 PM	8.0	2.6	2.5	9.3	5.0	4.0	10	6	5
4:45-5:00 PM	7.0	6.7	2.8	9.3	8.0	4.0	10	10	5
5:00-5:15 PM	6.0	4.7	3.5	7.0	6.2	5.0	8	7	5
5:15-5:30 PM	10.3	7.9	5.0	11.1	11.3	6.9	12	14	8
5:30-5:45 PM	9.4	14.1	10.7	11.0	16.2	14.9	11	18	16
5:45-6:00 PM	2.0	8.9	15.1	3.3	11.0	16.9	4	12	17
6:00-6:15 PM	7.8	8.0	15.8	10.8	11.0	17.0	12	12	19
6:15-6:30 PM	9.9	7.8	15.7	11.4	10.2	17.0	15	13	17
6:30-6:45 PM	13.2	10.5	15.5	14.3	12.0	18.0	15	14	21
6:45-7:00 PM	14.5	10.9	6.9	15.3	13.0	8.9	16	14	11
Highest Value	14.5	14.1	15.8	15.3	16.2	18.0	16	18	21

Notes: [1] 85th percentile = The queue will be less than the queue shown 85% of the time.

Attachment 2

TABLE 2

SUMMARY OF DRIVE-THROUGH QUEUING DATA COLLECTION
RAISING CANE'S - SATURDAY
AVERAGE, 85TH PERCENTILE, AND PEAK QUEUES

Time Period	Number of Drive-through Vehicles in the Queue								
	Average Queue			85th %-ile [1] Queue			Peak Queue		
	Orange	Huntington Beach	Foothill Ranch	Orange	Huntington Beach	Foothill Ranch	Orange	Huntington Beach	Foothill Ranch
Lunch									
11:00-11:15 AM	3.3	0.9	2.3	4.0	1.1	3.9	4	2	4
11:15-11:30 AM	5.0	2.6	4.9	7.0	3.0	8.0	7	4	8
11:30-11:45 AM	2.1	1.8	8.7	3.0	3.6	11.0	4	4	12
11:45-12:00 PM	4.6	5.1	7.7	5.2	8.0	8.0	7	9	10
12:00-12:15 PM	7.7	9.2	11.5	9.0	10.0	14.0	10	10	15
12:15-12:30 PM	8.3	8.5	12.4	9.0	10.0	14.9	11	11	16
12:30-12:45 PM	6.9	5.4	12.8	8.0	6.6	14.0	8	9	15
12:45-1:00 PM	9.4	13.6	14.8	11.3	16.8	16.9	14	18	18
1:00-1:15 PM	13.8	13.7	16.1	16.7	16.0	20.0	18	16	19
1:15-1:30 PM	17.5	9.7	19.6	18.0	11.0	22.0	18	12	23
1:30-1:45 PM	15.3	7.2	15.5	17.1	8.0	16.9	18	9	19
1:45-2:00 PM	16.3	7.7	16.1	19.0	10.0	18.0	19	11	19
Highest Value	17.5	13.7	19.6	19.0	16.8	22.0	19	18	23
Dinner									
4:00-4:15 PM	14.7	7.3	2.7	17.8	10.0	4.0	20	11	6
4:15-4:30 PM	20.5	3.3	6.1	20.9	4.0	7.0	21	5	8
4:30-4:45 PM	18.7	2.6	7.5	19.0	4.0	9.0	19	7	10
4:45-5:00 PM	21.3	4.1	9.6	21.7	5.0	11.0	22	6	12
5:00-5:15 PM	21.0	6.4	14.3	22.8	9.3	17.0	24	10	18
5:15-5:30 PM	23.3	6.5	20.3	24.1	9.0	21.9	25	10	23
5:30-5:45 PM	23.0	10.6	16.4	23.7	13.0	19.9	24	15	20
5:45-6:00 PM	20.8	6.3	15.9	22.1	8.5	17.0	23	11	19
6:00-6:15 PM	23.3	7.5	15.1	24.4	11.0	17.9	25	12	19
6:15-6:30 PM	21.5	9.8	16.5	21.9	12.2	17.9	22	15	18
6:30-6:45 PM	21.3	14.4	16.5	21.7	16.0	18.0	22	18	18
6:45-7:00 PM	21.8	15.3	17.0	22.6	17.0	18.0	23	19	18
Highest Value	23.3	15.3	20.3	24.4	17.0	21.9	25	19	23

Notes: [1] 85th percentile = The queue will be less than the queue shown 85% of the time.

ATTACHMENT D

QUEUING CALCULATIONS

Attachment 2

DRIVE-THROUGH QUEUING ANALYSIS

Project: Raising Cane's Restaurant
Location: Northeast corner of Galleria Boulevard and Creekside Roade, Roseville

INPUT VALUES

Variable	Description	Value
A =	average number of vehicle arrivals per hour [1]	79
S =	service rate, number of vehicles per hour	87
I =	traffic intensity, utilization factor = A/S	0.91
Q =	queue capacity (vehicles)	22

FORMULAS

Average Length of Queue

$$\text{Avg } Q = A^2 / S(S-A) = I^2 / 1-I$$ 8.97

Probability of Q Number of Vehicles in Queue

$$P(Q) = (I)^Q (1-I)$$ 1.10%

Probability of Queue Exceeding Q Vehicles

$$\sum_{Q=0}^{Q=a} P(Q) \geq 0.95$$ 10.88%

[1] For a worst-case analysis, the peak arrival rate observed at the Orange Raising Cane's site is used here.

Source: Institute of Transportation Engineers (ITE) Transportation Planning Handbook, 3rd Edition