DC ENGINEERS, INC.

Memorandum

To: Ms. Angela Gargin
Living Water Construction

From: J. Suzanne Danielsen, P.E.

Date: September 24, 2018

Re: Popeye's Louisiana Kitchen - Margate, FL
Trip Generation and Queuing Analysis

As requested, Danielsen Consulting Engineers, Inc. (DC Engineers, Inc.) has prepared a trip generation and queuing analysis specific to the proposed Popeye's Louisiana Kitchen to be constructed along the east side of SR 7 (US 441) immediately north of SW 8 Court within municipal limits of the City of Margate, Florida. This study addresses trip generation and drive-through lane queuing characteristics for the proposed restaurant.

TRIP GENERATION ANALYSIS

A current site plan, included as Attachment A, shows a 2,557.31 square foot fast food restaurant with two (2) drive-through lanes. Upon buildout of the proposed restaurant, access will be provided through three (3) driveways as follows: one (1), two (2)-way driveway along SW 8 Court, one (1) entrance only driveway along the west property line and one (1), two (2)-way cross access driveway along the north property line.

Trip Generation

A trip generation analysis has been completed for the proposed restaurant. The analysis was performed using rates and formulae published in the Institute of Transportation Engineer's (ITE) report *Trip Generation* (10th Edition). The trip generation analysis was undertaken for daily and PM peak hour conditions. An AM analysis has not been considered as the restaurant, opening at 10:30 AM, will not impact the AM peak hour of the adjacent roadway network. According to the referenced ITE report, the most appropriate land use category and corresponding rates for the proposed development are as follows:

Fast-Food Restaurant with Drive-Through Window - ITE Land Use #934

Daily Trips: T = 470.95(X) (50% inbound and 50% outbound)
where T = number of trips and X = 1,000 square feet gross floor area

PM Peak Hour Trips T = 32.67(X) (52% inbound and 48% outbound)

The results of this effort are documented in Table 1 included as Attachment B. As shown in Table 1, the proposed restaurant is expected to produce 1,204 vehicle trips per day with 84 vehicle trips occurring during the PM peak hour (44 entering and 40 exiting).

Queuing Analysis

As shown in the site plan included as Attachment A, the proposed Popeye's Louisiana Kitchen includes a drive-through lane that widens to two (2) parallel lanes at the menu board and then merges back to one (1) lane prior to the pick-up window. This double menu board arrangement is intended to increase efficiency of the drive-through operation and to maximize the stacking capacity.

The length of queue anticipated within the drive-through lane(s) was determined using methodologies contained in ITE's *Transportation and Land Development*, Chapter 8 - Drive-In Facilities. For this analysis, the following input variables were used:

- Service Rate: The average window transaction time is estimated to be 60 seconds consistent with information provided in *Transportation and Land Development*.

- Demand Rate: Based on ITE's *Trip Generation* (10th Edition), the maximum inbound vehicular traffic flow anticipated at a 2,557.31 square foot fast food restaurant is 44 vehicles (refer to trip generation section above). Although ITE estimates that 45 percent of inbound vehicular traffic uses drive-through lanes, to provide a conservative analysis this queue analysis assumes 100 percent of inbound vehicles will use the drive-through lanes.

Using equation 8-9b and Table 8-11 of ITE's *Transportation and Land Development*, the maximum length of queue anticipated within the drive-through lane(s) is two (2) vehicles. Calculations are included as Attachment C. As the site plan provides in excess of 44 feet of stacking space (22 feet per vehicle queued), vehicular queuing outside of the stacking area proposed is not expected.

Conclusion

In summary, the Popeye's Louisiana Kitchen as proposed is expected to have adequate storage to accommodate peak inbound vehicular demands anticipated within the drive-through lane(s).

Of course, please do not hesitate to contact me directly with any questions you may have.

Sincerely,

DC ENGINEERS, INC.

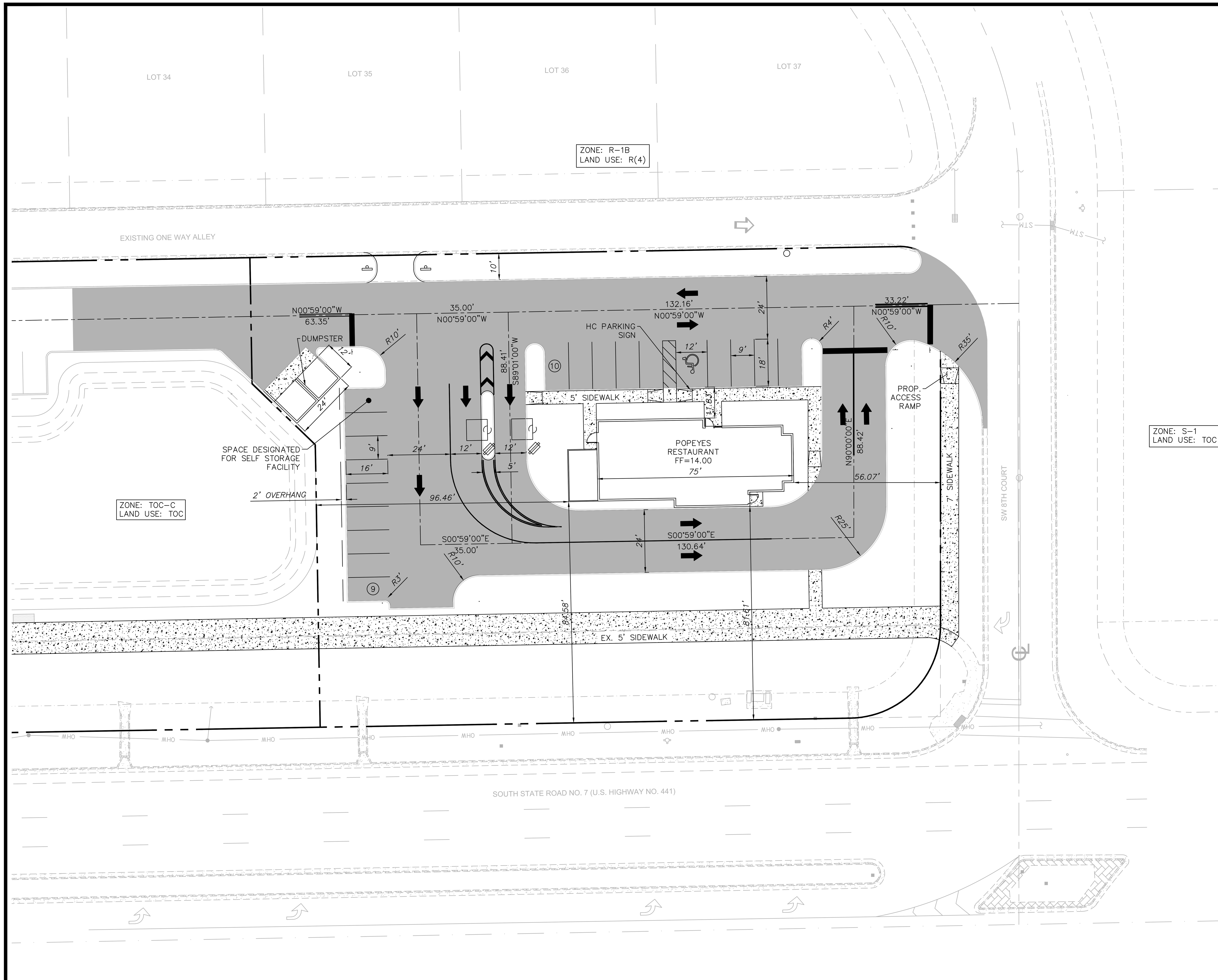
J. Suzanne Danielsen, P.E.
Senior Transportation Engineer

SUZANNE DANIELSEN
LICENSE
No. 42533
STATE OF
8.24.18
FLORIDA
PROFESSIONAL ENGINEER

J. Suzanne Danielsen, P.E.
Florida Registration Number 42533
Danielsen Consulting Engineers, Inc.
12743 NW 13th Court
Coral Springs, FL 33071
CA # 3202

Attachment A

Site Plan



Graphic Scale

0 20 40

Scale: 1"=20'

SITE DATA

CURRENT USE:	VACANT
LAND USE DESIGNATION:	TOC
ZONING DESIGNATION:	TOC-C
WATER SERVICE PROVIDER:	CITY OF MARGATE
WASTEWATER SERVICE PROVIIDER:	CITY OF MARGATE
BUILDING HEIGHT:	21'-4"
BUILDING LENGTH	82'
NUMBER OF STORIES:	1 STORY
GROSS FLOOR AREA:	2,137 SF

	SF	ACRES	PERCENTAGE
LAND AREA	44,085.50	1.01	100
PROP. BLDG	2,557.31	0.06	5.80
ASPHALT	20,002.38	0.46	45.37
SIDEWALK	2,647.38	0.06	6.01
TOTAL IMPERVIOUS	25,207.07	0.58	57.18
PERVIOUS	18,878.43	0.43	42.82

PARKING REQUIRED

1 SPACE PER 50 SF OF GROSS FLOOR AREA: 895 SF / 18 = SPACES

PARKING PROVIDED

STANDARD	= 17 SPACES
SPACE DESIGNATED FOR SELF STORAGE	= 1 SPACE
HANDICAP SPACES	= 1 SPACE
TOTAL PROVIDED	= 19 SPACES

NOTE:

ALL TRAFFIC CONTROL PAVEMENT MARKINGS WILL BE THERMOPLASTIC.

SITE PLAN

DATE	DESCRIPTION	REV.
		1
		2
		3
		4
		5
		6

IMTIAZ AHMED, P.E.
LICENSED ENGINEER NO. 46102
STATE OF FLORIDA

SEAL

METRO CHICKEN
750 STATE ROAD 7
MARGATE, FLORIDA

LOUISIANA KITCHEN POPEYES

ATLANTIC ENGINEERING SERVICES, INC.
200 C2 CROSSWINDS DRIVE
WEST PALM BEACH, FLORIDA 33413
PHONE – (561) 358-4140
FAX – (561) 966-9242
CERTIFICATE OF AUTHORIZATION NO.: 9390

PROJ. NO. 0000
SCALE: AS SHOWN

DES.	DWN.	CHK.
	ddt	

SHEET NUMBER
SP1

DATE DRAWN
MAR 2018

Attachment B

Trip Generation

Table 1: Trip Generation Summary Proposed Uses

Land Use	Scale	Units	AM Peak Hour			PM Peak Hour			Daily		
			Total Trips	Inbound	Outbound	Total Trips	Inbound	Outbound	Total Trips	Inbound	Outbound
Fast-Food Restaurant with Drive-Through Window (LUC 934)	2.557	ksf	NA	NA	NA	84	44	40	1204	602	602
Total			**0**	**0**	**0**	**84**	**44**	**40**	**1,204**	**602**	**602**

Source: ITE Trip Generation Manual (10th Edition)

T = 470.95(x)	50% in, 50% out	Daily
T = 32.67(x)	52% in, 48% out	PM Peak

Attachment C

Queue Analysis

Popeye's Louisiana Kitchen – Margate – Drive-Through Operations

Queuing Analysis based on ITE Procedures

q = 44 veh/hr (demand rate)

Q = 60 veh/hr (service rate)

$$p = \frac{q}{NQ} = 0.367 \ (N = 2)$$

Q_M = 0.1986 (for N = 2)

Using Acceptable Probability of 1% (99% Confidence Level)

$$M = \left(\frac{\text{Ln}\,(x > M) - \text{Ln}\,(Q_M)}{\text{Ln}\,(p)}\right) - 1$$

$$M = \left(\frac{\text{Ln}(0.01) - \text{Ln}(0.199)}{\text{Ln}(0.367)}\right) - 1$$

$$M = \left(\frac{-4.605 - (-1.617)}{-1.003}\right) - 1$$

M = 2.979 – 1 = 1.979 vehicles

or, 2 vehicles

DC Engineers, Inc.