BHC RHODES
Civil Engineering · Surveying · Utilities

January 12, 2018

Danielle Sitzman
City Planner
City of Mission
6090 Woodson
Mission, KS 66202

Dear Ms. Sitzman:

As per a design memorandum dated September 7, 2017, a brief traffic memorandum was recommended for the Tidal Wave Auto Spa located at 6501 Johnson Drive. The purpose of this traffic memorandum is to address the three bullets points (trip generation, comparison to existing, and anticipated queuing) noted in that design memorandum.

Existing Site
The existing site contains a Convenience Market with Gasoline Pumps. It was formerly a Valero, then Conoco, and most recently a Quick Zone. The convenience market is 3,000 square feet (SF) and there are 8 vehicle fueling positions.

Proposed Site
The proposed development will be a 3,250 SF Automated Car Wash with one car wash tunnel. There is stacking for 14 vehicles (3 in the tunnel and 11 outside the tunnel). The eastern site driveway shown on <u>Figure 1</u> illustrates a shared driveway for Tidal Wave Auto Spa and Exact Performance. This arrangement eliminates one driveway location along Johnson Drive. <u>Figure 1</u> also indicates the removal of 18 feet of the Johnson Drive median nose to safely accommodate westbound left turns from Johnson Drive to the two businesses. Observations indicate that some patrons of Exact Performance currently make a U-turn movement around the existing median to access that business, and some exit into oncoming Johnson Drive traffic for a short distance to proceed west.

Trip Generation
The Institute of Transportation Engineers (ITE) <u>Trip Generation Manual</u>, is in its 10th edition and is one of the most widely used and accepted tools in projecting development trips. The businesses will be classified with the following ITE land use codes and independent variable.
Existing
- Valero / Conoco / Quick Zone, 853 "Convenience Market with Gasoline Pumps", 8 Vehicle Fueling Positions or 3000 SF
Proposed
- Tidal Wave Auto Spa, 948 "Automated Car Wash", 3250 SF or 1 Car Wash Tunnel

Note that ITE land use code 945 "Gasoline/Service Station with Convenience Market" was also considered for the existing site but not used. The vehicle fueling positions and area values were outside the range of the sites studied, as shown in <u>Appendix A</u>.

For the existing site, the variable generating the fewest trips (1000 SF) is the most conservative for this comparison. For the proposed site, the variable generating the most trips (Tunnels) is the most conservative for this comparison.

Table 1 summarizes the trip ends produced for the weekday PM peak hour. The Trip Generation Manual only provides PM peak hour data for 948 "Automated Car Wash, so Daily and AM peak hour comparison will not be provided. See the trip generation data plots in Appendix A for each land use shown in Table 1.

Table 1 - Trip Generation (Weekday PM Peak Hour)							
Land Use	Variable	Value	Avg. Trip Gen. Rate	Dir. Dist.	Trip Ends		
					Total	Entering	Exiting
Existing							
Conv. Market	Fuel Pos.	8	23.04	50/50	184	92	92
Conv. Market	1000 SF	3.00	49.29	50/50	148	74	74
Proposed							
Tidal Wave	1000 SF	3.25	14.20	50/50	46	23	23
Tidal Wave	Tunnels	1	77.50	50/50	78	39	39
Compared to Existing					-70	-35	-35

Table 1 illustrates that 78 vehicle trips may be generated by the proposed Tidal Wave Auto Spa. This is 70 less trips than the existing convenience market.

Expected Vehicle Arrival Rates
As shown in Table 1, 39 vehicles can be expected to arrive at the facility during the weekday PM peak hour. This averages to an arrival rate at approximately one vehicle every 1.5 minutes.

Car Wash Service Rates
From an operations standpoint, Tidal Wave Auto Spa plans for a maximum service rate of 55 vehicles per hour (VPH). The conveyor speed is designed to process 180 VPH with service rates as high as 140 VPH vehicles per hour (VPH) can be attained. For this traffic memorandum, a conservative service rate of 55 VPH will be assumed.

Anticipated Queuing
The following equations can be used to evaluate average vehicle queue length and the probability of vehicles stacking onto Johnson Drive.

$$E_m = \lambda^2/\mu(\mu-\lambda) = 1.73 \text{ veh}$$
$$P(n>N) = (\lambda/\mu)^{N+1} \rightarrow P(n>14) = 0.0058 \text{ or 1 in 174}$$

Where:
E_m = Mean (average) queue length (veh)
λ = Vehicle arrival rate (veh/min), λ is 39 veh/hr or 0.6500 veh/min
μ = Car wash service rate (veh/min), μ is 55 veh/hr or 0.9167 veh/min
$P(n>N)$ = Probability of more than N vehicles being in the queue, N is 14 (3+11)

The average queue length is calculated at 1.73 vehicles. As shown in the Preliminary Development Plan in Figure 1, stacking is available for 14 vehicles (3 in the tunnel and 11 outside the tunnel). With a service rate of 55 VPH, the chance of more than 14 vehicles in queue is 1 in 174. If the queue nears this length, a faster service rate of 140 VPH could be implemented.

Conclusion

This memorandum has reviewed the trip generation, made a comparison to existing conditions, and completed queuing analysis for the proposed site. The findings indicate that less vehicle trips are expected than the existing land use. The probability of vehicles stacking onto Johnson Drive is minimal. As a result, no modifications to Johnson Drive will be necessary.
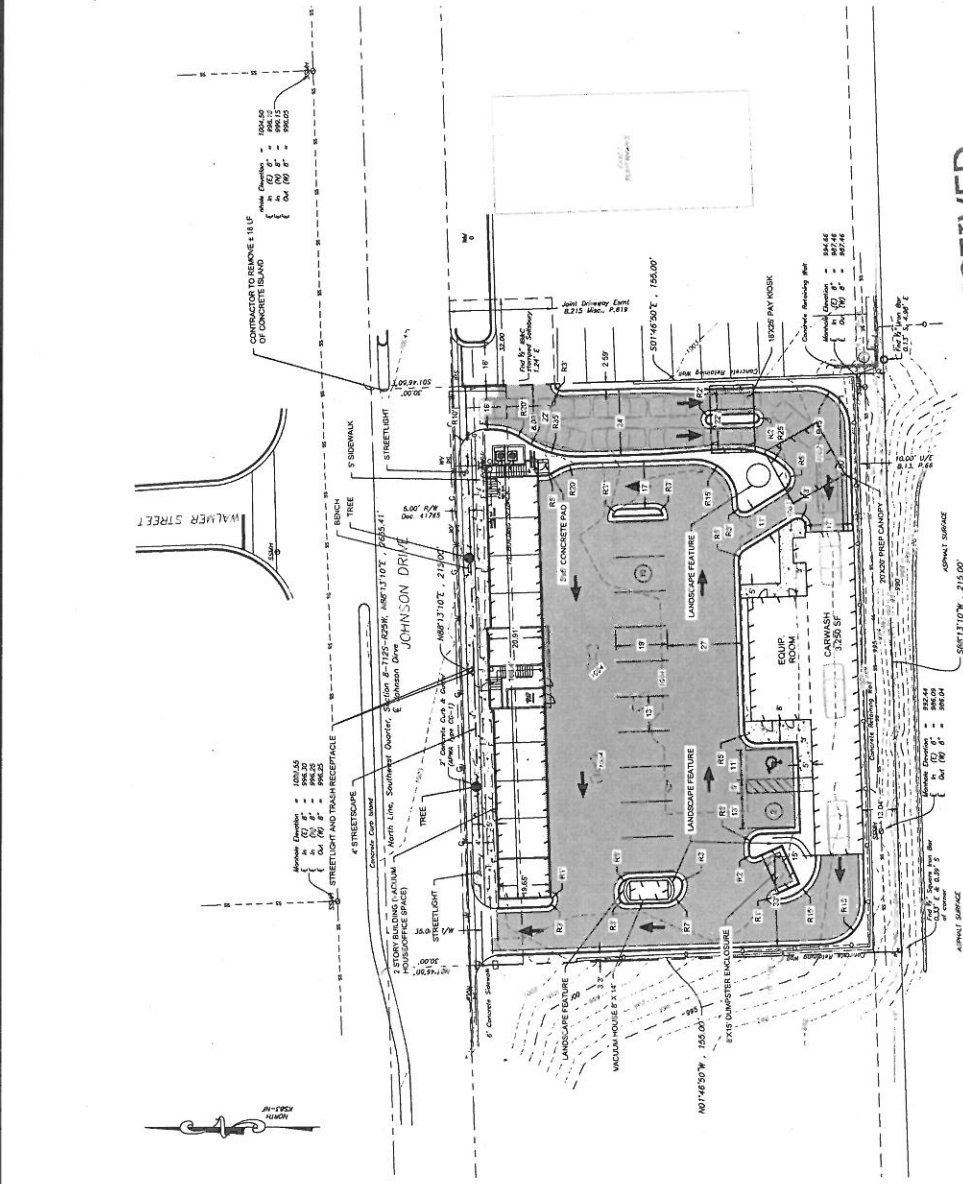
If you have any questions, please contact me at david.smalling@ibhc.com or 913-663-1900.

Sincerely,

David Smalling, P.E., PTOE, ENV SP

Figures

Figure 1 - Preliminary Development Plan

EMC ENGINEERING SERVICES, INC.

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Leesburg, GA 31763
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kbarry@emc-eng.com

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OFFICE LOCATIONS: ALBANY, ATLANTA, AUGUSTA, BRUNSWICK,
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Prepared for:
SHJ CONSTRUCTION GROUP

TIDAL WAVE AUTO SPA
MISSION, JOHNSON COUNTY, KANSAS

PROPERTY ID #: KP6960000010003

PRELIMINARY DEVELOPMENT PLAN

SHEET 1 OF 2

OWNER INFORMATION
OWNER: CSTORE INVESTORS TOO, LLC
ADDRESS: 700 W 47TH ST, KANSAS CITY, MO 64118

APPLICANT INFORMATION
APPLICANT: TW MACON, LLC (d.b.a. TIDAL WAVE AUTO SPA)
ADDRESS: 124 THOMPSON STREET, THOMASTON, GEORGIA 30286
PHONE #: 770-271-5646

SITE INFORMATION
ADDRESS: 6501 JOHNSON DR, MISSION, KANSAS 66202
PROPERTY AREA: ±0.76 AC
PROPERTY ZONING: CP-2B
BUILDING SETBACKS:
FRONT: 0-10'
SIDE: 0'
REAR: 0'

PARKING NOTE
PARKING REQUIRED:
3.5 SPACE PER 1,000 SF
(±250 / 1,000) X 3.5 = 12 SPACES

PARKING PROVIDED:
11 STANDARD SPACES
+1 HANDICAPPED SPACES
12 TOTAL SPACES

HATCH LEGEND:
CONCRETE PAVEMENT
PROPOSED CONCRETE SIDEWALK
EXISTING CONCRETE SIDEWALK

SPECIAL NOTE
1. ALL DEVELOPMENTS SHALL CONFORM TO THE REQUIREMENTS OF THE CITY OF MISSIONS STORM WATER MANAGEMENT CRITERIA INCORPORATED BY REFERENCE HEREIN

STORMWATER NOTES:
EXISTING CONDITION
PERVIOUS AREA = ±0.05 AC (7%)
IMPERVIOUS AREA = ±0.71 AC (93%)

PROPOSED CONDITION
PERVIOUS AREA = ±0.09 AC (12%)
IMPERVIOUS AREA = ±0.67 AC (88%)

VICINITY MAP N.T.S.
SITE

Know what's below.
Call before you dig.
Kansas 811

WALMER STREET

JOHNSON DRIVE

EQUIP. ROOM
CARWASH 3,250 SF
20'X29' PREP CANOPY

8'X15 DUMPSTER ENCLOSURE
VACUUM HOUSE 8' X 14'

LANDSCAPE FEATURE
STREETLIGHT
SIDEWALK
BENCH
TREE

Appendices

Convenience Market with Gasoline Pumps
(853)

Vehicle Trip Ends vs:	Vehicle Fueling Positions
On a:	Weekday,
	Peak Hour of Adjacent Street Traffic,
	One Hour Between 4 and 6 p.m.
Setting/Location:	General Urban/Suburban
Number of Studies:	69
Avg. Num. of Vehicle Fueling Positions:	6
Directional Distribution:	50% entering, 50% exiting

Vehicle Trip Generation per Vehicle Fueling Position

Average Rate	Range of Rates	Standard Deviation
23.04	5.75 - 57.80	11.91

Data Plot and Equation
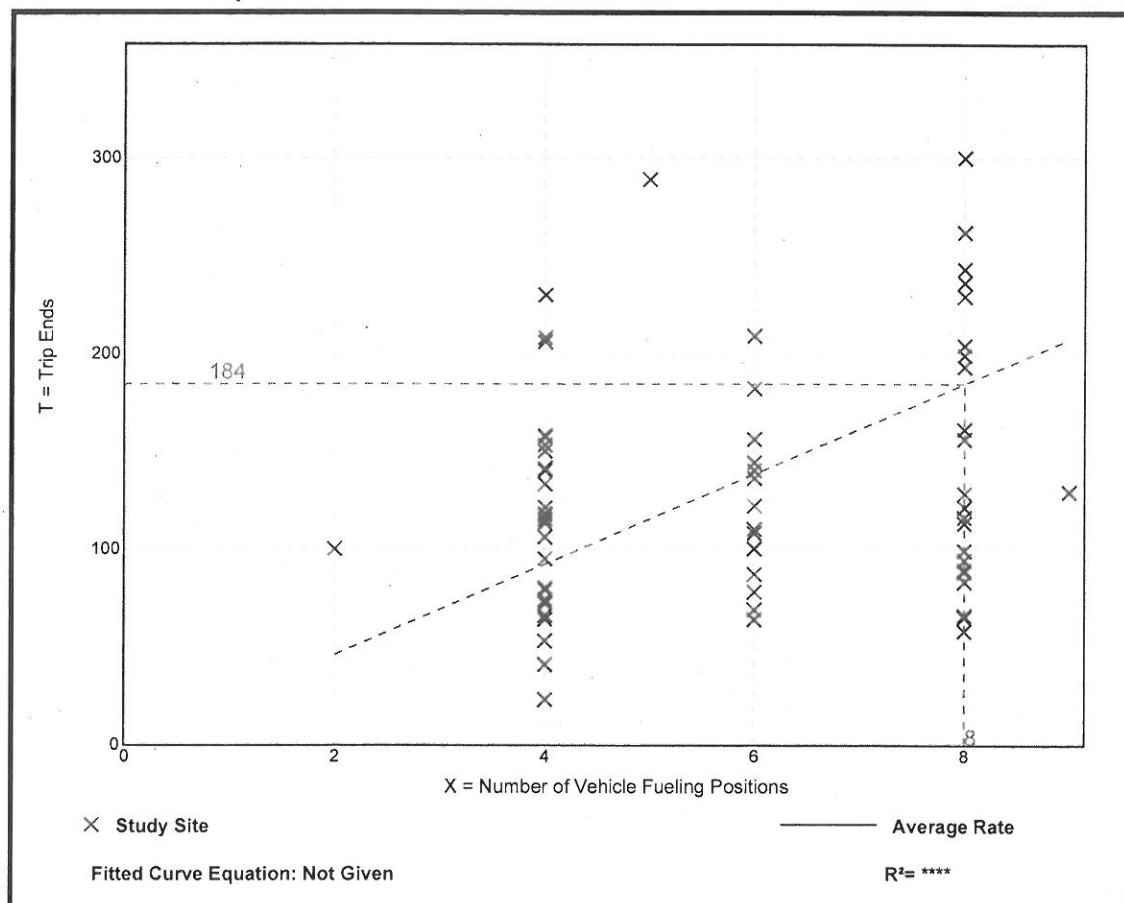
X = Number of Vehicle Fueling Positions

T = Trip Ends

X Study Site
——— Average Rate

Fitted Curve Equation: Not Given

R^2 = ****

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Appendix A - Trip Generation Data Plots

Convenience Market with Gasoline Pumps
(853)

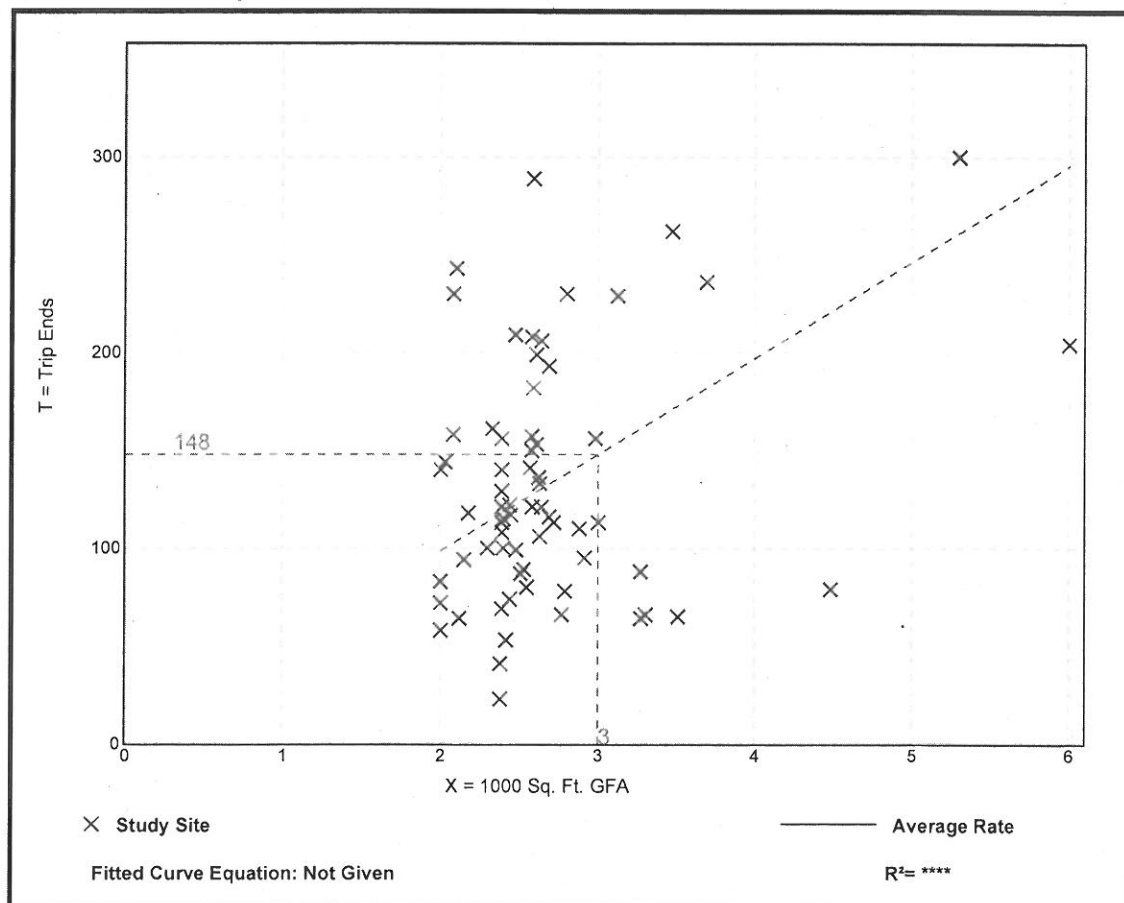|	
Vehicle Trip Ends vs:	1000 Sq. Ft. GFA
On a:	Weekday,
	Peak Hour of Adjacent Street Traffic,
	One Hour Between 4 and 6 p.m.
Setting/Location:	General Urban/Suburban
Number of Studies:	67
Avg. 1000 Sq. Ft. GFA:	3
Directional Distribution:	50% entering, 50% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
49.29	9.66 - 115.71	22.49

Data Plot and Equation

X = 1000 Sq. Ft. GFA

T = Trip Ends

× Study Site   ———— Average Rate

Fitted Curve Equation: Not Given R^2= ****

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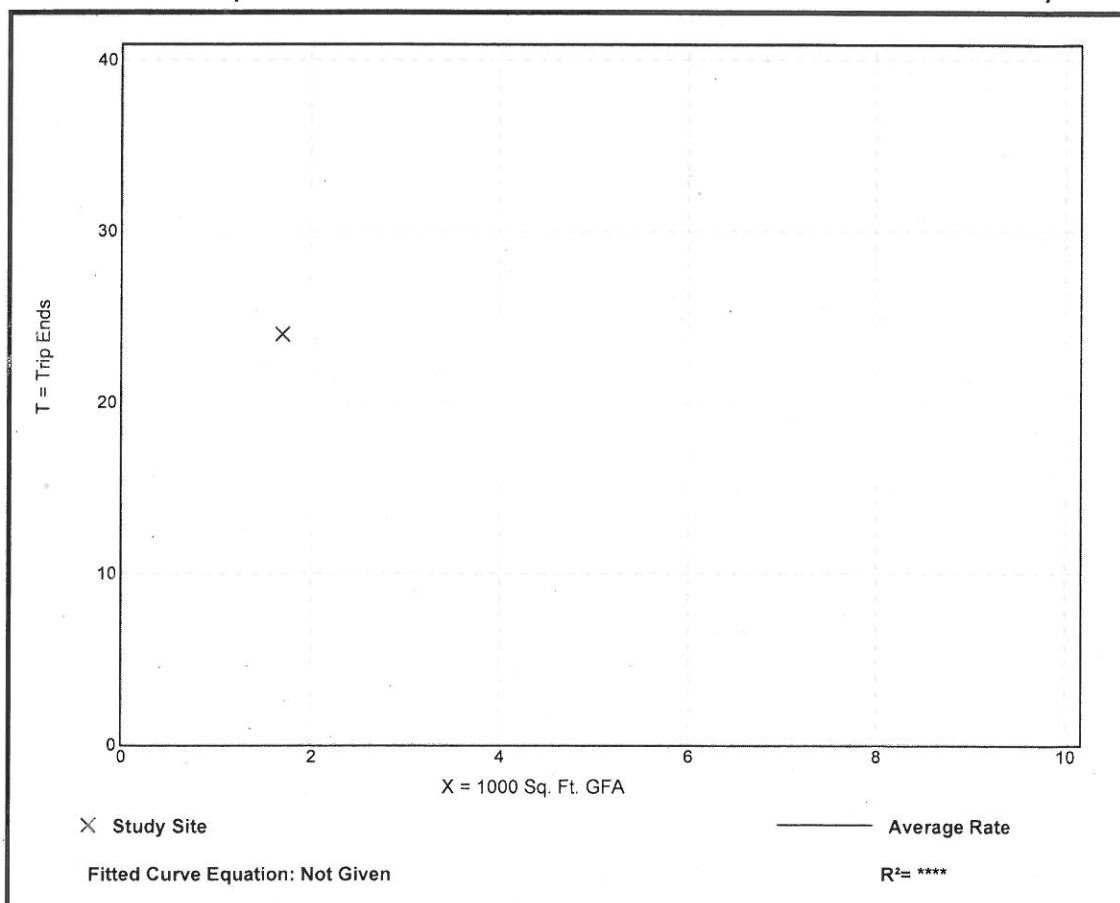
Appendix A - Trip Generation Data Plots

Automated Car Wash
(948)

Vehicle Trip Ends vs:	1000 Sq. Ft. GFA
On a:	Weekday,
	Peak Hour of Adjacent Street Traffic,
	One Hour Between 4 and 6 p.m.
Setting/Location:	General Urban/Suburban
Number of Studies:	1
Avg. 1000 Sq. Ft. GFA:	2
Directional Distribution:	50% entering, 50% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
14.20 X 3.25 = 46	14.20 - 14.20	*

Data Plot and Equation

Caution – Small Sample Size

X = 1000 Sq. Ft. GFA

X Study Site   ——— Average Rate

Fitted Curve Equation: Not Given   R²= ****

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Appendix A - Trip Generation Data Plots

Automated Car Wash
(948)

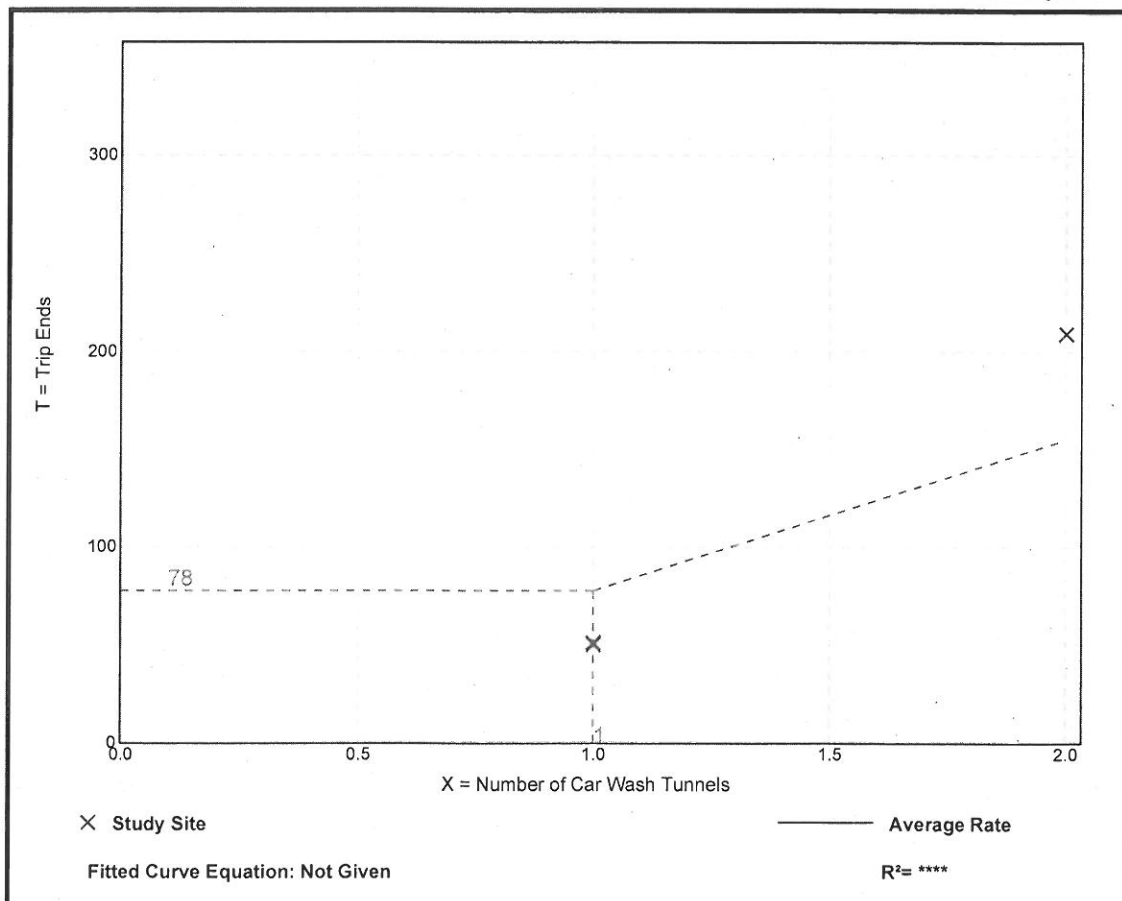|	
Vehicle Trip Ends vs:	Car Wash Tunnels
On a:	Weekday,
	Peak Hour of Adjacent Street Traffic,
	One Hour Between 4 and 6 p.m.
Setting/Location:	General Urban/Suburban
Number of Studies:	3
Avg. Num. of Car Wash Tunnels:	1
Directional Distribution:	50% entering, 50% exiting

Vehicle Trip Generation per Car Wash Tunnel

Average Rate	Range of Rates	Standard Deviation
77.50	50.00 - 104.50	33.07

Data Plot and Equation

Caution – Small Sample Size

X = Number of Car Wash Tunnels

T = Trip Ends

✕ Study Site ——— Average Rate

Fitted Curve Equation: Not Given $R^2 = ****$

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Gasoline/Service Station With Convenience Market
(945)

Vehicle Trip Ends vs:	Vehicle Fueling Positions	
On a:	Weekday, Peak Hour of Adjacent Street Traffic, One Hour Between 4 and 6 p.m.	
Setting/Location:	General Urban/Suburban	
Number of Studies:	16	
Avg. Num. of Vehicle Fueling Positions:	15	
Directional Distribution:	51% entering, 49% exiting	

Considered, but
not used

Vehicle Trip Generation per Vehicle Fueling Position

Average Rate	Range of Rates	Standard Deviation
13.99	7.67 - 27.35	6.18

Data Plot and Equation
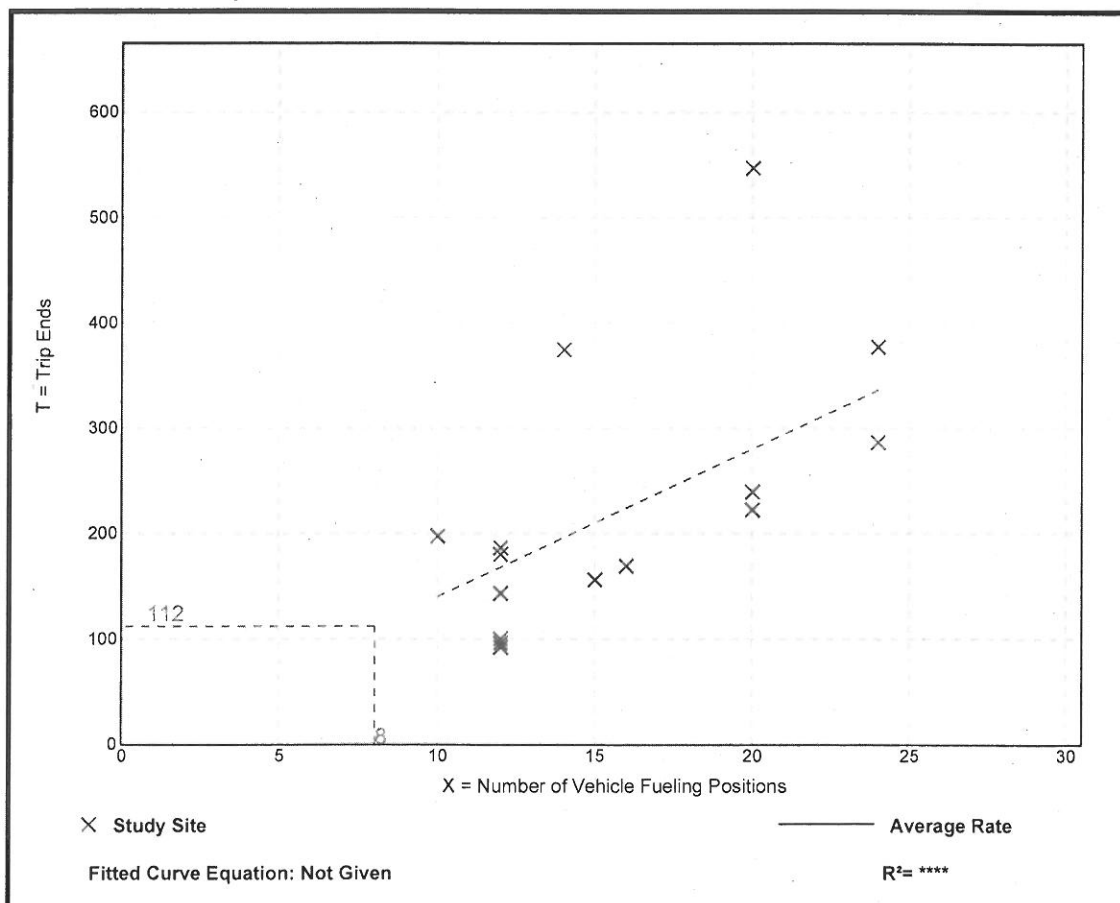
Fitted Curve Equation: Not Given   R²= ****

X Study Site   —— Average Rate

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Gasoline/Service Station With Convenience Market
(945)

Vehicle Trip Ends vs:	**1000 Sq. Ft. GFA**
On a:	**Weekday,**
	Peak Hour of Adjacent Street Traffic,
	One Hour Between 4 and 6 p.m.
Setting/Location:	**General Urban/Suburban**
Number of Studies:	16
Avg. 1000 Sq. Ft. GFA:	2
Directional Distribution:	51% entering, 49% exiting

Considered, but not used

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
88.35	35.56 - 213.17	47.42

Data Plot and Equation

Fitted Curve Equation: Not Given $R^2=$ ****

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https://itetripgen.org/PrintGraph.htm?code=945&ivlabel=QFQAF&timeperiod=TPSIDE&... 12/5/2017