Vanasse & Associates inc
Transportation Engineers & Planners

35 New England Business Center Drive
Suite 140
Andover, MA 01810

Ref: 8707

May 20, 2021

Ms. Jean M. Bubon, AICP
Town Planner
Town of Sturbridge
301 Main Street
Sturbridge, MA 01566

Re: Proposed Travel Center
195 Charlton Road (Route 20)
Sturbridge, Massachusetts

Dear Jean:

Vanasse & Associates, Inc. (VAI) is providing responses to the comments that were raised in the May 12, 2021 Peer Review memorandum prepared by Pare Corporation (Pare) on behalf of the Town and the email comments from the Sturbridge Police Department dated May 7, 2021 in reference to the April 2021 *Transportation Impact Assessment* (the "April 2021 TIA") prepared by VAI in support of the proposed travel center to be located at 195 Charlton Road (Route 20) in Sturbridge, Massachusetts (hereafter referred to as the "Project"). Listed below are the comments that were identified by the subject parties followed by our response on behalf of the Applicant.

Pare Review Comments on the Traffic Impact Study, dated April 2021:

Comment 1: *Introduction - Limits of study area are acceptable.*

Response: No response required.

Comment 2: *Project Description – Please provide update regarding consultation with MassDOT regarding off-site improvements and the State Highway Access Permit in addition to the Environmental Notification Form (ENF) and the Environmental Impact Report (EIR).*

Response: The Applicant has been actively coordinating with the Town and MassDOT as the Project has advanced. An initial State Highway Access Permit Application was submitted to MassDOT in December 2020 in order to initiate a coordination/scoping meeting that was also held in December 2020. Follow-up consultations were held with MassDOT to confirm the trip-generation methodology and the study area that has been assessed in the April 2021 TIA, as well as the design of the access to the Project site and, in particular, the planned installation of a traffic control signal at the primary access to the Project based on meeting the warrants specified in the Manual on Uniform Traffic Control Devices (MUTCD).[1] An Expanded Environmental Notification Form (EENF) is currently being prepared for the Project pursuant to the requirements of the Massachusetts Environmental Policy Act (MEPA) and will be followed by the preparation of an Environmental Impact Report (EIR)

[1]*Manual on Uniform Traffic Control Devices (MUTCD)*; Federal Highway Administration; Washington, D.C.; 2009.

that will be responsive to the Secretary of Energy and Environmental Affairs (EEA) Certificate issued on the EENF and the associated comment letters.

Comment 3: *Study Methodology - The applicant's has completed the traffic study by reviewing existing conditions, future no-build conditions and future build conditions and by performing the study in accordance with MassDOT's Transportation Impact Assessment Guidelines. Capacity and safety analysis were completed as part of the study. Methodology is acceptable.*

Response: No response required.

Comment 4: *Existing Conditions – Roadway and intersection descriptions are correct.*

Response: No response required.

Comment 5: *Existing Travel Volumes – Weekday a.m. peak hour, weekday p.m. peak hour and Saturday midday peak hour counts were collected. Adjustments were reviewed for the counts due to seasonal fluctuations. The month (October) when counts were performed are above-average month conditions. No adjustments were made for seasonal fluctuations. Also, adjustments were reviewed and made due to the COVID-19 pandemic. Volumes pre-COVID versus during the pandemic were reviewed from the Hobbs Brook Driveway. Proper adjustments were made to the existing volumes throughout the study area.*

Response: No response required.

Comment 6: *Spot Speed Measurements – Speed data was obtained for Route 20 in the vicinity of the proposed site. Speed data obtained appears correct.*

Response: No response required.

Comment 7: *Pedestrian and Bicycle Facilities - Data collected for these components appear accurate.*

Response: No response required.

Comment 8: *Public Transportation – Section description is correct.*

Response: No response required.

Comment 9: *Motor Vehicle Crash Data – The data collection and summary appear accurate. Crash rate analysis to support the rates being below both MassDOT Statewide and District Averages are included in Appendix. Crash rates currently are less than State averages.*

Response: No response required.

Comment 10: *Future Traffic Growth - Applicant considered future projects and background growth to determine Future No-Build (2028) conditions. Methodology is correct.*

Response: No response required.

Comment 11: *Project – Generated Traffic – Pare agrees that Automobile Sales LUC 840 for the electrical vehicle discovery center is the best comparable use to determine trips. It is understood that classes/seminars could be taught at this center attracting a significant number of visitors/users. Were these volumes considered?*

Response: The traffic volumes associated with the classes/seminars that could take place at the electrical vehicle discovery center will most likely occur during off-peak traffic volume periods; however, the associated traffic volumes would reasonably be reflected in the trip projections resulting from the use of Institute of Transportation Engineers (ITE) Land Use Code (LUC) 840, *Automobile Sales (New)*,[2] given that said land use includes trips associated with a full-service automobile dealership that includes both vehicle sales and service, components that are not associated with the electric vehicle discovery center.

Comment 12: *For the travel center, two XtraMarts on Route 146 in Sutton and Millbury were used to determine potential trips as they have a similar level of amenities. It has been noted that these sites were discussed with MassDOT. Please provide information to size of those facilities, uses at those facilities (number of fueling stations, diesel stations, uses inside building, etc.) for comparison. For example the site at 27 Worcester-Providence Turnpike does not have a drive-thru or sit-down restaurants. Provide further back-up as to how they compare and to justify why they were used to develop trips for this site.*

Response: The subject XtraMarts were selected by the MassDOT District 3 Office to develop the traffic characteristics of the travel center due to their location proximate to a major highway (Interstate-90 (I-90)) and that they are located in a similar region of the state. Data was provided to MassDOT for other travel centers; however, the subject locations were specified for use in conducting the assessment.

The XtraMart located at 27 Worcester-Providence Turnpike in Sutton is approximately 5,805 square foot (sf) and contains the following amenities: convenience market with an ATM machine; Dunkin' Donuts with drive-through; Subway restaurant; an 8-pump (16 vfp) fueling facility; and a 3-pump diesel fueling facility. The XtraMart located at 100 Worcester-Providence Turnpike in Millbury is approximately 3,824 sf and contains the following amenities: convenience market with an ATM machine; Dunkin' Donuts with drive-through; a 5-pump (10 vfp) fueling facility; and a 3-pump diesel fueling facility. A comparison of the trip rates derived from the XtraMart sites to those of ITE LUC 853, *Convenience Market with Gasoline Pumps*, indicates that the average trip rates derived from the XtraMart sites are higher on an weekday (daily) and for the weekday morning peak-hour, and similar to the trip rate for weekday evening peak-hour. The calculate trip rates for the two sites, the assessors records, and trip rates for ITE LUC 853 are attached.

Comment 13: *Pass-by trip adjustments are acceptable.*

Response: No response required.

[2] *Trip Generation*, 10th Edition; Institute of Transportation Engineers; Washington, DC; 2017.

Comment 14: *Trip Distribution and Assignment- The trip distribution was based on existing traffic patterns. The distribution of traffic provided in Figures 9 through 15 are acceptable.*

Response: No response required.

Comment 15: *Traffic Operations Analysis- Applicant reviewed existing (2020) conditions and Future (2028) No-build and Build conditions.*

Results

- *Route 20 at the Center at Hobbs Brook Driveway- The proposed development with projected volumes indicate no significant impacts to capacity or delay at this intersection.*

Response: No response required.

- *Route 20/Main Site Driveway/Bank - Does analysis take into account traffic from Bank if driveway is to be realigned? This should be included in the operations of the intersection and the analysis. This will be needed to get a better understanding of capacity, delays and queues.*

Response: The traffic operations analysis that was presented in the April 2021 TIA did not include the exiting traffic from the bank as part of the analysis. This analysis has been revised and is attached, and indicates that the proposed signalized intersection will continue to operate at a level-of-service (LOS) of B under all analysis periods.

- *Route 20 at Hall Road - Existing movements northbound operate at LOS E and F during peak hours. Future No-Build versus Future Build indicates no significant reduction in LOS but there is significant delay northbound. The applicant is to perform a detailed Traffic Signal Warrant Analysis for the Route 20/Hall Road intersection. The results of that and the impacts on this project should be discussed.*

Response: Potential improvements will be identified in conjunction with the technical memorandum that will accompany the Traffic Signal Warrant Analysis and will be submitted to both the Town and MassDOT. To some extent, the installation of a traffic control signal at the primary Project site driveway intersection will induce gaps in through traffic along Route 20 in the westbound direction that will afford additional opportunities for vehicles to turn left from Hall Road that is not reflected in the analysis model.

- *Route 20 at the Exit-Only Driveway - Level of Service appears acceptable based on volumes generated. There is a concern however that this is going to be truck traffic only and most will be travelling westbound towards the Turnpike. Traffic exiting the site heading westbound will need to cross two eastbound travel lanes. How will this intersection work with proposed signal in place. Gaps may be created due to signal but what will queues be like for traffic heading westbound. This should be addressed.*

Response: The circulation within the Project site will allow for passenger vehicles and light-duty trucks to use both driveways to exit; however, tractor semi-trailer combinations will use the exit-only Project site driveway. While the Project site has been designed to accommodate the fueling of such vehicles, only two (2) parking spaces are provided that

can accommodate a tractor semi-trailer combination. As such and given the extended time that is required to fuel such vehicles, the number of such trucks exiting from the driveway is expected to be relatively minor. Given that there are exiting travel centers along I-84 and I-90 that accommodate trucks using these roadways, it is expected that the majority of the tractor semi-trailers that access the Project site are most likely traveling east on Route 20 and would be turning right when exiting the driveway.

As indicated by Pare, the proposed traffic signal that will be installed at the primary Project site driveway intersection will create gaps in the flow of eastbound traffic that will allow for trucks to exit from the driveway in a safe manner, particularly given that sights lines at the driveway far exceed the minimum distances for safe and efficient operations with consideration of the additional travel time that is needed to cross the added travel lanes on Route 20. A review of the predicted vehicle queue on the Route 20 westbound approach to the traffic signal indicates that the longest 95th percentile vehicle queue is expected to be 109 feet in the left-turn lane and 152 feet in the through lanes, neither of which will block the exit-only Project site driveway which is located approximately 340 feet east of the stop-line for westbound traffic at the proposed traffic signal.

Comment 16: *Traffic Signal Warrant Analysis – Applicant has demonstrated that a traffic signal is warranted at the proposed main driveway entrance.*

Response: No response required.

Comment 17: *Sight Distance Evaluation – Pare is in agreement that the sight distance at the driveways are acceptable as good sight lines are available eastbound and westbound along Route 20.*

Response: No response required.

Comment 18: *Site Access and Circulation – The report does not discuss site access and circulation. Comments regarding this are provided under Plan comments.*

Response: Recommendations were provided regarding internal circulation within the Project site for vehicles, pedestrians and bicyclists, which are or will be incorporated into the Site Plans.

Sturbridge Police Department Comments:

Comment 1: *From Chief Dessert Via Email 05-07-2021*

Hi Jean, my only concern at this time is based on information provided to me by Lt. Lombardi and I concur. He expressed concern that TT units will be pulling out of the far east driveway. This driveway will not be the driveway controlled by a traffic light and therefore TT units will be crossing over all lanes of travel when making a left turn out of there. As you are aware this is a high speed road and having the TT units crossing over all travel lanes to turn left will be unsafe. I would also be concerned that the traffic light would stop TT's as they pull out and potentially leave TT units stopped across the lanes as they pull out.

Lt. Lombardi, please provide your feedback as well. TY

Response: See response to Pare Comment 15 regarding "Route 20 at the Exit Only Driveway".

Comment 2: *From Lt. Joseph Lombardi – Via Email 05-07-2021*

Good evening Jean, Chief Dessert is accurate in what I expressed to him. The only addition I'd like to include is most of these trucks would probably exit 20 westbound heading towards the pike and 84 ramps. As stated by the Chief, this is dangerous for TT units pulling out onto route 20 crossing eastbound lanes. I would caution the solution of only allowing "right turn only" out of this exit as that will create further problems for TT units attempting to make a u-turn in the Hobbs brook plaza or no better at 49/20 to reverse direction of travel.

Response: We concur that given the exiting travel centers along I-84 and I-90 that accommodate trucks using these roadways, the majority of the tractor semi-trailers that access the Project site are most likely traveling east on Route 20 and would be turning right when exiting the driveway. That being said and as stated previously, the number of tractor semi-trailers that are expected to patronize the Project is relatively small and the design and location of the driveway as it relates to the operation of the proposed traffic signal and lines of sight indicates that the driveway can function in a safe manner.

We trust that this information is responsive to the comments that were provided by Pare and the Police Department concerning the April 2021 TIA. If you should have any questions or would like to discuss our responses in more detail, please feel free to contact me.

Sincerely,

VANASSE & ASSOCIATES, INC.

Jeffrey S. Dirk

Jeffrey S. Dirk, P.E., PTOE, FITE
Managing Partner

Professional Engineer in CT, MA, ME, NH, RI and VA

JSD/jsd

Attachments

ATTACHMENTS

ASSESSORS RECORDS
TRIP RATE CALCULATIONS
ITE LUC 853 TRIP RATES
CAPACITY ANALYSIS WORKSHEETS

ASSESSORS RECORDS

27 WORC-PROV TPKE

Location	27 WORC-PROV TPKE	**Mblu**	5/ 18/ / /
Acct#		**Owner**	T E D REALTY TRUST
Assessment	$1,407,200	**Appraisal**	$1,407,200
PID	98	**Building Count**	1

Current Value

Appraisal			
Valuation Year	**Improvements**	**Land**	**Total**
2021	$1,036,700	$370,500	$1,407,200
Assessment			
Valuation Year	**Improvements**	**Land**	**Total**
2021	$1,036,700	$370,500	$1,407,200

Owner of Record

Owner	T E D REALTY TRUST	**Sale Price**	$550,000
Co-Owner	THOMAS DENESOWICZ TRUSTEE	**Certificate**	
Address	10 SUSAN DRIVE DUDLEY, MA 01571	**Book & Page**	33173/0256
		Sale Date	03/30/2004
		Instrument	1G

Ownership History

Ownership History					
Owner	**Sale Price**	**Certificate**	**Book & Page**	**Instrument**	**Sale Date**
T E D REALTY TRUST	$550,000		33173/0256	1G	03/30/2004
HOWARD ROBERT J	$0		04718/0366		

Building Information

Building 1 : Section 1

Year Built:	2007
Living Area:	5,805
Replacement Cost:	$723,135
Building Percent Good:	88

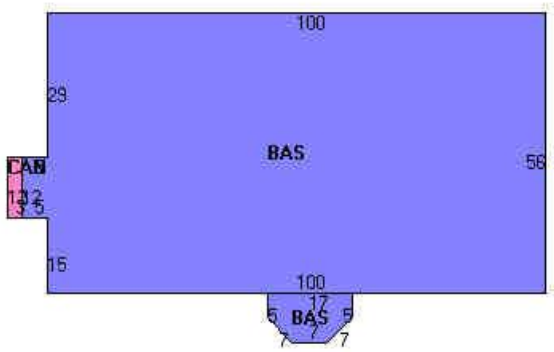
Replacement Cost
Less Depreciation: $636,400

Building Attributes	
Field	**Description**
Style:	Gas Mart
Model	Comm/Ind
Grade	Average +10
Stories:	1
Occupancy	2.00
Exterior Wall 1	Hardy Plank
Exterior Wall 2	
Roof Structure	Gable/Hip
Roof Cover	Asph/F Gls/Cmp
Interior Wall 1	Drywall/Sheet
Interior Wall 2	
Interior Floor 1	Ceram Clay Til
Interior Floor 2	
Heating Fuel	Gas
Heating Type	Forced Air-Duc
AC Type	Central
Struct Class	
Bldg Use	Gas Mart/Gas Station
Total Rooms	
Total Bedrms	
Total Baths	
1st Floor Use:	
Heat/AC	HEAT/AC PKGS
Frame Type	WOOD FRAME
Baths/Plumbing	AVERAGE
Ceiling/Wall	SUS-CEIL & WL
Rooms/Prtns	AVERAGE
Wall Height	14.00
% Comn Wall	

Building Photo

(http://images.vgsi.com/photos/SuttonMAPhotos//\00\00\87\67.jpg)

Building Layout



(http://images.vgsi.com/photos/SuttonMAPhotos//Sketches/98_107.jpg)

Building Sub-Areas (sq ft)			Legend
Code	**Description**	**Gross Area**	**Living Area**
BAS	First Floor	5,805	5,805
CAN	Canopy	36	0
		5,841	5,805

Extra Features

Extra Features				Legend
Code	**Description**	**Size**	**Value**	**Bldg #**
DUW1	DRIVE-UP WINDW	1.00 UNITS	$5,300	1

Land

Land Use **Land Line Valuation**

Use Code	3340	**Size (Acres)**	7.79
Description	Gas Mart/Gas Station	**Frontage**	315
Zone	B2	**Depth**	0
Neighborhood	C1	**Assessed Value**	$370,500
Alt Land Appr	No	**Appraised Value**	$370,500
Category			

Outbuildings

Outbuildings						Legend
Code	**Description**	**Sub Code**	**Sub Description**	**Size**	**Value**	**Bldg #**
PAV1	PAVING-ASPHALT			35000.00 S.F.	$63,000	1
PAV2	PAVING-CONC			6000.00 S.F.	$14,400	1
CNP2	CANOPY,GD			5280.00 S.F.	$83,200	1
CNP2	CANOPY,GD			736.00 S.F.	$11,600	1
LT5	MERC VAP/FLU			18.00 UNITS	$13,500	1
PMP4	DOUBLE HOSE			8.00 UNITS	$15,600	1
PMP7	3 HOSE			1.00 UNITS	$4,900	1
SGN3	W/INT LIGHTS			76.00 S.F.&HGT	$4,400	1
TNK2	3000-10000 GAL			15000.00 GALS	$45,000	1
TNK3	GT-10,000			45000.00 GALS	$135,000	1
SHD4	COMM,WD			120.00 S.F.	$1,800	1
PMP1	PUMP-SING HSE			2.00 UNITS	$2,600	1

Valuation History

Appraisal			
Valuation Year	**Improvements**	**Land**	**Total**
2021	$1,036,700	$370,500	$1,407,200
2020	$1,036,700	$370,500	$1,407,200
2019	$985,300	$349,000	$1,334,300

Assessment			
Valuation Year	**Improvements**	**Land**	**Total**
2021	$1,036,700	$370,500	$1,407,200
2020	$1,036,700	$370,500	$1,407,200
2019	$985,300	$349,000	$1,334,300

100 WORC-PROV PIKE

Location	100 WORC-PROV PIKE	**Mblu**	52/ 3/ / /
Acct#	R	**Owner**	DRAKE PETROLEUM CO INC
Assessment	$1,176,900	**PID**	2949
Building Count	1		

Current Value

Assessment			
Valuation Year	**Improvements**	**Land**	**Total**
2020	$906,200	$270,700	$1,176,900

Owner of Record

Owner	DRAKE PETROLEUM CO INC	**Sale Price**	$1,300,000
Co-Owner	C/O GLOBAL PARTNERS LP	**Certificate**	
Address	15 NORTHEAST INDUSTRIAL RD BRANFORD, CT 02905	**Book & Page**	41536/0088
		Sale Date	07/25/2007
		Instrument	1U

Ownership History

Ownership History					
Owner	**Sale Price**	**Certificate**	**Book & Page**	**Instrument**	**Sale Date**
DRAKE PETROLEUM CO INC	$1,300,000		41536/0088	1U	07/25/2007
BG DEVELOPMENT LLC	$664,000		30669/0306	1O	07/03/2003
STAR GAS PROPANE,L.P.	$0		17549/0360	1A	12/18/1995
ARROW GAS CORPORATION	$0		/0		

Building Information

Building 1 : Section 1

Year Built: 2003
Living Area: 3,544
Replacement Cost: $572,433
Building Percent Good: 85
Replacement Cost Less Depreciation: $486,600

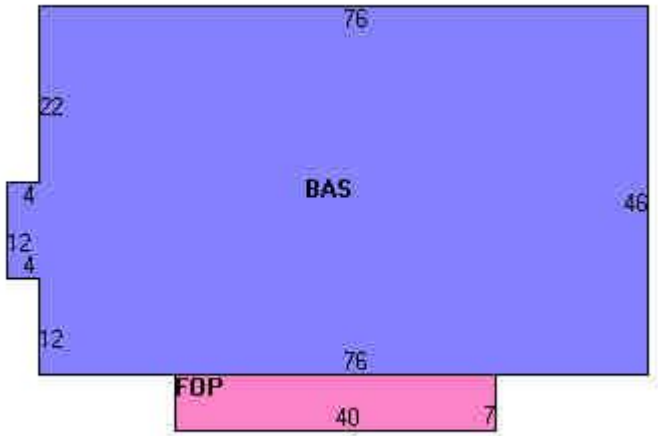
Building Attributes	
Field	**Description**
Style:	Gas Mart
Model	Comm/Ind
Grade	Average
Stories:	1
Occupancy	2.00
Exterior Wall 1	Hardy Plank
Exterior Wall 2	
Roof Structure	Gable/Hip

Building Photo

(http://images.vgsi.com/photos/MillburyMAPhotos//default.jpg)

Roof Cover	Asph/F Gls/Cmp
Interior Wall 1	Drywall/Sheet
Interior Wall 2	
Interior Floor 1	Ceramic Tile
Interior Floor 2	
Heating Fuel	Oil
Heating Type	Forced Air-Duc
AC Type	Central
Struct Class	
Bldg Use	GASMART
Total Rooms	
Total Bedrms	00
Total Baths	0
1st Floor Use:	3250
Heat/AC	HEAT/AC PKGS
Frame Type	WOOD FRAME
Baths/Plumbing	AVERAGE
Ceiling/Wall	SUS-CEIL & WL
Rooms/Prtns	AVERAGE
Wall Height	10.00
% Comn Wall	0.00

Building Layout



(http://images.vgsi.com/photos/MillburyMAPhotos//Sketches/2949_3012.jp

Building Sub-Areas (sq ft)			Legend
Code	**Description**	**Gross Area**	**Living Area**
BAS	First Floor	3,544	3,544
FOP	Porch, Open	280	0
		3,824	3,544

Extra Features

Extra Features	Legend

Code	Description	Size	Value	Bldg #
DUW1	DRIVE-UP WINDW	1.00 UNITS	$5,100	1
CLR1	COOLER	304.00 S.F.	$6,500	1

Land

Land Use

Use Code	3330
Description	GASMART
Zone	I1
Neighborhood	C1
Alt Land Appr	No
Category	

Land Line Valuation

Size (Acres)	3
Frontage	0
Assessed Value	$270,700

Outbuildings

Outbuildings						Legend
Code	**Description**	**Sub Code**	**Sub Description**	**Size**	**Value**	**Bldg #**
PAV1	PAVING-ASPHALT			50000.00 S.F.	$87,500	1
FN3	FENCE-6' CHAIN			600.00 L.F.	$5,900	1
SHD1	SHED FRAME			120.00 S.F.	$1,200	1
PMP5	W/BLENDING			5.00 UNITS	$24,500	1
PMP1	PUMP-SING HSE			2.00 UNITS	$4,200	1
TNK1	TANK-UNDERGRND			42000.00 GALS	$73,500	1
SGN3	W/INT LIGHTS			64.00 S.F.&HGT	$3,400	1
LT5	MERC VAP/FLU			10.00 UNITS	$7,000	1
LT6	W/DOUBLE LIGHT			4.00 UNITS	$4,200	1

CNP2	CANOPY,GOOD			960.00 S.F.	$20,200	1
CNP3	GAS CANOPY			3360.00 S.F.	$176,400	1

Valuation History

Assessment			
Valuation Year	**Improvements**	**Land**	**Total**
2021	$906,200	$270,700	$1,176,900
2020	$906,200	$270,700	$1,176,900
2019	$747,300	$347,000	$1,094,300

TRIP RATE CALCULATIONS

Vanasse & Associates, Inc.
Transportation Engineers & Planners

10 New England Business Center Drive
Suite 314
Andover, MA 01810-1066
Office 978-474-8800
Fax 978-688-6508

Calculations

Job: Travel Center
Location: Sturbridge, MA
Title: T/G
Calculated by: BG

Job Number: 8707
Date: 3/30/21
Sheet ____ of ____
Checked by: ____

Xtra Mart - 100 Wor-Prov Turnpike, Millbury, MA
GFA = 3,824 sf (Assessor's Record)
Weekday 24-Counts (Thursday, Jan 7, 2021)

In + Out Total = 3,041 trips

3,041/3,824 ≈ 795.24

Weekday Morning 8:15-9:15 AM

In	143		37.39
Out	119	÷ 3,824 ≈	31.12
Total	262		68.51

Weekday Evening 3:45-4:45 PM

In	124		32.43
Out	123	÷ 3,824 ≈	32.16
Total	247		64.59

Saturday Midday 11:45 AM-12:45 PM (Saturday Jan. 9, 2021)

In	123		32.16
Out	121	÷ 3,824 ≈	31.64
Total	244		63.80

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Calculations

Job: Travel Center
Location: Sturbridge, MA
Title: T/G
Calculated by: BG

Job Number: 8707
Date: 3/30/21
Sheet ____ of ____
Checked by: ____

XtraMart - 27 Hour - Rear Turnpike, Sutton, MA
GFA = 5,805 sf

Weekday 24-hour Counts (Thursday, Jan. 7, 2021)

In & Out Total = 3276

3276 / 5.805 ≈ 564.34

Weekday Morning 7:15 - 8:15 AM

In	188		32.39
Out	187	/ 5.805 ≈	32.21
Total	375		64.60

Weekday Evening 2:45 - 3:45 PM

In	93		16.02
Out	96	/ 5.805 ≈	16.54
Total	189		32.56

Saturday Midday 11:15 - 12:15 PM (Saturday, Jan. 9, 2021)

In	127		21.88
Out	134	/ 5.805 ≈	23.08
Total	261		44.96

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Suite 314
Andover, MA 01810-1066
Office 978-474-8800
Fax 978-688-6508

Calculations

Job: Travel Center
Location: Sturbridge, MA
Title: TG
Calculated by: BG

Job Number: 8707
Date: 5/30/21
Sheet ____ of ____
Checked by: ____

Average of Two sites

795.24 + 574.34 = 1359.58/2 ≃ 679.79 Weekday Daily

Weekday Morning

In	37.39	32.39	69.78	÷ 2 ≃	34.89
Out	31.12	+ 32.21	= 63.33		31.67
Total	68.51	64.60	133.11		66.56

Weekday Evening

In	32.43	16.02	48.45	÷ 2 ≃	24.23
Out	32.16	+ 16.54	= 48.70		24.35
Total	64.59	32.56	97.15		48.58

Saturday Midday

In	32.16	21.88	54.04	÷ 2 ≃	27.02
Out	31.64	+ 23.08	= 54.72		27.36
Total	63.80	44.96	108.76		54.58

ITE LUC 853 TRIP RATES

Convenience Market with Gasoline Pumps
(853)

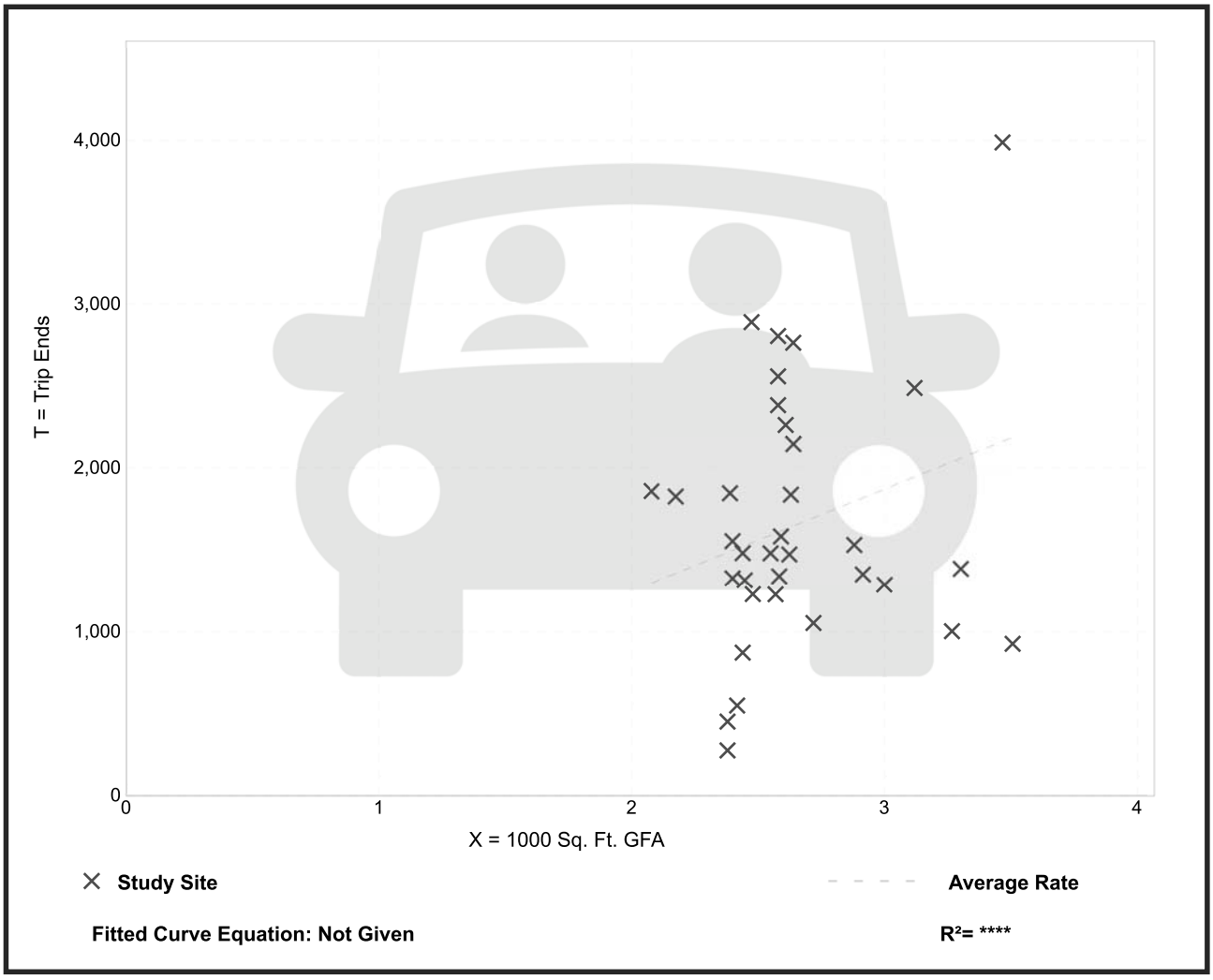
Vehicle Trip Ends vs: **1000 Sq. Ft. GFA**
On a: **Weekday**

Setting/Location: **General Urban/Suburban**
Number of Studies: 34
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
624.20	115.13 - 1167.27	283.35

Data Plot and Equation



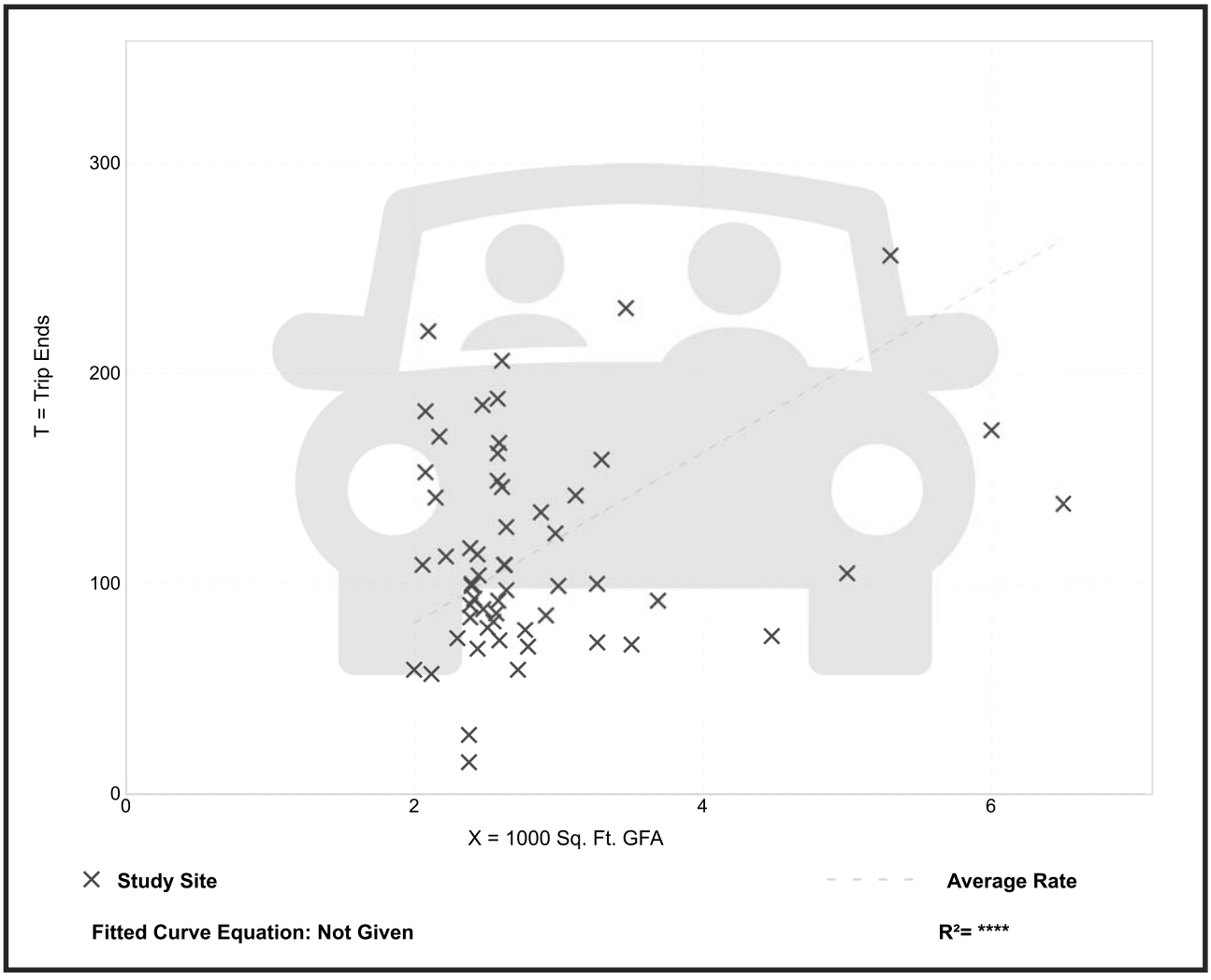
Convenience Market with Gasoline Pumps
(853)

Vehicle Trip Ends vs:	**1000 Sq. Ft. GFA**
On a:	**Weekday,**
	Peak Hour of Adjacent Street Traffic,
	One Hour Between 7 and 9 a.m.
Setting/Location:	**General Urban/Suburban**
Number of Studies:	57
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
40.59	6.30 - 104.76	19.18

Data Plot and Equation



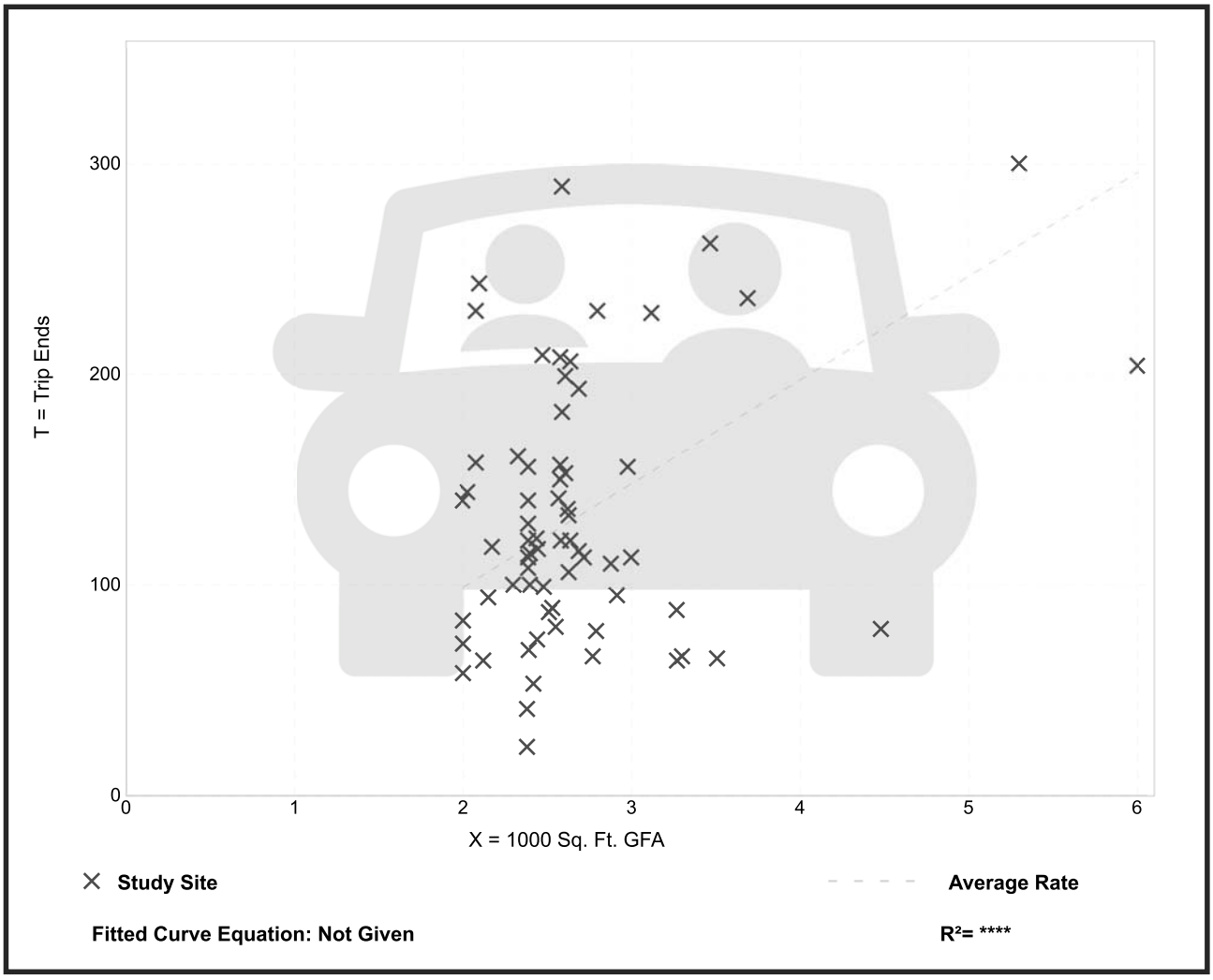
Convenience Market with Gasoline Pumps
(853)

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

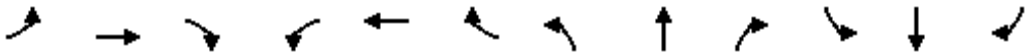
Vehicle Trip Generation per 1000 Sq. Ft. GFA

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

Data Plot and Equation



CAPACITY ANALYSIS WORKSHEETS

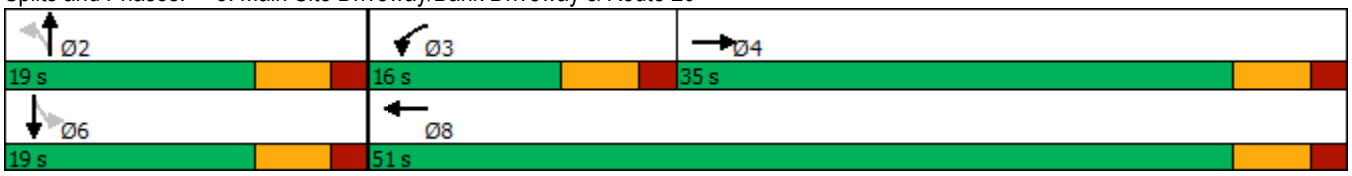


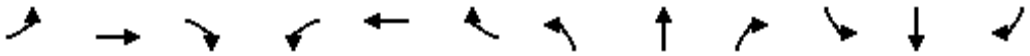
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	846	223	131	624	0	157	0	73	4	0	6
Future Volume (vph)	0	846	223	131	624	0	157	0	73	4	0	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	125		0	0		50	0		0
Storage Lanes	0		0	1		0	1		0	0		0
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		150			407			200			213	
Travel Time (s)		3.4			9.3			4.5			4.8	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	7%	2%	2%	7%	2%	2%	2%	2%	2%	2%	2%
Parking (#/hr)									0			
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1162	0	142	678	0	171	79	0	0	11	0
Turn Type		NA		Prot	NA		Perm	NA		Perm	NA	
Protected Phases		4		3	8			2			6	
Permitted Phases							2			6		
Detector Phase		4		3	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)		4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)		22.0		10.0	22.0		18.0	18.0		19.0	19.0	
Total Split (s)		35.0		16.0	51.0		19.0	19.0		19.0	19.0	
Total Split (%)		50.0%		22.9%	72.9%		27.1%	27.1%		27.1%	27.1%	
Yellow Time (s)		4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)		2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		-2.0		-2.0	-2.0		-2.0	0.0			-2.0	
Total Lost Time (s)		4.0		4.0	4.0		4.0	6.0			4.0	
Lead/Lag		Lag		Lead								
Lead-Lag Optimize?		Yes		Yes								
Recall Mode		None		None	None		None	None		None	None	
v/c Ratio		0.62		0.38	0.27		0.49	0.13			0.02	
Control Delay		15.7		29.7	4.5		30.2	0.5			0.1	
Queue Delay		0.0		0.0	0.0		0.0	0.0			0.0	
Total Delay		15.7		29.7	4.5		30.2	0.5			0.1	
Queue Length 50th (ft)		203		56	52		66	0			0	
Queue Length 95th (ft)		281		108	75		126	0			0	
Internal Link Dist (ft)		70			327			120			133	
Turn Bay Length (ft)				125								
Base Capacity (vph)		1874		443	2514		437	669			573	
Starvation Cap Reductn		0		0	0		0	0			0	
Spillback Cap Reductn		0		0	0		0	0			0	
Storage Cap Reductn		0		0	0		0	0			0	
Reduced v/c Ratio		0.62		0.32	0.27		0.39	0.12			0.02	

Intersection Summary	
Area Type:	Other
Cycle Length: 70	

Actuated Cycle Length: 59.5
Natural Cycle: 60
Control Type: Actuated-Uncoordinated

Splits and Phases: 5: Main Site Driveway/Bank Driveway & Route 20

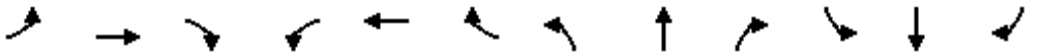




Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	846	223	131	624	0	157	0	73	4	0	6
Future Volume (vph)	0	846	223	131	624	0	157	0	73	4	0	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0		4.0	6.0			4.0	
Lane Util. Factor		0.95		1.00	0.95		1.00	1.00			1.00	
Frt		0.97		1.00	1.00		1.00	0.85			0.91	
Flt Protected		1.00		0.95	1.00		0.95	1.00			0.98	
Satd. Flow (prot)		3301		1770	3374		1770	1583			1672	
Flt Permitted		1.00		0.95	1.00		0.75	1.00			0.90	
Satd. Flow (perm)		3301		1770	3374		1398	1583			1524	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	920	242	142	678	0	171	0	79	4	0	7
RTOR Reduction (vph)	0	30	0	0	0	0	0	68	0	0	9	0
Lane Group Flow (vph)	0	1132	0	142	678	0	171	11	0	0	2	0
Heavy Vehicles (%)	2%	7%	2%	2%	7%	2%	2%	2%	2%	2%	2%	2%
Parking (#/hr)									0			
Turn Type		NA		Prot	NA		Perm	NA		Perm	NA	
Protected Phases		4		3	8			2			6	
Permitted Phases							2			6		
Actuated Green, G (s)		28.4		6.7	41.1		8.6	8.6			8.6	
Effective Green, g (s)		30.4		8.7	43.1		10.6	8.6			10.6	
Actuated g/C Ratio		0.49		0.14	0.70		0.17	0.14			0.17	
Clearance Time (s)		6.0		6.0	6.0		6.0	6.0			6.0	
Vehicle Extension (s)		3.0		3.0	3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)		1626		249	2356		240	220			261	
v/s Ratio Prot		c0.34		c0.08	0.20			0.01				
v/s Ratio Perm							c0.12				0.00	
v/c Ratio		0.70		0.57	0.29		0.71	0.05			0.01	
Uniform Delay, d1		12.1		24.8	3.5		24.1	23.0			21.2	
Progression Factor		1.00		1.00	1.00		1.00	1.00			1.00	
Incremental Delay, d2		1.3		3.1	0.1		9.6	0.1			0.0	
Delay (s)		13.4		27.9	3.6		33.7	23.1			21.2	
Level of Service		B		C	A		C	C			C	
Approach Delay (s)		13.4			7.8			30.4			21.2	
Approach LOS		B			A			C			C	

Intersection Summary			
HCM 2000 Control Delay	13.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	61.7	Sum of lost time (s)	14.0
Intersection Capacity Utilization	64.8%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

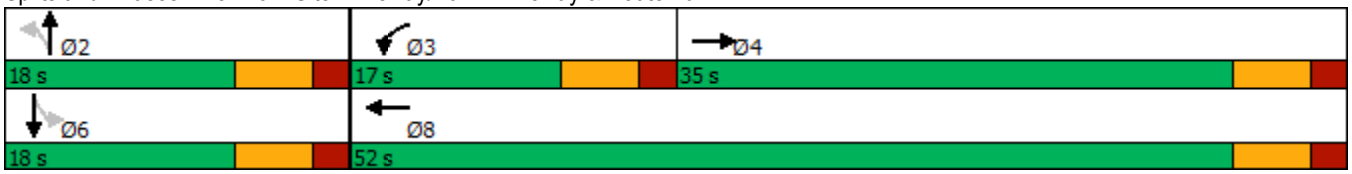


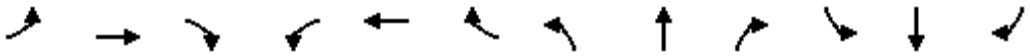
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	1049	144	116	1138	0	139	0	60	6	0	25
Future Volume (vph)	0	1049	144	116	1138	0	139	0	60	6	0	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	125		0	0		59	0		0
Storage Lanes	0		0	1		0	1		0	0		0
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		184			389			200			189	
Travel Time (s)		4.2			8.8			4.5			4.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1297	0	126	1237	0	151	65	0	0	34	0
Turn Type		NA		Prot	NA		Perm	NA		Perm	NA	
Protected Phases		4		3	8			2			6	
Permitted Phases							2			6		
Detector Phase		4		3	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)		4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)		22.0		10.0	22.0		17.0	17.0		18.0	18.0	
Total Split (s)		35.0		17.0	52.0		18.0	18.0		18.0	18.0	
Total Split (%)		50.0%		24.3%	74.3%		25.7%	25.7%		25.7%	25.7%	
Yellow Time (s)		4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)		2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		-2.0		-2.0	-2.0		-2.0	0.0			-2.0	
Total Lost Time (s)		4.0		4.0	4.0		4.0	6.0			4.0	
Lead/Lag		Lag		Lead								
Lead-Lag Optimize?		Yes		Yes								
Recall Mode		None		None	None		None	None		None	None	
v/c Ratio		0.66		0.32	0.47		0.46	0.11			0.07	
Control Delay		16.9		27.9	5.4		30.5	0.4			0.3	
Queue Delay		0.0		0.0	0.0		0.0	0.0			0.0	
Total Delay		16.9		27.9	5.4		30.5	0.4			0.3	
Queue Length 50th (ft)		237		48	111		58	0			0	
Queue Length 95th (ft)		330		95	150		115	0			0	
Internal Link Dist (ft)		104			309			120			109	
Turn Bay Length (ft)				125								
Base Capacity (vph)		1962		504	2686		419	654			572	
Starvation Cap Reductn		0		0	0		0	0			0	
Spillback Cap Reductn		0		0	0		0	0			0	
Storage Cap Reductn		0		0	0		0	0			0	
Reduced v/c Ratio		0.66		0.25	0.46		0.36	0.10			0.06	

Intersection Summary	
Area Type:	Other
Cycle Length: 70	
Actuated Cycle Length: 58.9	
Natural Cycle: 55	

Control Type: Actuated-Uncoordinated

Splits and Phases: 5: Main Site Driveway/Bank Driveway & Route 20

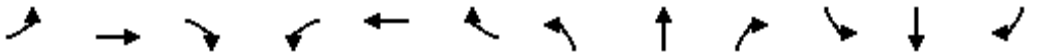




Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	1049	144	116	1138	0	139	0	60	6	0	25
Future Volume (vph)	0	1049	144	116	1138	0	139	0	60	6	0	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0		4.0	6.0			4.0	
Lane Util. Factor		0.95		1.00	0.95		1.00	1.00			1.00	
Frt		0.98		1.00	1.00		1.00	0.85			0.89	
Flt Protected		1.00		0.95	1.00		0.95	1.00			0.99	
Satd. Flow (prot)		3475		1770	3539		1770	1583			1646	
Flt Permitted		1.00		0.95	1.00		0.73	1.00			0.93	
Satd. Flow (perm)		3475		1770	3539		1369	1583			1550	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	1140	157	126	1237	0	151	0	65	7	0	27
RTOR Reduction (vph)	0	14	0	0	0	0	0	57	0	0	28	0
Lane Group Flow (vph)	0	1283	0	126	1237	0	151	8	0	0	6	0
Turn Type		NA		Prot	NA		Perm	NA		Perm	NA	
Protected Phases		4		3	8			2			6	
Permitted Phases							2			6		
Actuated Green, G (s)		28.0		6.9	40.9		7.9	7.9			7.9	
Effective Green, g (s)		30.0		8.9	42.9		9.9	7.9			9.9	
Actuated g/C Ratio		0.49		0.15	0.71		0.16	0.13			0.16	
Clearance Time (s)		6.0		6.0	6.0		6.0	6.0			6.0	
Vehicle Extension (s)		3.0		3.0	3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)		1714		259	2497		222	205			252	
v/s Ratio Prot		c0.37		0.07	c0.35			0.01				
v/s Ratio Perm							c0.11				0.00	
v/c Ratio		0.75		0.49	0.50		0.68	0.04			0.02	
Uniform Delay, d1		12.4		23.8	4.1		24.0	23.1			21.4	
Progression Factor		1.00		1.00	1.00		1.00	1.00			1.00	
Incremental Delay, d2		1.8		1.4	0.2		8.3	0.1			0.0	
Delay (s)		14.2		25.3	4.2		32.2	23.2			21.4	
Level of Service		B		C	A		C	C			C	
Approach Delay (s)		14.2			6.2			29.5			21.4	
Approach LOS		B			A			C			C	

Intersection Summary			
HCM 2000 Control Delay	11.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	60.8	Sum of lost time (s)	14.0
Intersection Capacity Utilization	66.0%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group



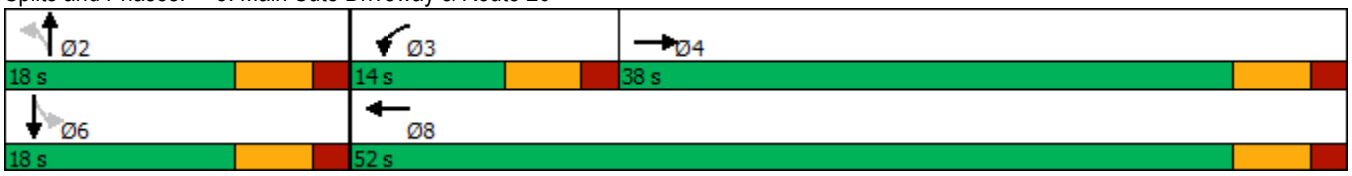
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	1126	165	127	1149	0	151	0	66	9	0	31
Future Volume (vph)	0	1126	165	127	1149	0	151	0	66	9	0	31
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	125		0	0		50	0		0
Storage Lanes	0		0	1		0	1		0	0		0
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		208			395			200			207	
Travel Time (s)		4.7			9.0			4.5			4.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1403	0	138	1249	0	164	72	0	0	44	0
Turn Type		NA		Prot	NA		Perm	NA		Perm	NA	
Protected Phases		4		3	8			2			6	
Permitted Phases							2			6		
Detector Phase		4		3	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)		4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)		22.0		10.0	22.0		18.0	18.0		18.0	18.0	
Total Split (s)		38.0		14.0	52.0		18.0	18.0		18.0	18.0	
Total Split (%)		54.3%		20.0%	74.3%		25.7%	25.7%		25.7%	25.7%	
Yellow Time (s)		4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)		2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		-2.0		-2.0	-2.0		-2.0	-2.0			-2.0	
Total Lost Time (s)		4.0		4.0	4.0		4.0	4.0			4.0	
Lead/Lag		Lag		Lead								
Lead-Lag Optimize?		Yes		Yes								
Recall Mode		None		None	None		None	None		None	None	
v/c Ratio		0.68		0.44	0.47		0.53	0.13			0.10	
Control Delay		15.7		33.1	5.4		33.2	0.5			0.5	
Queue Delay		0.0		0.0	0.0		0.0	0.0			0.0	
Total Delay		15.7		33.1	5.4		33.2	0.5			0.5	
Queue Length 50th (ft)		251		56	113		65	0			0	
Queue Length 95th (ft)		341		109	152		#136	0			0	
Internal Link Dist (ft)		128			315			120			127	
Turn Bay Length (ft)				125								
Base Capacity (vph)		2059		337	2654		362	604			513	
Starvation Cap Reductn		0		0	0		0	0			0	
Spillback Cap Reductn		0		0	0		0	0			0	
Storage Cap Reductn		0		0	0		0	0			0	
Reduced v/c Ratio		0.68		0.41	0.47		0.45	0.12			0.09	

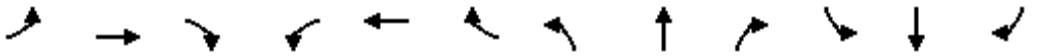
Intersection Summary	
Area Type:	Other
Cycle Length: 70	
Actuated Cycle Length: 61.1	
Natural Cycle: 60	

Control Type: Actuated-Uncoordinated

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 5: Main Sute Driveway & Route 20





Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	1126	165	127	1149	0	151	0	66	9	0	31
Future Volume (vph)	0	1126	165	127	1149	0	151	0	66	9	0	31
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0		4.0	4.0			4.0	
Lane Util. Factor		0.95		1.00	0.95		1.00	1.00			1.00	
Frt		0.98		1.00	1.00		1.00	0.85			0.90	
Flt Protected		1.00		0.95	1.00		0.95	1.00			0.99	
Satd. Flow (prot)		3471		1770	3539		1770	1583			1650	
Flt Permitted		1.00		0.95	1.00		0.73	1.00			0.92	
Satd. Flow (perm)		3471		1770	3539		1357	1583			1538	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	1224	179	138	1249	0	164	0	72	10	0	34
RTOR Reduction (vph)	0	15	0	0	0	0	0	60	0	0	37	0
Lane Group Flow (vph)	0	1388	0	138	1249	0	164	12	0	0	7	0
Turn Type		NA		Prot	NA		Perm	NA		Perm	NA	
Protected Phases		4		3	8			2			6	
Permitted Phases							2			6		
Actuated Green, G (s)		31.8		5.6	43.4		8.3	8.3			8.3	
Effective Green, g (s)		33.8		7.6	45.4		10.3	10.3			10.3	
Actuated g/C Ratio		0.53		0.12	0.71		0.16	0.16			0.16	
Clearance Time (s)		6.0		6.0	6.0		6.0	6.0			6.0	
Vehicle Extension (s)		3.0		3.0	3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)		1841		211	2522		219	255			248	
v/s Ratio Prot		c0.40		c0.08	0.35			0.01				
v/s Ratio Perm							c0.12				0.00	
v/c Ratio		0.75		0.65	0.50		0.75	0.05			0.03	
Uniform Delay, d1		11.7		26.8	4.1		25.5	22.5			22.5	
Progression Factor		1.00		1.00	1.00		1.00	1.00			1.00	
Incremental Delay, d2		1.8		7.1	0.2		13.1	0.1			0.0	
Delay (s)		13.5		33.9	4.2		38.6	22.6			22.5	
Level of Service		B		C	A		D	C			C	
Approach Delay (s)		13.5			7.2			33.7			22.5	
Approach LOS		B			A			C			C	

Intersection Summary			
HCM 2000 Control Delay	12.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	63.7	Sum of lost time (s)	12.0
Intersection Capacity Utilization	68.5%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group