MEMORANDUM

TO: NYLAH crossing LLC
c/o Mr Mirajuddin Ahmed
95 East Main Street
Westborough, MA 01581

FROM: Mr. Jeffrey S. Dirk, P.E.*, PTOE, FITE
Managing Partner
Vanasse & Associates, Inc.
35 New England Business Center Drive
Suite 140
Andover, MA 01810-1066
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Professional Engineer in CT, MA, ME, NH, RI and VA

DATE: May 30, 2024

RE: 10010

SUBJECT: Trip Generation Assessment
Proposed Mixed-Use Development - 240 East Central Street (Route 140) & 9 Lewis Street
Franklin, Massachusetts

Vanasse & Associates, Inc. (VAI) has prepared a trip generation assessment in support of the proposed mixed-use development to be located at 240 East Central Street (Route 140) and 9 Lewis Street in Franklin, Massachusetts (hereafter referred to as the "Project"). Specifically, this assessment provides a comparison of the anticipated traffic characteristics of the Project to those of the existing two-family home that is located at 240 East Central Street that included a day care and single-family home that is located at 9 Lewis Street, both of which will be removed to accommodate the Project.

Based on this assessment it has been determined that the Project will not result in a material impact (increase) on motorist delays or vehicle queueing along Route 140 or Lewis Street over existing conditions with consideration of the impacts that are associated with the existing uses that currently occupy the Project site and that will be removed to accommodate the Project.

The following details our assessment of the Project.

PROJECT DESCRIPTION

The Project will entail the construction of two (2) three-story buildings that will contain 14 multifamily residential units (an 8-unit building and a 6-unit building) and 806± square feet (sf) of commercial space to be located at 240 East Central Street (Route 140) and 9 Lewis Street in Franklin, Massachusetts. The Project site encompasses approximately 0.79± acres of land that is bounded by Route 140 and a residential/commercial building (244 East Central Street) to the north; a residential property to the south (29 Lewis Street); Lewis Street and the residential/commercial building at 244 East Central Street to the east; and the Taj Estates of Franklin II mixed-use development (currently under construction) to the west. The Project site is currently improved by two (2) primary structures with supporting garages and appurtenances that include a two-family home that is located at 240 East Central Street that included a day care and a single-family home that is located at 9 Lewis Street, both of which will be removed to accommodate the Project.

Imagery ©2024 Google

Access to the commercial unit and eight (8) of the residential units will be provided by way of a one-way drive that will traverse an alignment between Route 140 and Lewis Street, with traffic entering by way of a driveway that will intersect the south side of Route 140 approximately 80 feet west of Lewis Street and exiting by way of a driveway that will intersect the west side of Lewis Street approximately 310 feet south of Route 140. Access to the remaining six (6) residential units will be provided by way of four (4) driveways that will intersect the west side of Lewis Street along the Project site frontage. On-site parking will be provided for 31 vehicles, with 28 parking spaces provided to support the residential component of the Project, or a parking ratio of 2.0 parking spaces per unit, and three (3) parking spaces to support the commercial unit, which exceeds the parking requirements of c. 185, § 185-21, *Parking loading and driveway requirements*, of the Bylaws of the Town of Franklin.[1]

PROJECT-GENERATED TRAFFIC

In order to develop the traffic characteristics of the Project, trip generation statistics published by the Institute of Transportation Engineers (ITE)[2] for similar land uses as those proposed were used. ITE Land Use Codes (LUCs) 215, *Single-Family Attached Housing*, and LUC 822, *Strip Retail Plaza (<40k)*, was used to establish the traffic characteristics of the Project, the results of which are summarized in Table 1 with the detailed trip-generation calculations attached.

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[1]In the Commercial 1 Zoning District, 1.5 parking spaces per residential unit are required for a residential units and 1.0 parking spaces per 500 sf is required for a non-residential use, or 22 parking spaces in the case of the Project.

[2]*Trip Generation*, 11th Edition; Institute of Transportation Engineers; Washington, D.C.; 2021.

Table 1
TRIP-GENERATION SUMMARY

| | Vehicle Trips[a] | | |
Time Period	Entering	Exiting	Total
Average Weekday:	50	50	100
Weekday Morning Peak-Hour:	1	3	4
Weekday Evening Peak-Hour:	6	3	9

[a]Based on ITE LUC 215, *Single-Family Attached Housing* (14 dwelling units); and LUC 822, *Strip Retail Plaza* (<40k) (806 sf).

Project-Generated Traffic-Volume Summary

As can be seen in Table 1, the Project is expected to generate approximately 100 vehicle trips on an average weekday (two-way, 24-hour volume, or 50 vehicles entering and 50 exiting), with four (4) vehicle trips (one (1) vehicle entering and three (3) exiting) expected during the weekday morning peak-hour and nine (9) vehicle trips (six (6) vehicles entering and three (3) exiting) expected during the weekday evening peak-hour.

As mentioned previously, the Project site is currently improved by two (2) primary structures that include a two-family home that is located at 240 East Central Street that included a day care and a single-family home that is located at 9 Lewis Street, both of which will be removed to accommodate the Project. Table 2 compares the traffic volumes of the Project to those of the existing uses that will be removed to accommodate the Project. The detailed trip generation calculations for the existing uses are provided as an attachment.

Table 2
TRAFFIC VOLUME COMPARISON

| | Vehicle Trips | | |
Time Period	(A) Proposed Mixed-Use Development[a]	(B) Existing Uses[b]	(A-B) Difference
Average Weekday:	100	50	+50
Weekday Morning Peak-Hour:	4	7	-3
Weekday Evening Peak-Hour:	9	7	+2

[a]See Table 1.
[b]Based on ITE LUC 210, *Single-Family Detached Housing* (1 dwelling unit); LUC 215, *Single-Family Attached Housing* (2 dwelling units); and LUC 565, *Day Care Center* (6 students).

Traffic Volume Comparison

As can be seen in Table 2, in comparison to the existing uses that occupy the Project site and that will be removed to accommodate the Project, the Project is expected to generate approximately 50 *additional* vehicle trips on an average weekday, with three (3) *fewer* vehicle trips expected during the weekday morning peak-hour and two (2) *additional* vehicle trips expected during the weekday evening peak-hour.

Focusing on the peak-hour traffic volume changes, ***the predicted increase in traffic that may result from the Project during the weekday evening peak-hour is considered nominal (no more than one (1) additional vehicle every 30 minutes) and is more than off-set by the predicted reduction in trips during the weekday morning peak-hour, and would not result in a material impact (increase) on motorist delays or vehicle queueing along Route 140 or Lewis Street over existing conditions.***

LEWIS STREET IMPACTS

As proposed, all traffic exiting from the 8-unit residential building and the commercial unit will be directed to Lewis Street and both entering and exiting trips for the 6-unit residential building will also use Lewis Street. As such and based on a review of trip-generation calculations shown in Table 1, three (3) vehicles associated with the Project would travel along Lewis Street during the weekday morning peak-hour and six (6) vehicles would use Lewis Street during the weekday evening peak-hour. ***After accounting for the removal of the existing single-family home at 9 Lewis Street as a part of the Project, the traffic volume increases along Lewis Street as a result of the Project would range from two (2) vehicles during the weekday morning peak-hour to five (5) vehicles during the weekday evening peak-hour, or no more than one (1) added vehicle evening 12-minutes, a level of impact that would not result in a material impact (increase) on motorist delays or vehicle queueing along Lewis Street over existing conditions.***

SUMMARY

VAI has prepared a trip generation assessment in support of the proposed mixed-use development to be located at 240 East Central Street (Route 140) and 9 Lewis Street in Franklin, Massachusetts. Based on this assessment, we have concluded the following with respect to the Project:

1. Using trip-generation statistics published by the ITE,[3] the Project is expected to generate approximately 100 vehicle trips on an average weekday (two-way, 24-hour volume), with four (4) vehicle trips expected during the weekday morning peak-hour and nine (9) vehicle trips during the weekday evening peak-hour;

2. In comparison to the existing uses that currently occupy the Project site and that will be removed to accommodate the Project and <u>without consideration of the day care use</u>, the Project is expected to generate approximately 50 *additional* vehicle trips on an average weekday, with three (3) *fewer* vehicle trips expected during the weekday morning peak-hour and two (2) *additional* vehicle trips expected during the weekday evening peak-hour; and

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[3]Institute of Transportation Engineers, op. cit. 1.

3. Project-related traffic volume increases along Lewis Street are predicted to be two (2) vehicles during the weekday morning peak-hour and five (5) vehicles during the weekday evening peak-hour.

In consideration of the above, we have concluded that the Project will not result in a material impact (increase) on motorist delays or vehicle queueing along Route 140 or Lewis Street over existing conditions with consideration of the impacts that are associated with the existing uses that currently occupy the Project site and that will be removed to accommodate the Project.

Attachments: Site Plan
                Trip-Generation Calculations

ATTACHMENTS

SITE PLAN
PROJECT TRIP GENERATION CALUCLATIONS
EXISTING USES TRIP GENERATION CALCULATIONS

SITE PLAN

CONSTRUCTION NOTES

1. AT THE END OF CONSTRUCTION, ALL DRAINAGE STRUCTURES ARE TO BE CLEANED OF SILT, STONES AND OTHER DEBRIS.
2. CONTRACTOR SHALL REPORT SIGNIFICANT CONFLICTS TO THE OWNER AND DESIGN ENGINEER.
3. THE CONTRACTOR SHALL VERIFY EXISTING GRADES IN THE FIELD AND REPORT ANY DISCREPANCIES IMMEDIATELY TO THE OWNER AND DESIGN ENGINEER.
4. EXCAVATION REQUIRED WITHIN THE PROXIMITY OF EXISTING UTILITY LINES SHALL BE DONE BY HAND. CONTRACTOR SHALL REPAIR ANY DAMAGE TO EXISTING UTILITY LINES OR STRUCTURES INCURRED DURING CONSTRUCTION OPERATIONS.
5. PITCH EVENLY BETWEEN SPOT GRADES. GRADE ALL AREAS TO DRAIN. ALL PAVED AREAS MUST PITCH TO DRAIN AT A MINIMUM OF 1/8" PER FOOT UNLESS OTHERWISE SPECIFIED. ANY DISCREPANCIES NOT ALLOWING THIS MINIMUM PITCH SHALL BE REPORTED TO THE OWNER OR HIS REPRESENTATIVE PRIOR TO CONTINUING WORK.
6. ALL SITE WORK SHALL CONFORM TO THE CONTRACT DOCUMENTS AND SHALL COMPLY WITH APPLICABLE CODES AND REGULATIONS.
7. DURING THE PROGRESS OF THE WORK, THE CONTRACTOR MAY BE REQUIRED TO EXCAVATE ADDITIONAL TEST PITS FOR THE PURPOSE OF LOCATING UNDERGROUND UTILITIES OR STRUCTURES AS AN AID IN ESTABLISHING THE PRECISE LOCATION OF NEW WORK. THIS WORK IS TO BE PERFORMED AT NO ADDITIONAL COST TO THE OWNER. TEST PITS SHALL BE BACKFILLED, AS SOON AS THE DESIRED INFORMATION HAS BEEN OBTAINED.
8. PROTECT STRUCTURES, UTILITIES, SIDEWALKS, PAVEMENTS AND OTHER FACILITIES FROM DAMAGE CAUSED BY SETTLEMENT, LATERAL MOVEMENT, UNDERMINING, WASHOUT AND OTHER HAZARDS CREATED BY CONTRACTOR OPERATIONS.
9. PAVING, CONCRETE WORK AND BASE COURSE PREPARATION SHALL BE DONE ONLY AFTER EXCAVATION AND CONSTRUCTION WORK WHICH MIGHT INJURE THEM HAS BEEN COMPLETED. DAMAGE CAUSED DURING CONSTRUCTION SHALL BE REPAIRED BEFORE ACCEPTANCE.
10. PAVEMENT OR BASE MATERIALS SHALL NOT BE PLACED ON A MUDDY OR FROZEN SUBGRADE.
11. ESTABLISHMENT OF GRADES, GRADE CONTROL, AND CONFORMANCE TO REQUIRED GRADE TOLERANCES SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.
12. PROTECT GRADED, FINISHED OR PAVED AREAS FROM DAMAGE AND KEEP THEM FREE OF TRASH AND DEBRIS RESULTING FROM CONSTRUCTION OPERATIONS. REPAIR AND RE-ESTABLISH GRADES IN SETTLED, ERODED AND RUTTED AREAS.
13. PAVEMENT EXCAVATED DURING UTILITY CONSTRUCTION, WHETHER ON THE SITE OR ADJACENT PROPERTIES, SHALL BE RESTORED AND MATCHED WITH EXACTLY THE SAME MATERIALS AND TOLERANCES AS PRIOR TO DISRUPTION, AT NO ADDITIONAL COST TO THE OWNER, OR ADJACENT PROPERTY OWNERS.
14. STONE USED FOR MACHINE PLACED RIP-RAP SHALL BE REASONABLY WELL GRADED, HARD, DURABLE, ANGULAR IN SHAPE, RESISTANT TO WEATHERING AND FREE FROM ORGANIC MATERIAL. ROUNDED STONES OR BOULDERS ARE NOT ACCEPTABLE. THE MINIMUM WEIGHT OF THE STONE SHALL BE 155 POUNDS PER CUBIC FOOT. STONE SHALL BE PLACED IN CONFORMANCE WITH THE LINES, GRADES AND THICKNESS SHOWN ON THE DRAWINGS.
15. AT ALL LOCATIONS WHERE EXISTING CURBING OR PAVEMENT ABUTS NEW CONSTRUCTION, THE EDGE OF THE EXISTING CURB OR PAVEMENT SHALL BE SAW CUT TO A CLEAN, SMOOTH EDGE. BLEND NEW PAVEMENT, CURBS AND EARTHWORK SMOOTHLY INTO EXISTING BY MATCHING LINES, GRADES AND JOINTS.
16. ALL RIP RAP STONE SHALL BE HAND CHINKED AND SHALL CONFORM TO MASSACHUSETTS HIGHWAY DEPARTMENT STANDARDS.
17. PROTECT PROPOSED INFILTRATION BASINS FROM SEDIMENTATION THROUGHOUT CONSTRUCTION OPERATIONS. INFILTRATION BASINS ARE NOT TO BE USED UNTIL DRAINAGE SYSTEM IS INSTALLED AND FUNCTIONAL.
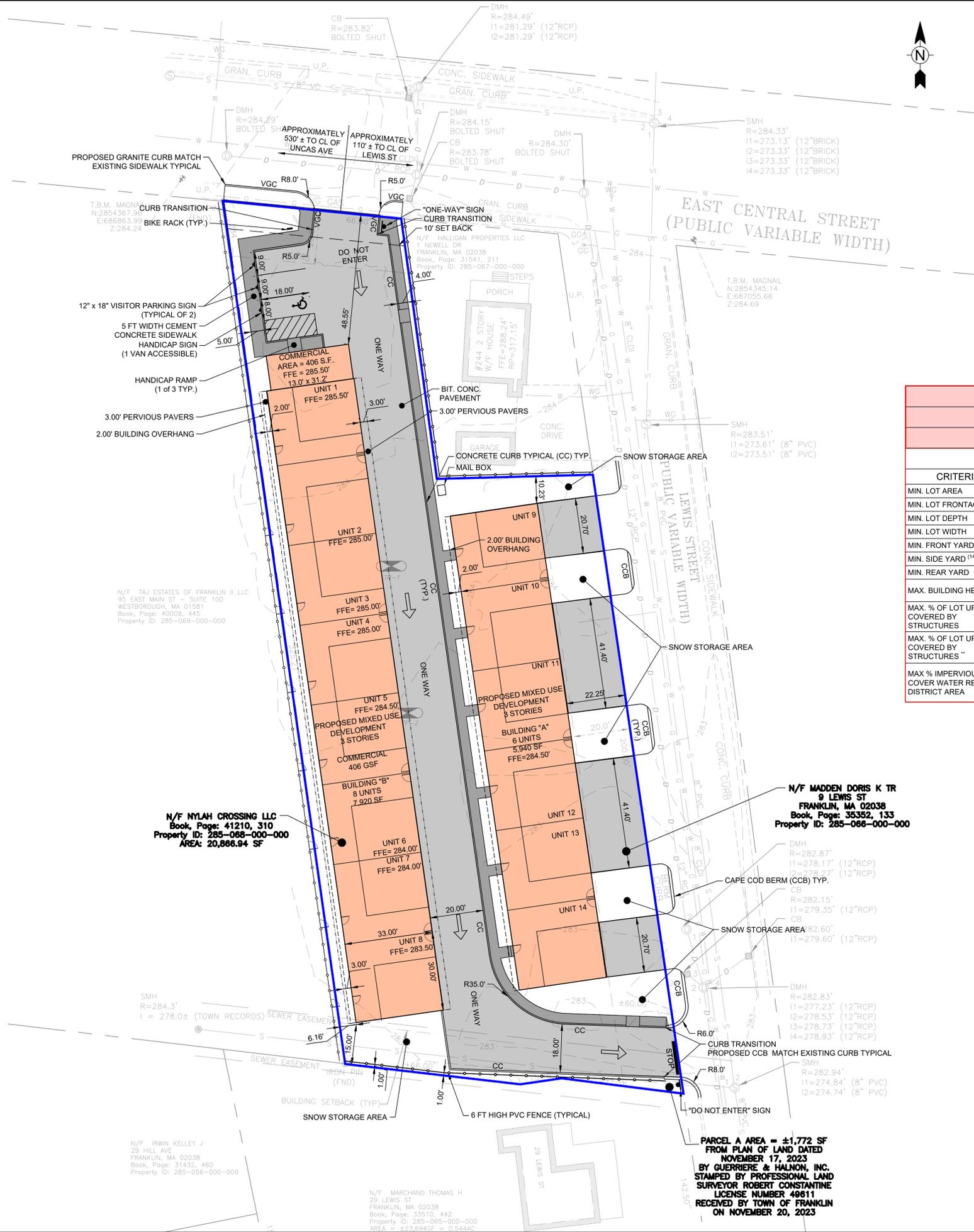
LEGEND

SUBJECT PARCEL	
PROPERTY LINE	
EXISTING MINOR CONTOUR	291
EXISTING MAJOR CONTOUR	290
MAJOR CONTOUR	290
SPOT GRADE	x 193.75

GENERAL NOTES

1. EXISTING CONDITIONS SURVEY COMPLETED BY TODD CHAPIN PROFESSIONAL LICENSE 37558 AND SUPPLEMENTED FROM PLAN OF LAND DATED NOVEMBER 17, 2023 BY GUERRIERE & HALNON, INC. STAMPED BY PROFESSIONAL LAND SURVEYOR ROBERT CONSTANTINE LICENSE NUMBER 49611 RECEIVED BY TOWN OF FRANKLIN ON NOVEMBER 20, 2023.
2. THIS LAND IS ZONED COMMERCIAL I (CI).
3. ALL LAND WILL BE COMBINED PRIOR TO LAND ENDORSEMENT
4. THE CONTRACTOR SHALL VERIFY THE LOCATIONS OF ALL UTILITIES IN THE FIELD. DISCREPANCIES SHALL BE IMMEDIATELY REPORTED TO THE DESIGN ENGINEER UPON DISCOVERY.
5. REFER TO FRANKLIN ASSESSORS PARCEL NUMBER 265-068-000.
6. THE SITE IS LOCATED IN THE TOWN OF FRANKLIN WATER RESOURCE DISTRICT.
7. REFERENCED DEED BOOK 41210 PAGE 310 PLAN NUMBER 2488 OF 1908 RECORDED AT NORFOLK COUNTY REGISTRY OF DEEDS. PROPERTY OWNED BY NYLAH CROSSING LLC.

ZONING SUMMARY

ZONING DISTRICT: COMMERCIAL I

WATER RESOURCE DISTRICT

MIXED USE DEVELOPMENT PROJECT

CRITERIA	REQUIRED	EXISTING	PROPOSED
MIN. LOT AREA	5,000 SF	±34,567 SF	±34,567 SF
MIN. LOT FRONTAGE	50 FT	66 FT	66 FT
MIN. LOT DEPTH	50 FT	>50 FT	>50 FT
MIN. LOT WIDTH	45 FT	64.4 FT	64.4 FT
MIN. FRONT YARD [1]	20 FT	13 FT	20 FT
MIN. SIDE YARD [14]	10 FT	4.6 FT	6.16 FT
MIN. REAR YARD	15 FT	>15 FT	15 FT
MAX. BUILDING HEIGHT [15]	3 STORIES/40 FT	2 STORIES/33.86 FT	3 STORIES/40 FT
MAX. % OF LOT UPLAND COVERED BY STRUCTURES	80%	8.68%	
MAX. % OF LOT UPLAND COVERED BY STRUCTURES **	90%	-	40.8%
MAX. % IMPERVIOUS COVER WATER RESOURCE DISTRICT AREA	80%	13.24%	78.6%

(1) BUT NO NEW STRUCTURE SHALL BE REQUIRED TO PROVIDE A DEEPER YARD THAN THAT EXISTING ON THAT PARCEL UPON ADOPTION OF THIS AMENDMENT.

(7) PERMITTED RESIDENTIAL USES MUST OBSERVE REQUIREMENTS OF THE GENERAL RESIDENTIAL V DISTRICT FOR RESIDENTIAL USE BUILDING ONLY. MIXED-USE BUILDINGS ARE EXEMPT FROM THIS REQUIREMENT.

(14) THE 10-FOOT SIDE SETBACK IS ONLY REQUIRED ON ONE SIDE OF LOT; IF LOT ABUTS A RESIDENTIAL DISTRICT, A 20-FOOT SETBACK IS REQUIRED ON THE ABUTTING SIDE.

(15) BUILDINGS UP TO 50 FEET IN HEIGHT, REGARDLESS OF THE NUMBER OF STORIES, MAY BE PERMITTED BY A SPECIAL PERMIT FROM THE PLANNING BOARD.

** NON-RESIDENTIAL IMPERVIOUS COVER IN THE TOWN OF FRANKLIN WATER DISTRICT SHALL NOT EXCEED 80%.

COMMERCIAL I

185 ATTACHMENT 7-(3) NO MORE THAN ONE DWELLING PER 2,250 SF OF LOT AREA MAY BE PERMITTED.

34,567 SF LOT / 2,250 SF = 15 MAX DWELLINGS.

PROPOSED - (14) THREE BEDROOM UNITS.

PARKING REQUIREMENTS

CRITERIA	REQUIRED	PROPOSED
RESIDENTIAL UNIT PARKING 1.5 PER UNIT	21	28
COMMERCIAL AREA PARKING 1 PER 500 S.F. TOTAL = 405± S.F.	1	3
TOTAL SPACES	22	31

DESIGNATED PARKING

VISITOR PARKING	2
DELIVERY PARKING	1
HANDICAP PARKING (VAN ACCESSIBLE)	1
2 SPACES PER UNIT (14 UNITS)	28
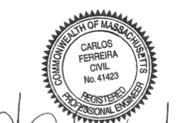
REVISIONS

No.	DATE	DESCRIPTION

PROJECT

NYLAH CROSSING LLC

240 EAST CENTRAL STREET &
9 LEWIS STREET
FRANKLIN, MASSACHUSETTS 02038

PROPERTY OWNER:

NYLAH CROSSING LLC
95 EAST MAIN STREET, SUITE 100
WESTBOROUGH, MASSACHUSETTS 01581

SHEET TITLE

LAYOUT AND MATERIALS PLAN

SCALE:	1" = 20'
DATE:	03/13/2024
DRAWN BY:	CMS
CHECKED BY:	JG
FILE:	NYLAHCROSS.dwg

DRAWING NO.

C-102

SCALE: 1" = 20'   0 10' 20' 40'

PROJECT TRIP GENERATION CALCULATIONS

📈 Graph Look Up

🔒 Change Password

👤 Account Settings

🖨️

Graph Look Up

How to Use *ITETripGen*

TGM Desk Reference

TGM Appendices

Support Documents

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Comments

Query   Filter

DATA SOURCE:
Trip Generation Manual, 11th Ed ▾

SEARCH BY LAND USE CODE:
215 🔍

LAND USE GROUP:
(200-299) Residential ▾

LAND USE :
215 - Single-Family Attached Housing ▾

LAND USE SUBCATEGORY:
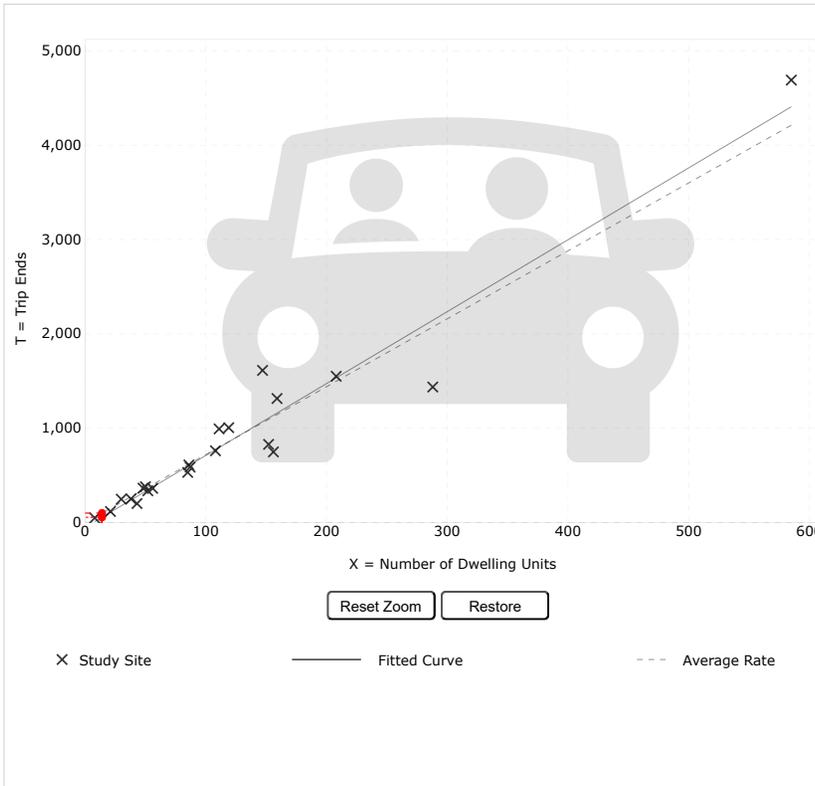All Sites ▾

SETTING/LOCATION:
General Urban/Suburban ▾

INDEPENDENT VARIABLE (IV):
Dwelling Units ▾

TIME PERIOD:
Weekday ▾

TRIP TYPE:
Vehicle ▾

ENTER IV VALUE TO CALCULATE TRIPS:
14   Calculate

Data Plot and Equation

Use the mouse wheel to Zoom Out or Zoom In.
Hover the mouse pointer on data points to view X and T values.

Reset Zoom   Restore

✕ Study Site   —— Fitted Curve   - - - Average Rate

DATA STATISTICS

Land Use:
Single-Family Attached Housing (215) *Click for Description and Data Plots*

Independent Variable:
Dwelling Units

Time Period:
Weekday

Setting/Location:
General Urban/Suburban

Trip Type:
Vehicle

Number of Studies:
22

Avg. Num. of Dwelling Units:
120

Average Rate:
7.20

Range of Rates:
4.70 - 10.97

Standard Deviation:
1.61

Fitted Curve Equation:
$T = 7.62(X) - 50.48$

R^2:
0.94

Directional Distribution:
50% entering, 50% exiting

Calculated Trip Ends:
Average Rate: 101 (Total), 50 (Entry), 51 (Exit)
Fitted Curve: 56 (Total), 28 (Entry), 28 (Exit)

Add-ons to do more

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ITETripGen Web-based App

Graph Look Up

How to Use *ITETripGen*

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Comments

Query | Filter

DATA SOURCE:
Trip Generation Manual, 11th Ed

SEARCH BY LAND USE CODE:
215 🔍

LAND USE GROUP:
(200-299) Residential

LAND USE :
215 - Single-Family Attached Housing

LAND USE SUBCATEGORY:
All Sites

SETTING/LOCATION:
General Urban/Suburban

INDEPENDENT VARIABLE (IV):
Dwelling Units

TIME PERIOD:
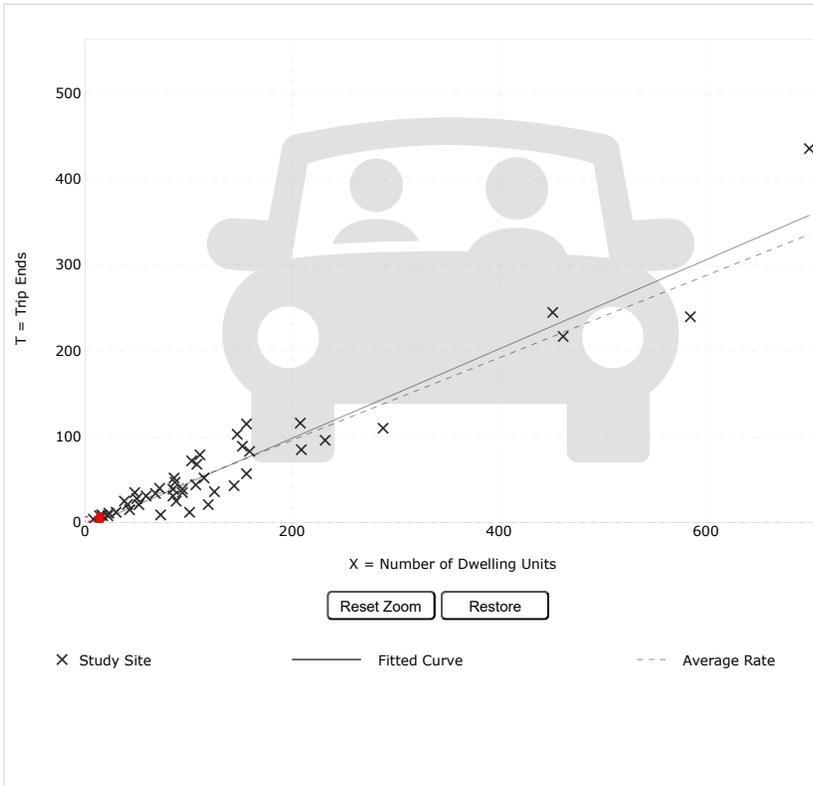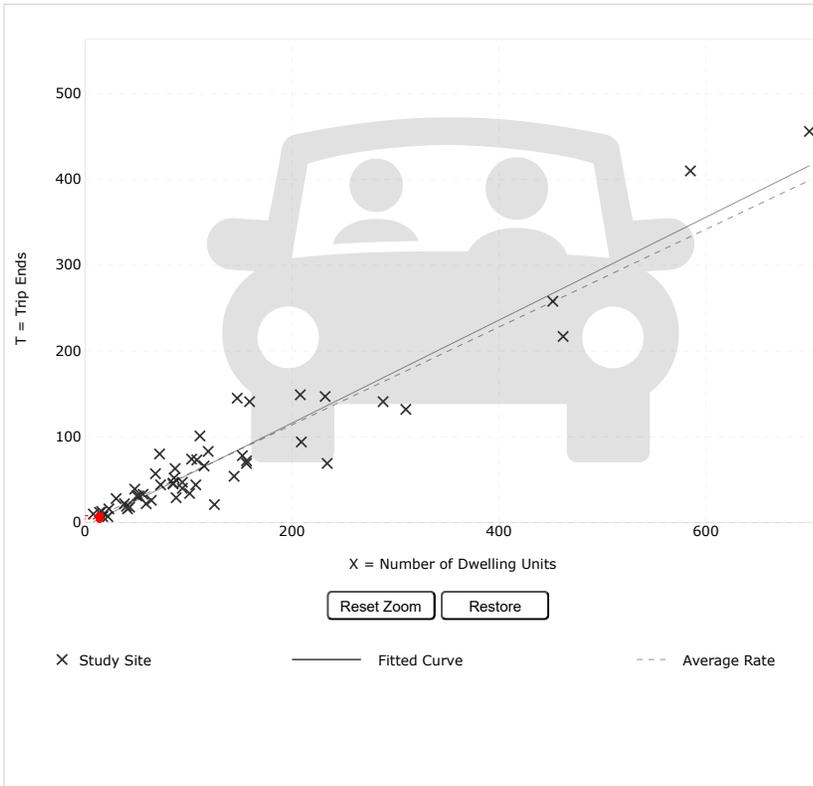Weekday, Peak Hour of Adjacent Street Traffic

TRIP TYPE:
Vehicle

ENTER IV VALUE TO CALCULATE TRIPS:
14 [Calculate]

Data Plot and Equation

T = 0.52(X) - 5.70

X = Number of Dwelling Units

Y axis: T = Trip Ends (0, 100, 200, 300, 400, 500)
X axis: (0, 200, 400, 600)

[Reset Zoom] [Restore]

✕ Study Site   —— Fitted Curve   - - - Average Rate

Use the mouse wheel to Zoom Out or Zoom In.
Hover the mouse pointer on data points to view X and T values.

DATA STATISTICS

Land Use:
Single-Family Attached Housing (215) Click for Description and Data Plots

Independent Variable:
Dwelling Units

Time Period:
Weekday
Peak Hour of Adjacent Street Traffic
One Hour Between 7 and 9 a.m.

Setting/Location:
General Urban/Suburban

Trip Type:
Vehicle

Number of Studies:
46

Avg. Num. of Dwelling Units:
135

Average Rate:
0.48

Range of Rates:
0.12 - 0.74

Standard Deviation:
0.14

Fitted Curve Equation:
T = 0.52(X) - 5.70

R^2:
0.92

Directional Distribution:
25% entering, 75% exiting

Calculated Trip Ends:
Average Rate: 7 (Total), 2 (Entry), 5 (Exit)
Fitted Curve: 2 (Total), 0 (Entry), 2 (Exit)

Add-ons to do more

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ITETripGen Web-based App

Graph Look Up

How to Use *ITETripGen*

TGM Desk Reference

TGM Appendices

Support Documents

Add Users

Comments

Query   Filter

Data Plot and Equation

DATA SOURCE:
Trip Generation Manual, 11th Ed

SEARCH BY LAND USE CODE:
215 🔍

LAND USE GROUP:
(200-299) Residential

LAND USE :
215 - Single-Family Attached Housing

LAND USE SUBCATEGORY:
All Sites

SETTING/LOCATION:
General Urban/Suburban

INDEPENDENT VARIABLE (IV):
Dwelling Units

TIME PERIOD:
Weekday, Peak Hour of Adjacent Street Traffic

TRIP TYPE:
Vehicle

ENTER IV VALUE TO CALCULATE TRIPS:
14   Calculate

Reset Zoom   Restore

✕ Study Site   ——— Fitted Curve   - - - Average Rate

Use the mouse wheel to Zoom Out or Zoom In.
Hover the mouse pointer on data points to view X and T values.

DATA STATISTICS

Land Use:
Single-Family Attached Housing (215) Click for Description and Data Plots

Independent Variable:
Dwelling Units

Time Period:
Weekday
Peak Hour of Adjacent Street Traffic
One Hour Between 4 and 6 p.m.

Setting/Location:
General Urban/Suburban

Trip Type:
Vehicle

Number of Studies:
51

Avg. Num. of Dwelling Units:
136

Average Rate:
0.57

Range of Rates:
0.17 - 1.25

Standard Deviation:
0.18

Fitted Curve Equation:
$T = 0.60(X) - 3.93$

R^2:
0.91

Directional Distribution:
59% entering, 41% exiting

Calculated Trip Ends:
Average Rate: 8 (Total), 5 (Entry), 3 (Exit)
Fitted Curve: 4 (Total), 3 (Entry), 1 (Exit)

Add-ons to do more

Try OTISS Pro

? Help 👤 Jeffrey Dirk ↪ Sign out

📊 Graph Look Up 🖨️

Data Plot and Equation

Caution – Small Sample Size

Query   Filter

DATA SOURCE:
Trip Generation Manual, 11th Ed ▾

SEARCH BY LAND USE CODE:
822 🔍

LAND USE GROUP:
(800-899) Retail ▾

LAND USE :
822 - Strip Retail Plaza (<40k) ▾

LAND USE SUBCATEGORY:
All Sites ▾

SETTING/LOCATION:
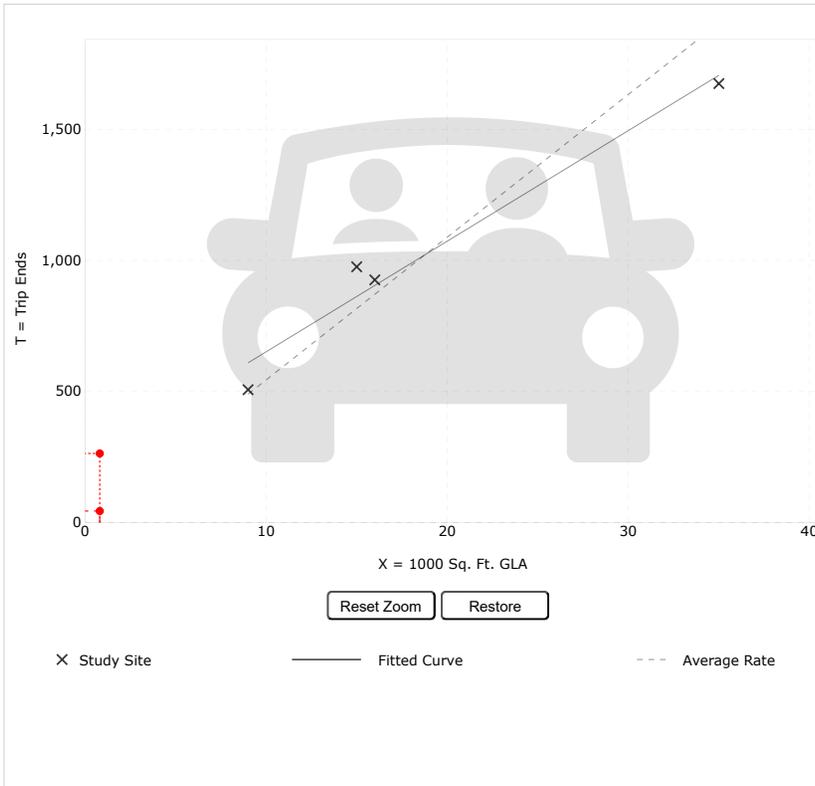General Urban/Suburban ▾

INDEPENDENT VARIABLE (IV):
1000 Sq. Ft. GLA ▾

TIME PERIOD:
Weekday ▾

TRIP TYPE:
Vehicle ▾

ENTER IV VALUE TO CALCULATE TRIPS:
0.81   Calculate

[Plot: X axis "X = 1000 Sq. Ft. GLA" from 0 to 40; Y axis "T = Trip Ends" from 0 to 1,500]

Reset Zoom   Restore

✕ Study Site ——— Fitted Curve - - - Average Rate

Use the mouse wheel to Zoom Out or Zoom In.
Hover the mouse pointer on data points to view X and T values.

DATA STATISTICS

Land Use:
Strip Retail Plaza (<40k) (822) *Click for Description and Data Plots*

Independent Variable:
1000 Sq. Ft. GLA

Time Period:
Weekday

Setting/Location:
General Urban/Suburban

Trip Type:
Vehicle

Number of Studies:
4

Avg. 1000 Sq. Ft. GLA:
19

Average Rate:
54.45

Range of Rates:
47.86 - 65.07

Standard Deviation:
7.81

Fitted Curve Equation:
$T = 42.20(X) + 229.68$

R^2:
0.96

Directional Distribution:
50% entering, 50% exiting

Calculated Trip Ends:
Average Rate: 44 (Total), 22 (Entry), 22 (Exit)
Fitted Curve: 264 (Total), 132 (Entry), 132 (Exit)

📊 **Graph Look Up** 🖨️

Query	Filter

DATA SOURCE:
Trip Generation Manual, 11th Ed

SEARCH BY LAND USE CODE:
822 🔍

LAND USE GROUP:
(800-899) Retail

LAND USE :
822 - Strip Retail Plaza (<40k)

LAND USE SUBCATEGORY:
All Sites

SETTING/LOCATION:
General Urban/Suburban

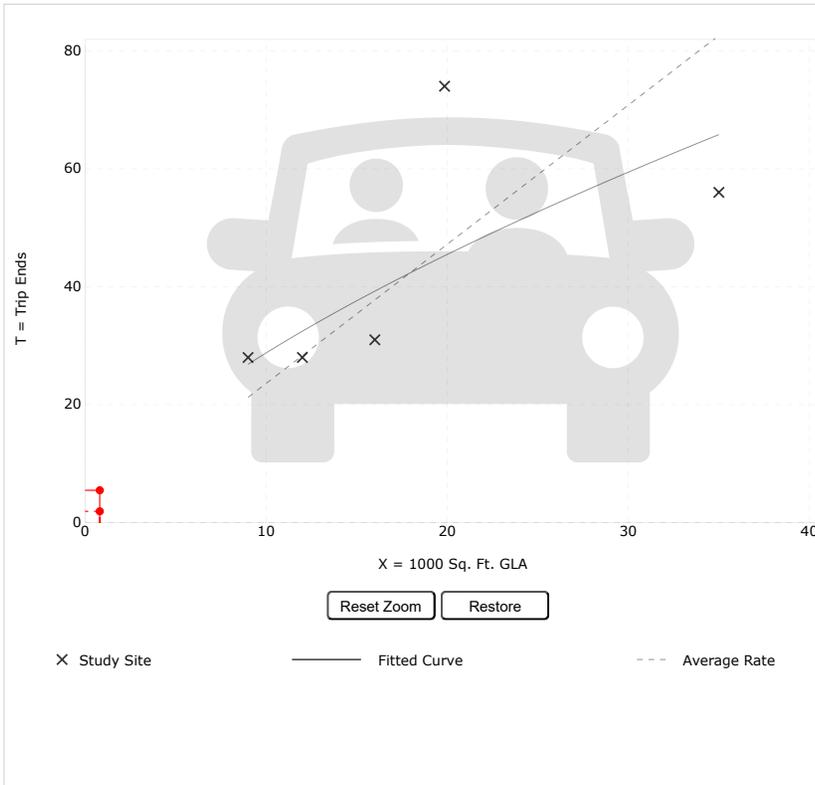**INDEPENDENT VARIABLE (IV):**
1000 Sq. Ft. GLA

TIME PERIOD:
Weekday, Peak Hour of Adjacent Street Traffic

TRIP TYPE:
Vehicle

ENTER IV VALUE TO CALCULATE TRIPS:
0.81 [Calculate]

Data Plot and Equation   *Caution – Small Sample Size*

X = 1000 Sq. Ft. GLA

[Reset Zoom] [Restore]

✕ Study Site   —— Fitted Curve   - - - Average Rate

Use the mouse wheel to Zoom Out or Zoom In.
Hover the mouse pointer on data points to view X and T values.

DATA STATISTICS

Land Use:
Strip Retail Plaza (<40k) (822) Click for Description and Data Plots

Independent Variable:
1000 Sq. Ft. GLA

Time Period:
Weekday
Peak Hour of Adjacent Street Traffic
One Hour Between 7 and 9 a.m.

Setting/Location:
General Urban/Suburban

Trip Type:
Vehicle

Number of Studies:
5

Avg. 1000 Sq. Ft. GLA:
18

Average Rate:
2.36

Range of Rates:
1.60 - 3.73

Standard Deviation:
0.94

Fitted Curve Equation:
$Ln(T) = 0.66 \, Ln(X) + 1.84$

R^2:
0.57

Directional Distribution:
60% entering, 40% exiting

Calculated Trip Ends:
Average Rate: 2 (Total), 1 (Entry), 1 (Exit)
Fitted Curve: 5 (Total), 3 (Entry), 2 (Exit)

Add-ons to do more

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Query   Filter

DATA SOURCE:
Trip Generation Manual, 11th Ed

SEARCH BY LAND USE CODE:
822   🔍

LAND USE GROUP:
(800-899) Retail

LAND USE :
822 - Strip Retail Plaza (<40k)

LAND USE SUBCATEGORY:
All Sites

SETTING/LOCATION:
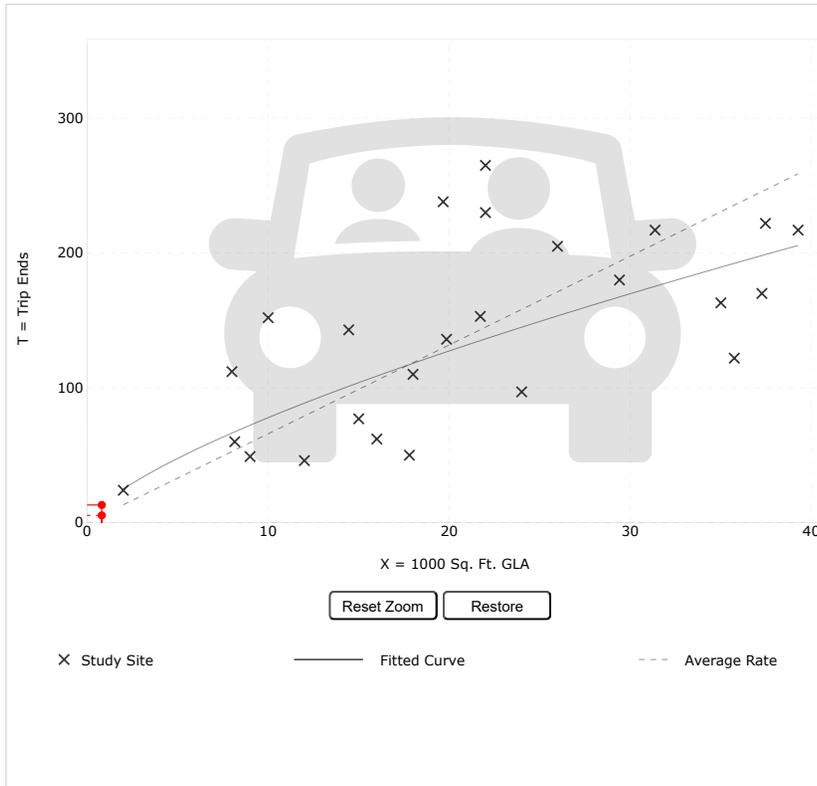General Urban/Suburban

INDEPENDENT VARIABLE (IV):
1000 Sq. Ft. GLA

TIME PERIOD:
Weekday, Peak Hour of Adjacent Street Traffic

TRIP TYPE:
Vehicle

ENTER IV VALUE TO CALCULATE TRIPS:
0.81   Calculate

Data Plot and Equation

T = Trip Ends

300

200

100

0

0   10   20   30   40

X = 1000 Sq. Ft. GLA

Reset Zoom   Restore

✕ Study Site   —— Fitted Curve   - - - Average Rate

Use the mouse wheel to Zoom Out or Zoom In.
Hover the mouse pointer on data points to view X and T values.

DATA STATISTICS

Land Use:
Strip Retail Plaza (<40k) (822) Click for Description and Data Plots

Independent Variable:
1000 Sq. Ft. GLA

Time Period:
Weekday
Peak Hour of Adjacent Street Traffic
One Hour Between 4 and 6 p.m.

Setting/Location:
General Urban/Suburban

Trip Type:
Vehicle

Number of Studies:
25

Avg. 1000 Sq. Ft. GLA:
21

Average Rate:
6.59

Range of Rates:
2.81 - 15.20

Standard Deviation:
2.94

Fitted Curve Equation:
$Ln(T) = 0.71 \ Ln(X) + 2.72$

R^2:
0.56

Directional Distribution:
50% entering, 50% exiting

Calculated Trip Ends:
Average Rate: 5 (Total), 3 (Entry), 2 (Exit)
Fitted Curve: 13 (Total), 7 (Entry), 6 (Exit)

Add-ons to do more

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EXISTING USES TRIP GENERATION CALCULATIONS

ITETripGen Web-based App

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- Comments

Add-ons to do more

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Query   Filter

DATA SOURCE:
Trip Generation Manual, 11th Ed ▾

SEARCH BY LAND USE CODE:
[210] 🔍

LAND USE GROUP:
(200-299) Residential ▾

LAND USE :
210 - Single-Family Detached Housing ▾

LAND USE SUBCATEGORY:
All Sites ▾

SETTING/LOCATION:
General Urban/Suburban ▾

INDEPENDENT VARIABLE (IV):
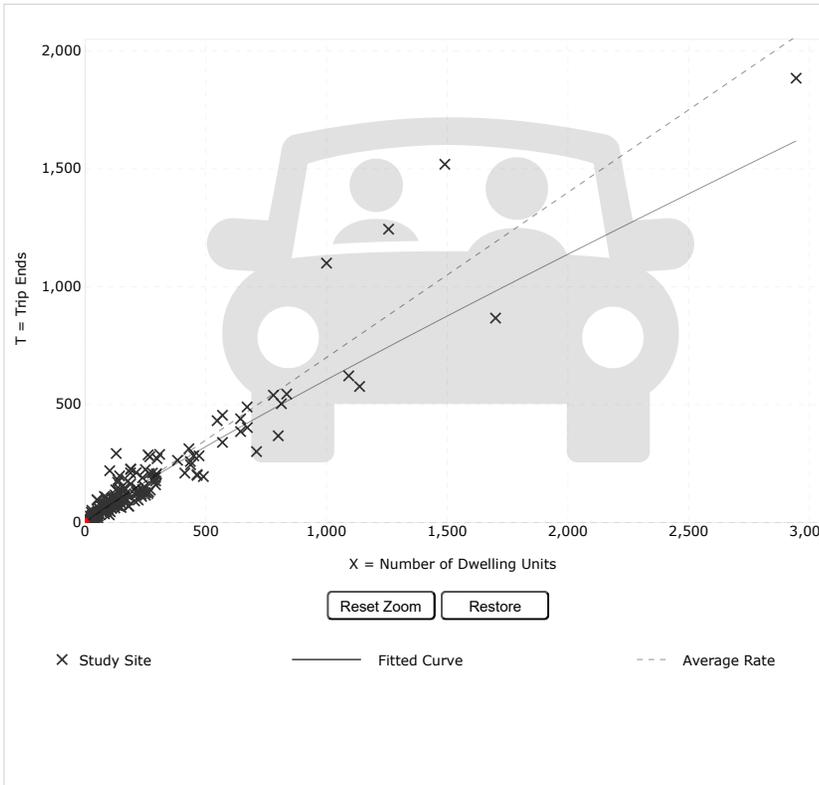Dwelling Units ▾

TIME PERIOD:
Weekday ▾

TRIP TYPE:
Vehicle ▾

ENTER IV VALUE TO CALCULATE TRIPS:
[1] [Calculate]

Data Plot and Equation

X = Number of Dwelling Units
T = Trip Ends

[Reset Zoom] [Restore]

✕ Study Site   —— Fitted Curve   - - - Average Rate

Use the mouse wheel to Zoom Out or Zoom In.
Hover the mouse pointer on data points to view X and T values.

DATA STATISTICS

Land Use:
Single-Family Detached Housing (210) Click for Description and Data Plots

Independent Variable:
Dwelling Units

Time Period:
Weekday

Setting/Location:
General Urban/Suburban

Trip Type:
Vehicle

Number of Studies:
174

Avg. Num. of Dwelling Units:
246

Average Rate:
9.43

Range of Rates:
4.45 - 22.61

Standard Deviation:
2.13

Fitted Curve Equation:
$Ln(T) = 0.92 \, Ln(X) + 2.68$

R^2:
0.95

Directional Distribution:
50% entering, 50% exiting

Calculated Trip Ends:
Average Rate: 9 (Total), 5 (Entry), 4 (Exit)
Fitted Curve: 15 (Total), 7 (Entry), 8 (Exit)

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Add-ons to do more

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Query   Filter

DATA SOURCE:
Trip Generation Manual, 11th Ed

SEARCH BY LAND USE CODE:
210

LAND USE GROUP:
(200-299) Residential

LAND USE :
210 - Single-Family Detached Housing

LAND USE SUBCATEGORY:
All Sites

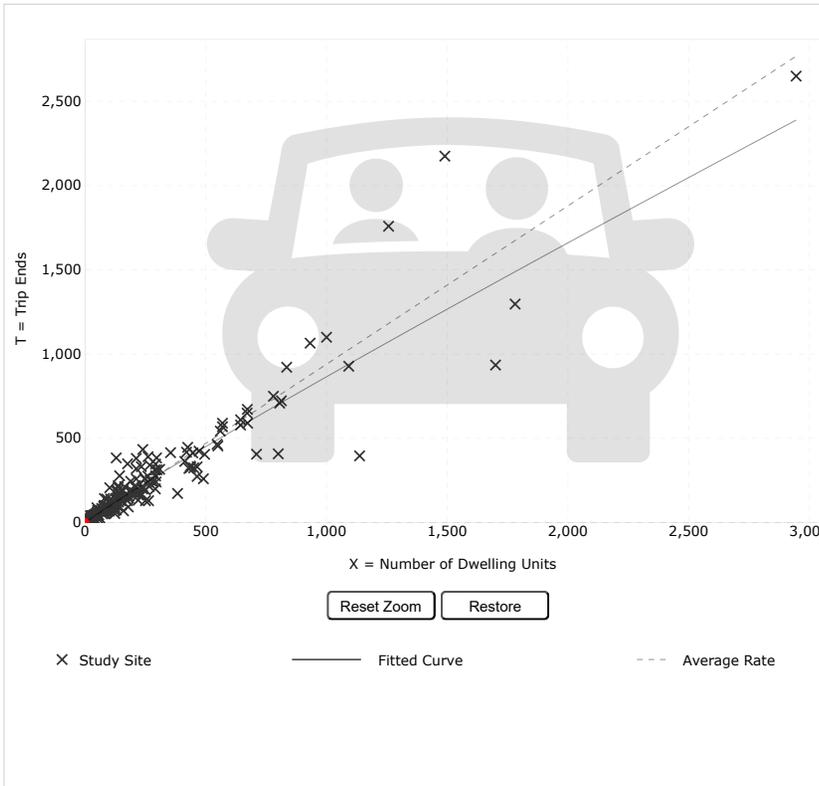**SETTING/LOCATION:**
General Urban/Suburban

INDEPENDENT VARIABLE (IV):
Dwelling Units

TIME PERIOD:
Weekday, Peak Hour of Adjacent Street Traffic

TRIP TYPE:
Vehicle

ENTER IV VALUE TO CALCULATE TRIPS:
1   Calculate

Data Plot and Equation

X = Number of Dwelling Units

T = Trip Ends

Reset Zoom   Restore

✕ Study Site   Fitted Curve   - - - Average Rate

Use the mouse wheel to Zoom Out or Zoom In.
Hover the mouse pointer on data points to view X and T values.

DATA STATISTICS

Land Use:
Single-Family Detached Housing (210) Click for Description and Data Plots

Independent Variable:
Dwelling Units

Time Period:
Weekday
Peak Hour of Adjacent Street Traffic
One Hour Between 7 and 9 a.m.

Setting/Location:
General Urban/Suburban

Trip Type:
Vehicle

Number of Studies:
192

Avg. Num. of Dwelling Units:
226

Average Rate:
0.70

Range of Rates:
0.27 - 2.27

Standard Deviation:
0.24

Fitted Curve Equation:
$Ln(T) = 0.91 Ln(X) + 0.12$

R^2:
0.90

Directional Distribution:
25% entering, 75% exiting

Calculated Trip Ends:
Average Rate: 1 (Total), 0 (Entry), 1 (Exit)
Fitted Curve: 1 (Total), 0 (Entry), 1 (Exit)

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Query   Filter

DATA SOURCE:
Trip Generation Manual, 11th Ed

SEARCH BY LAND USE CODE:
210 🔍

LAND USE GROUP:
(200-299) Residential

LAND USE :
210 - Single-Family Detached Housing

LAND USE SUBCATEGORY:
All Sites

SETTING/LOCATION:
General Urban/Suburban

INDEPENDENT VARIABLE (IV):
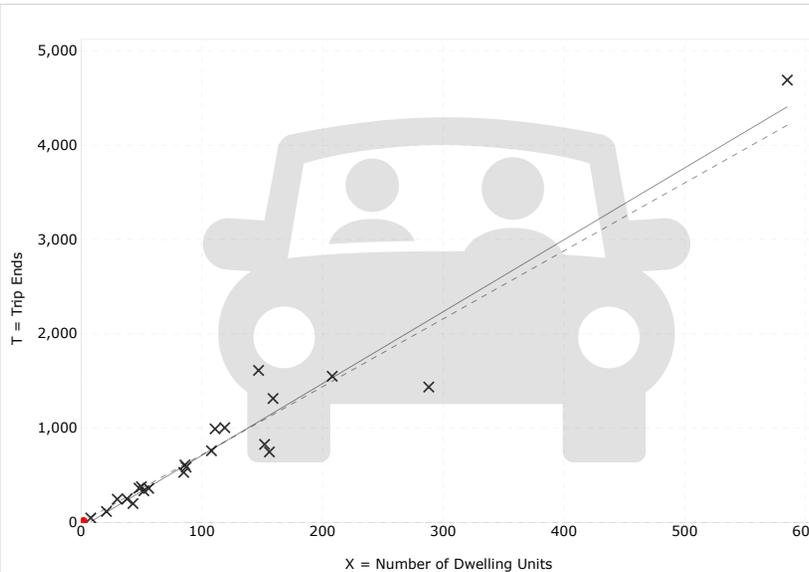Dwelling Units

TIME PERIOD:
Weekday, Peak Hour of Adjacent Street Traffic

TRIP TYPE:
Vehicle

ENTER IV VALUE TO CALCULATE TRIPS:
1   Calculate

Data Plot and Equation

T = Trip Ends (y-axis): 0, 500, 1,000, 1,500, 2,000, 2,500
X = Number of Dwelling Units (x-axis): 0, 500, 1,000, 1,500, 2,000, 2,500, 3,000

Reset Zoom   Restore

✕ Study Site   —— Fitted Curve   - - - Average Rate

Use the mouse wheel to Zoom Out or Zoom In.
Hover the mouse pointer on data points to view X and T values.

DATA STATISTICS

Land Use:
Single-Family Detached Housing (210) Click for Description and Data Plots

Independent Variable:
Dwelling Units

Time Period:
Weekday
Peak Hour of Adjacent Street Traffic
One Hour Between 4 and 6 p.m.

Setting/Location:
General Urban/Suburban

Trip Type:
Vehicle

Number of Studies:
208

Avg. Num. of Dwelling Units:
248

Average Rate:
0.94

Range of Rates:
0.35 - 2.98

Standard Deviation:
0.31

Fitted Curve Equation:
$Ln(T) = 0.94 \, Ln(X) + 0.27$

R^2:
0.92

Directional Distribution:
63% entering, 37% exiting

Calculated Trip Ends:
Average Rate: 1 (Total), 1 (Entry), 0 (Exit)
Fitted Curve: 1 (Total), 1 (Entry), 0 (Exit)

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DATA SOURCE:
Trip Generation Manual, 11th Ed

SEARCH BY LAND USE CODE:
215 🔍

LAND USE GROUP:
(200-299) Residential

LAND USE :
215 - Single-Family Attached Housing

LAND USE SUBCATEGORY:
All Sites

SETTING/LOCATION:
General Urban/Suburban

INDEPENDENT VARIABLE (IV):
Dwelling Units

TIME PERIOD:
Weekday

TRIP TYPE:
Vehicle

ENTER IV VALUE TO CALCULATE TRIPS:
2 | Calculate

Trip ends are not estimated for some methods as it yields negative values

Data Plot and Equation

X = Number of Dwelling Units
T = Trip Ends

Reset Zoom | Restore

✕ Study Site ——— Fitted Curve --- Average Rate

Use the mouse wheel to Zoom Out or Zoom In.
Hover the mouse pointer on data points to view X and T values.

DATA STATISTICS

Land Use:
Single-Family Attached Housing (215) Click for Description and Data Plots

Independent Variable:
Dwelling Units

Time Period:
Weekday

Setting/Location:
General Urban/Suburban

Trip Type:
Vehicle

Number of Studies:
22

Avg. Num. of Dwelling Units:
120

Average Rate:
7.20

Range of Rates:
4.70 - 10.97

Standard Deviation:
1.61

Fitted Curve Equation:
T = 7.62(X) - 50.48

R²:
0.94

Directional Distribution:
50% entering, 50% exiting

Calculated Trip Ends:
Average Rate: 14 (Total), 7 (Entry), 7 (Exit)
Fitted Curve: Not Available

Add-ons to do more

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Query   Filter

DATA SOURCE:
Trip Generation Manual, 11th Ed

SEARCH BY LAND USE CODE:
215   🔍

LAND USE GROUP:
(200-299) Residential

LAND USE :
215 - Single-Family Attached Housing

LAND USE SUBCATEGORY:
All Sites

SETTING/LOCATION:
General Urban/Suburban

INDEPENDENT VARIABLE (IV):
Dwelling Units

TIME PERIOD:
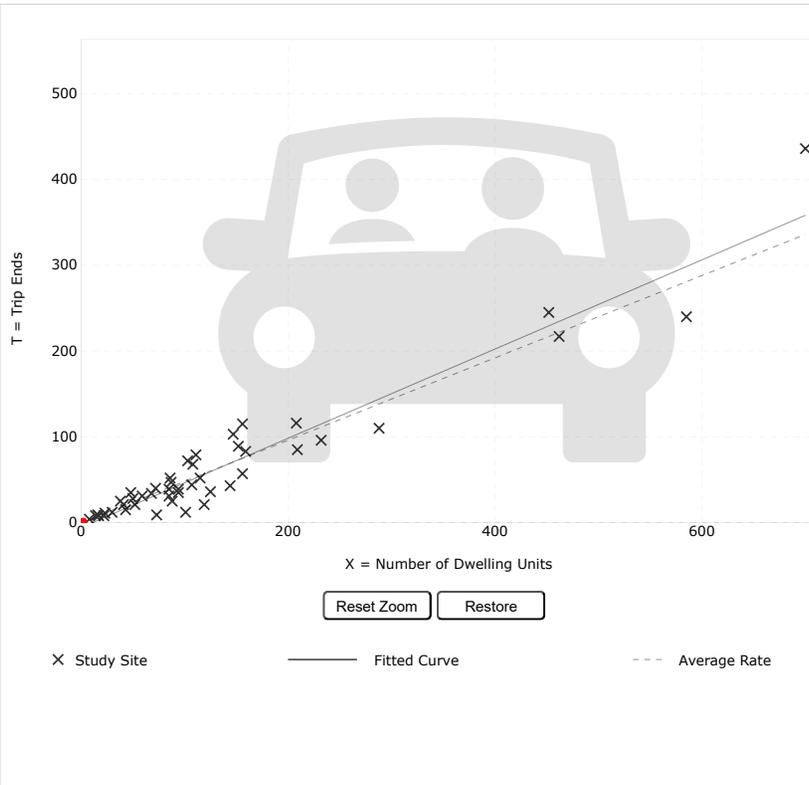Weekday, Peak Hour of Adjacent Street Traffic

TRIP TYPE:
Vehicle

ENTER IV VALUE TO CALCULATE TRIPS:
2   Calculate

Trip ends are not estimated for some methods as it yields negative values

Data Plot and Equation

Use the mouse wheel to Zoom Out or Zoom In.
Hover the mouse pointer on data points to view X and T values.

DATA STATISTICS

Land Use:
Single-Family Attached Housing (215) Click for Description and Data Plots

Independent Variable:
Dwelling Units

Time Period:
Weekday
Peak Hour of Adjacent Street Traffic
One Hour Between 7 and 9 a.m.

Setting/Location:
General Urban/Suburban

Trip Type:
Vehicle

Number of Studies:
46

Avg. Num. of Dwelling Units:
135

Average Rate:
0.48

Range of Rates:
0.12 - 0.74

Standard Deviation:
0.14

Fitted Curve Equation:
$T = 0.52(X) - 5.70$

R^2:
0.92

Directional Distribution:
25% entering, 75% exiting

Calculated Trip Ends:
Average Rate: 1 (Total), 0 (Entry), 1 (Exit)
Fitted Curve: Not Available

Graph Look Up

Query   Filter

DATA SOURCE:
Trip Generation Manual, 11th Ed

SEARCH BY LAND USE CODE:
215

LAND USE GROUP:
(200-299) Residential

LAND USE :
215 - Single-Family Attached Housing

LAND USE SUBCATEGORY:
All Sites

SETTING/LOCATION:
General Urban/Suburban

INDEPENDENT VARIABLE (IV):
Dwelling Units

TIME PERIOD:
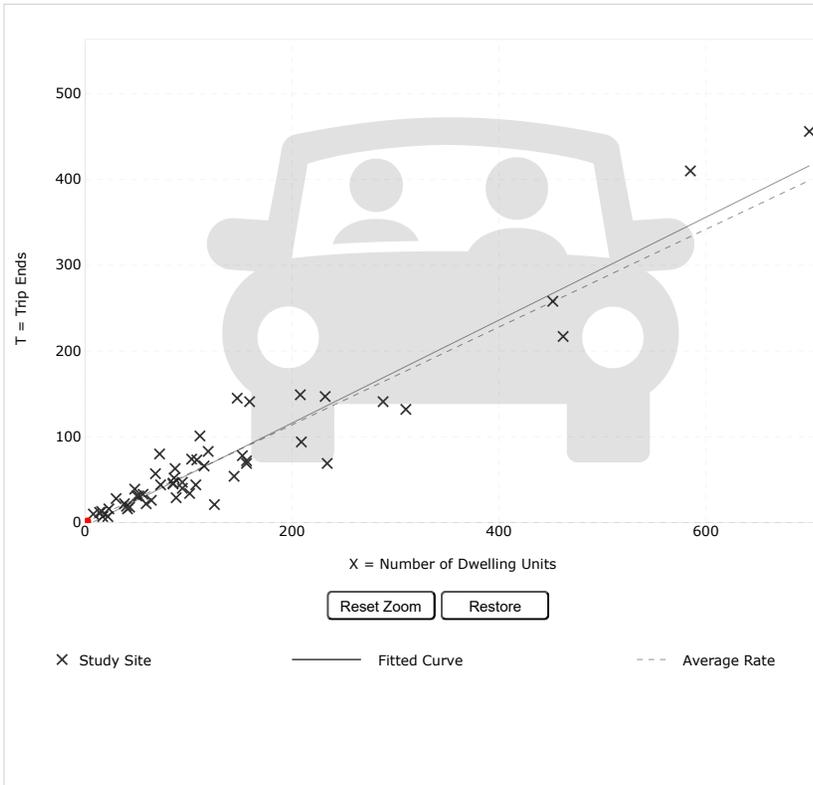Weekday, Peak Hour of Adjacent Street Traffic

TRIP TYPE:
Vehicle

ENTER IV VALUE TO CALCULATE TRIPS:
2   Calculate

Trip ends are not estimated for some methods as it yields negative values

Data Plot and Equation

T = Trip Ends

X = Number of Dwelling Units

Reset Zoom   Restore

✕ Study Site   —— Fitted Curve   - - - Average Rate

Use the mouse wheel to Zoom Out or Zoom In.
Hover the mouse pointer on data points to view X and T values.

DATA STATISTICS

Land Use:
Single-Family Attached Housing (215) Click for Description and Data Plots

Independent Variable:
Dwelling Units

Time Period:
Weekday
Peak Hour of Adjacent Street Traffic
One Hour Between 4 and 6 p.m.

Setting/Location:
General Urban/Suburban

Trip Type:
Vehicle

Number of Studies:
51

Avg. Num. of Dwelling Units:
136

Average Rate:
0.57

Range of Rates:
0.17 - 1.25

Standard Deviation:
0.18

Fitted Curve Equation:
T = 0.60(X) - 3.93

R^2:
0.91

Directional Distribution:
59% entering, 41% exiting

Calculated Trip Ends:
Average Rate: 1 (Total), 1 (Entry), 0 (Exit)
Fitted Curve: Not Available

Add-ons to do more

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Query   Filter

DATA SOURCE:
Trip Generation Manual, 11th Ed

SEARCH BY LAND USE CODE:
565 🔍

LAND USE GROUP:
(500-599) Institutional

LAND USE :
565 - Day Care Center

LAND USE SUBCATEGORY:
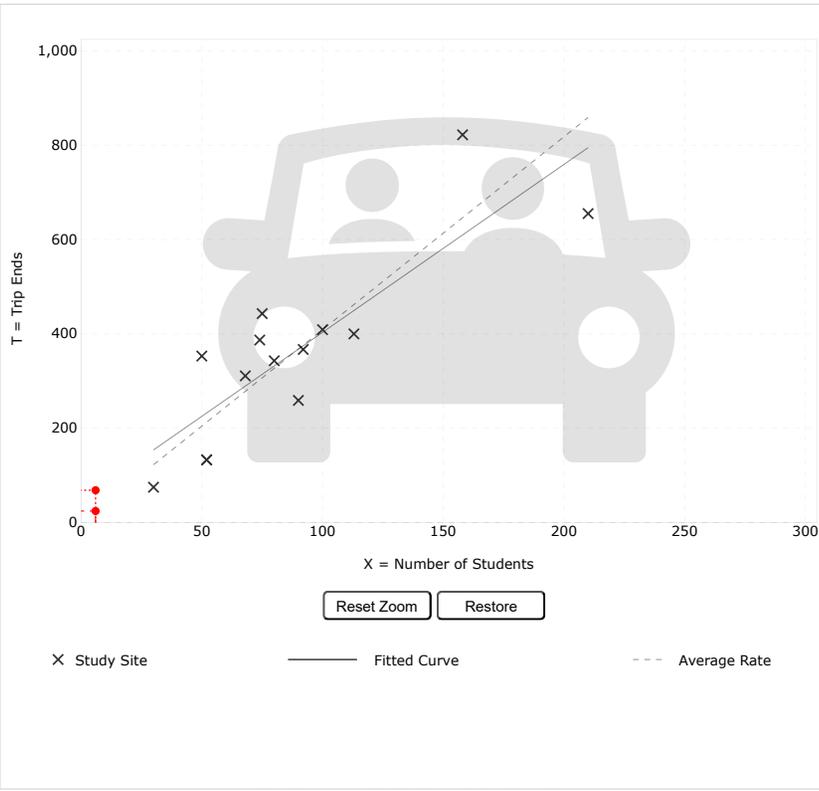All Sites

SETTING/LOCATION:
General Urban/Suburban

INDEPENDENT VARIABLE (IV):
Students

TIME PERIOD:
Weekday

TRIP TYPE:
Vehicle

ENTER IV VALUE TO CALCULATE TRIPS:
6   Calculate

Data Plot and Equation

T = Trip Ends (y-axis): 0, 200, 400, 600, 800, 1,000
X = Number of Students (x-axis): 0, 50, 100, 150, 200, 250, 300

Reset Zoom   Restore

✕ Study Site   ——— Fitted Curve   - - - Average Rate

Use the mouse wheel to Zoom Out or Zoom In.
Hover the mouse pointer on data points to view X and T values.

DATA STATISTICS

Land Use:
Day Care Center (565) Click for Description and Data Plots

Independent Variable:
Students

Time Period:
Weekday

Setting/Location:
General Urban/Suburban

Trip Type:
Vehicle

Number of Studies:
14

Avg. Num. of Students:
89

Average Rate:
4.09

Range of Rates:
2.50 - 7.06

Standard Deviation:
1.21

Fitted Curve Equation:
$T = 3.56(X) + 47.23$

R^2:
0.72

Directional Distribution:
50% entering, 50% exiting

Calculated Trip Ends:
Average Rate: 25 (Total), 12 (Entry), 13 (Exit)
Fitted Curve: 69 (Total), 34 (Entry), 35 (Exit)

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Graph Look Up

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Query   Filter

DATA SOURCE:
Trip Generation Manual, 11th Ed ▾

SEARCH BY LAND USE CODE:
565 🔍

LAND USE GROUP:
(500-599) Institutional ▾

LAND USE :
565 - Day Care Center ▾

LAND USE SUBCATEGORY:
All Sites ▾

SETTING/LOCATION:
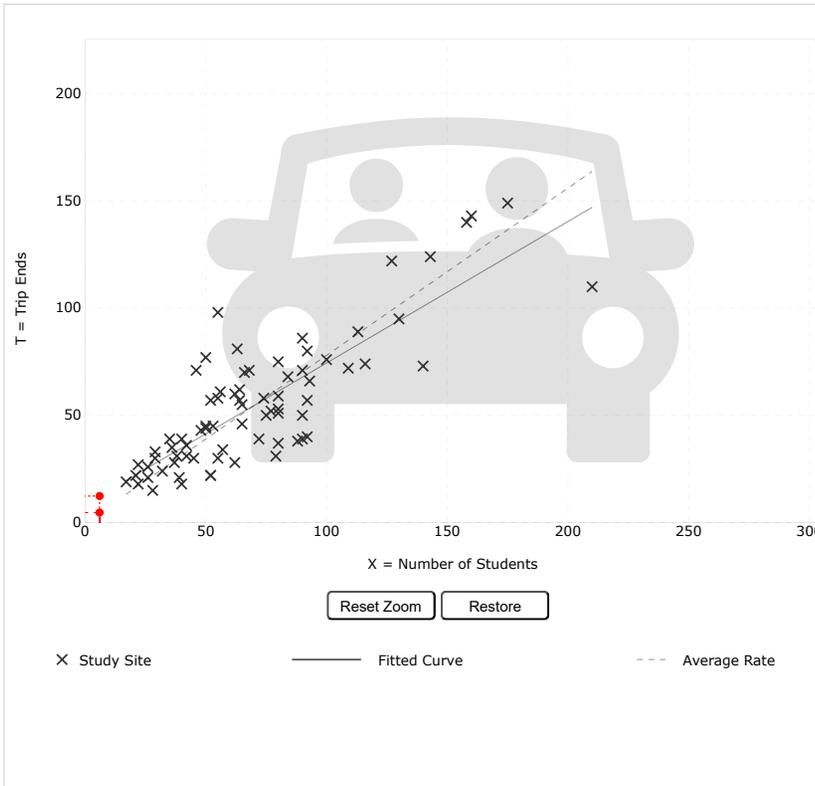General Urban/Suburban ▾

INDEPENDENT VARIABLE (IV):
Students ▾

TIME PERIOD:
Weekday, Peak Hour of Adjacent Street Traffic ▾

TRIP TYPE:
Vehicle ▾

ENTER IV VALUE TO CALCULATE TRIPS:
6   Calculate

Data Plot and Equation

Reset Zoom   Restore

✕ Study Site   —— Fitted Curve   - - - Average Rate

Use the mouse wheel to Zoom Out or Zoom In.
Hover the mouse pointer on data points to view X and T values.

DATA STATISTICS

Land Use:
Day Care Center (565) Click for Description and Data Plots

Independent Variable:
Students

Time Period:
Weekday
Peak Hour of Adjacent Street Traffic
One Hour Between 7 and 9 a.m.

Setting/Location:
General Urban/Suburban

Trip Type:
Vehicle

Number of Studies:
75

Avg. Num. of Students:
71

Average Rate:
0.78

Range of Rates:
0.39 - 1.78

Standard Deviation:
0.25

Fitted Curve Equation:
$T = 0.66(X) + 8.42$

R^2:
0.69

Directional Distribution:
53% entering, 47% exiting

Calculated Trip Ends:
Average Rate: 5 (Total), 2 (Entry), 3 (Exit)
Fitted Curve: 12 (Total), 7 (Entry), 5 (Exit)

Add-ons to do more

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Query   Filter

DATA SOURCE:
Trip Generation Manual, 11th Ed ▾

SEARCH BY LAND USE CODE:
565 🔍

LAND USE GROUP:
(500-599) Institutional ▾

LAND USE :
565 - Day Care Center ▾

LAND USE SUBCATEGORY:
All Sites ▾

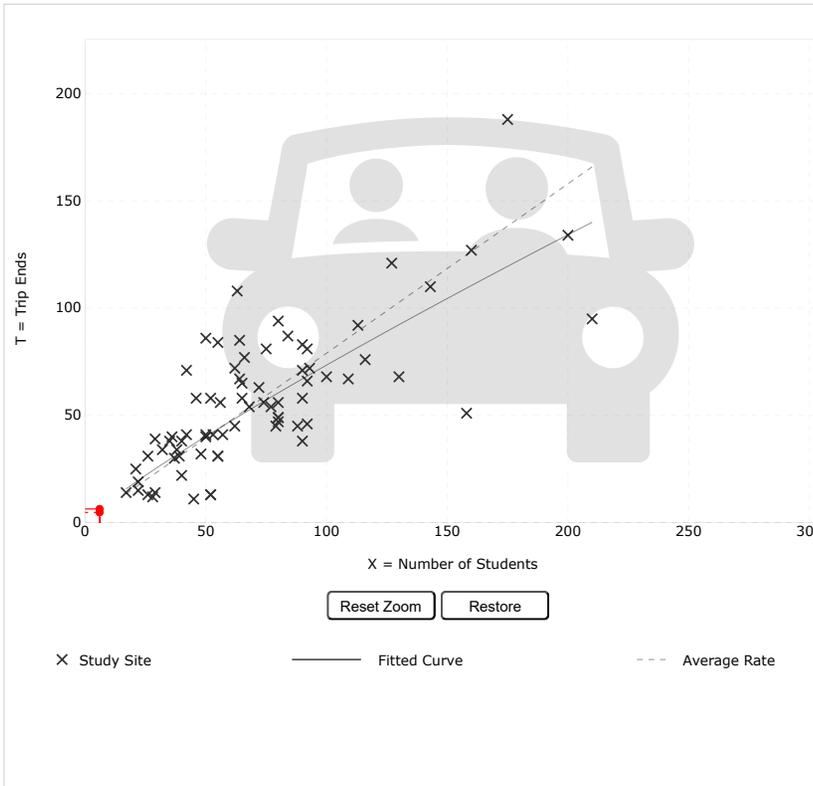**SETTING/LOCATION:**
General Urban/Suburban ▾

INDEPENDENT VARIABLE (IV):
Students ▾

TIME PERIOD:
Weekday, Peak Hour of Adjacent Street Traffic ▾

TRIP TYPE:
Vehicle ▾

ENTER IV VALUE TO CALCULATE TRIPS:
6   [Calculate]

Data Plot and Equation

T = Trip Ends

X = Number of Students

[Reset Zoom] [Restore]

✕ Study Site   ——— Fitted Curve   - - - Average Rate

Use the mouse wheel to Zoom Out or Zoom In.
Hover the mouse pointer on data points to view X and T values.

DATA STATISTICS

Land Use:
Day Care Center (565) Click for Description and Data Plots

Independent Variable:
Students

Time Period:
Weekday
Peak Hour of Adjacent Street Traffic
One Hour Between 4 and 6 p.m.

Setting/Location:
General Urban/Suburban

Trip Type:
Vehicle

Number of Studies:
75

Avg. Num. of Students:
72

Average Rate:
0.79

Range of Rates:
0.24 - 1.72

Standard Deviation:
0.30

Fitted Curve Equation:
$Ln(T) = 0.87 \, Ln(X) + 0.29$

R^2:
0.57

Directional Distribution:
47% entering, 53% exiting

Calculated Trip Ends:
Average Rate: 5 (Total), 2 (Entry), 3 (Exit)
Fitted Curve: 6 (Total), 3 (Entry), 3 (Exit)

Add-ons to do more

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