Central West Analysis Packet 9-3-13

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Planning | Transportation | Land Development | Environmental

Memorandum

To: David Bonk, AICP
Planning Department
Town of Chapel Hill

Date: August 28, 2013

Project No.: 38133.00

From: Baohong Wan, PhD, PE
Project Manager

Re: Traffic Analysis Assumptions for Proposed Chapel Hill Central West Focus Area

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This memorandum provides a summary of the traffic analysis assumptions for the proposed Chapel Hill Central West Focus Area (CWFA).

Development

- The proposed CWFA is located on the east side of MLK Jr. Boulevard along Estes Drive in Chapel Hill, NC. A total of four mixed-use land use scenarios were included in this analysis. It is assumed that the project will be build-out by 2023.

Study Area:

- As agreed upon with the Town of Chapel Hill, the traffic analysis focuses on the intersection of MLK Jr. Boulevard and Estes Drive only.

Existing Conditions

- Recent traffic turning movement data were obtained from the Carolina Flat Traffic Impact Analysis report prepared by RS&H.

Background Conditions

- 2% annual ambient traffic growth until 2016, and 1% annual ambient traffic growth between 2017 and 2023
- First phase (800 KSF) of Carolina North
- Background transportation improvements include a northbound right-turn lane on MLK at Estes, which is to be constructed with Carolina North Phase 1

Trip Generation

- For the four land use scenarios (A1, A2, B1, and B2), trip generation was conducted by the Town of Chapel Hill staff based on the ITE standard

Traffic Assignment

- Residential and Non-Residential were distributed differently to the four primary travel directions.

Direction	Residential	Non-Residential
MLK to the North	25%	35%
MLK to the South	50%	25%
Estes to the East	10%	25%
Estes to the West	15%	15%

- Traffic assignment percentages for each land parcel from A to I was based on the trip generation results, calculated based on the daily traffic percentages

Land Parcel	Residential				Non-Residential			
	A1	A2	B1	B2	A1	A2	B1	B2
A	25%	32%	23%	32%	45%	39%	20%	33%
B	13%	14%	18%	14%	0%	0%	9%	6%
C	22%	19%	21%	18%	0%	0%	7%	5%
D	0%	0%	0%	0%	18%	20%	23%	14%
E	13%	12%	12%	11%	0%	0%	12%	8%
F	0%	0%	0%	0%	32%	24%	14%	17%
G	8%	6%	9%	7%	0%	4%	5%	3%
H	15%	16%	17%	18%	0%	0%	0%	0%
I	4%	0%	0%	0%	5%	12%	11%	13%

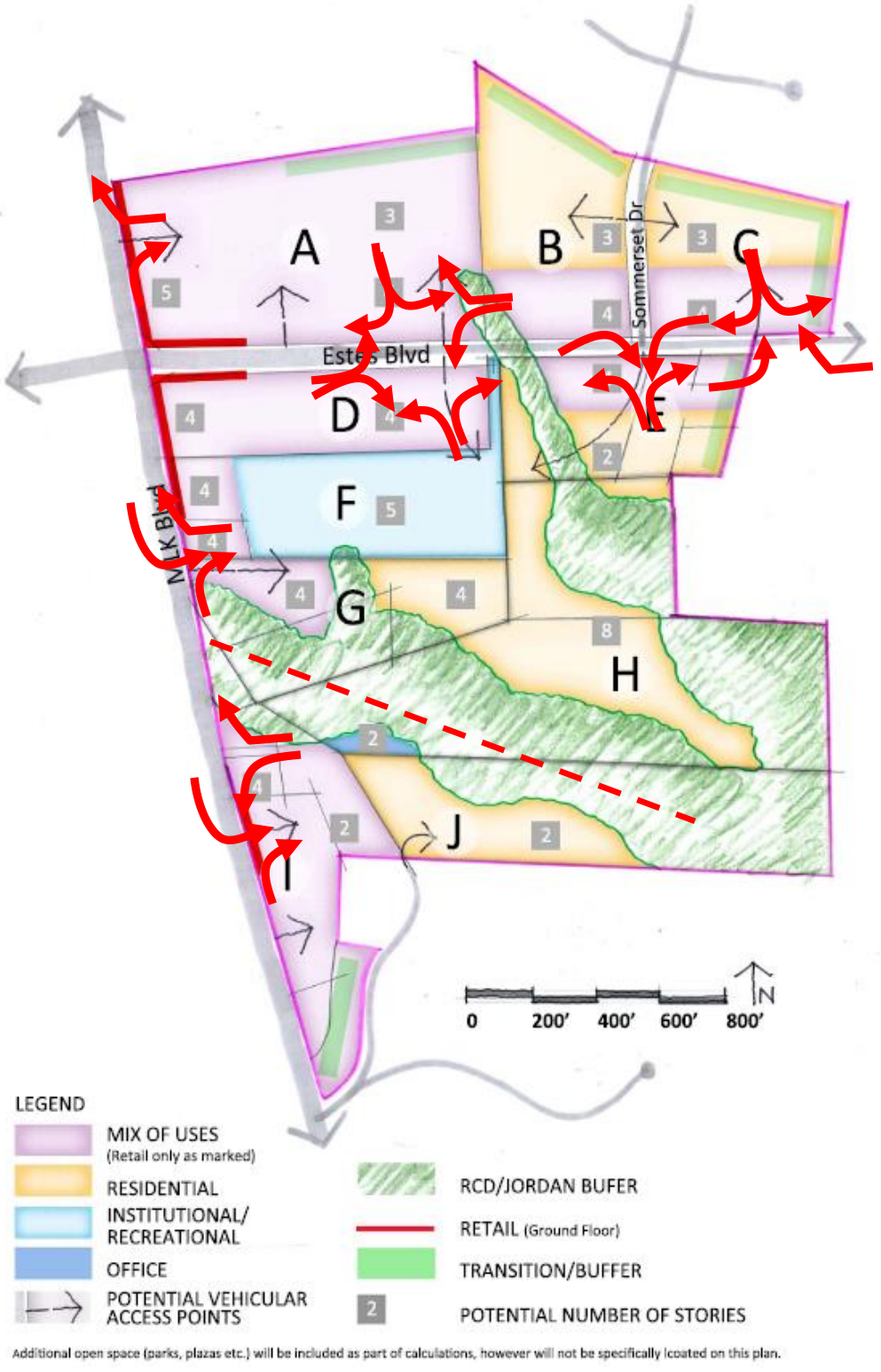
- Between land parcels and travel directions, the actual traffic assignment routes were subject to turning movement restrictions at site accesses. Illustrations of these site access layout and turning restrictions are attached.
- It is assumed that Parcels I and J are separated from other parcels by wet land.

Traffic Operations and Capacity Analysis

- Intersection geometrics and traffic control data were obtained from the Carolina North TIA.
- Traffic signal timings were optimized for all future condition analysis. NCDOT standard default values were used where applicable.

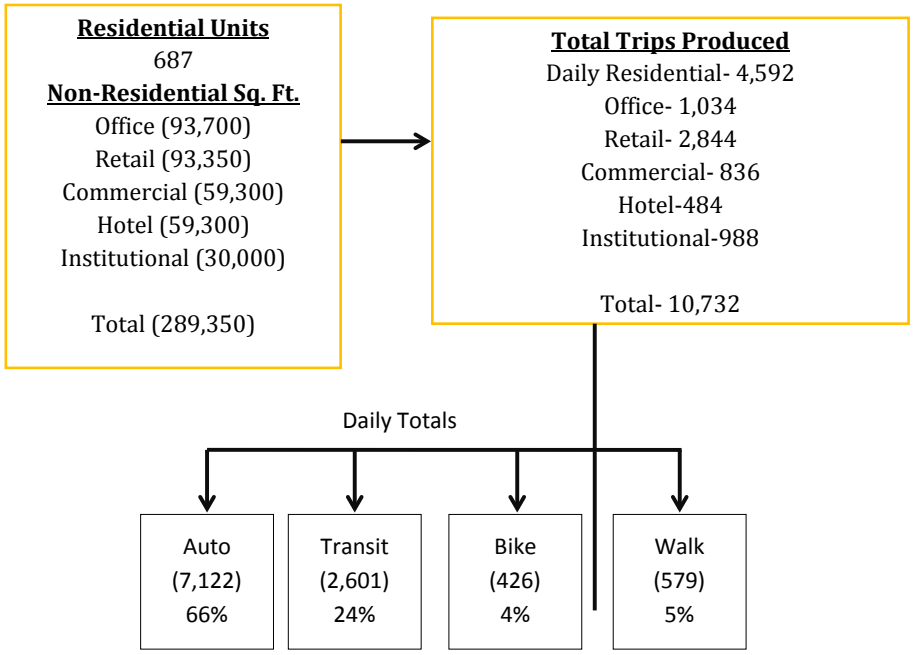
Traffic Mitigation Strategies

- A northbound right-turn lane was assumed in the background conditions.
- With the projected heavy traffic, the following improvements should be considered:
    - Adding a second through lane on Estes along both the eastbound and westbound directions
    - Adding a second westbound left-turn lane on Estes
    - Adding a southbound right-turn lane on MLK
    - Adding a second southbound left-turn lane on MLK
    - Adding a third though lane on MLK along both the northbound and southbound directions
- The Carolina North Phase 2 recommended a six-lane cross-section along MLK and four-lane cross-section along Estes with exclusive left-turn and right-turn lanes on all approaches; in addition, a second southbound left-turn lane was recommended. These could become long term planning geometrics at the MLK and Estes intersection.

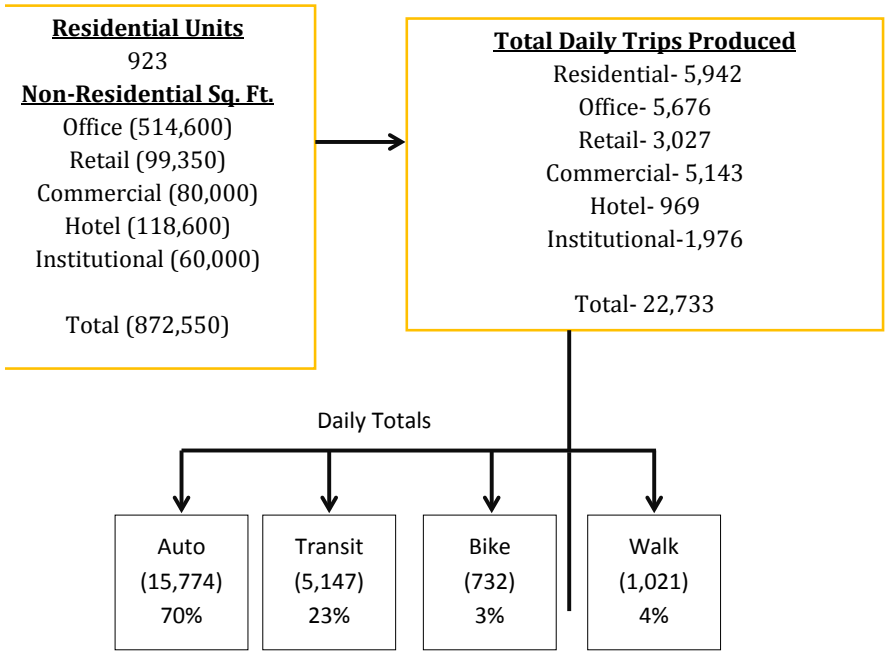

A
B
C
D
E
F
G
H
I
J
Estes Blvd
Sommerset Dr
MLK Blvd
0
200'
400'
600'
800'
N
LEGEND
MIX OF USES
(Retail only as marked)
RESIDENTIAL
INSTITUTIONAL/
RECREATIONAL
OFFICE
POTENTIAL VEHICULAR
ACCESS POINTS
RCD/JORDAN BUFER
RETAIL (Ground Floor)
TRANSITION/BUFFER
POTENTIAL NUMBER OF STORIES
Additional open space (parks, plazas etc.) will be included as part of calculations, however will not be specifically located on this plan.

Land Use Data and Trip Generation Summaries by Option

Scenario A1



Scenario A2



Land Use Data and Trip Generation Summaries by Option

Scenario B1

Residential Units
601
Non-Residential Sq. Ft.
Office (243,700)
Retail (93,350)
Commercial (86,500)
Hotel (59,300)
Institutional (77,500)

Total (560,350)

Total Daily Trips Produced
Residential- 3,974
Office- 2,797
Retail- 2,964
Commercial- 5,797
Hotel- 504
Institutional-2,057

Total- 18,093

Daily Totals

Auto	Transit	Bike	Walk
(12,763)	(4,020)	(548)	(769)
71%	22%	3%	4%

Scenario B2

Residential Units
881
Non-Residential Sq. Ft.
Office (514,600)
Retail (99,350)
Commercial (80,000)
Hotel (118,600)
Institutional (60,000)

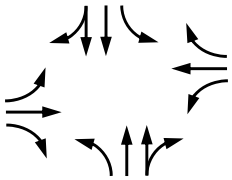
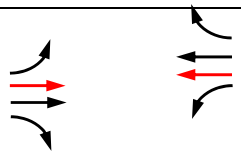
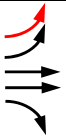
Total (872,550)

Total Daily Trips Produced
Residential- 5,663
Office- 6,558
Retail- 3,027
Commercial- 6,975
Hotel- 969
Institutional-1,976

Total- 25,168

Daily Totals

Auto	Transit	Bike	Walk
(18,123)	(5,789)	(785)	(1101)
70%	22%	3%	4%

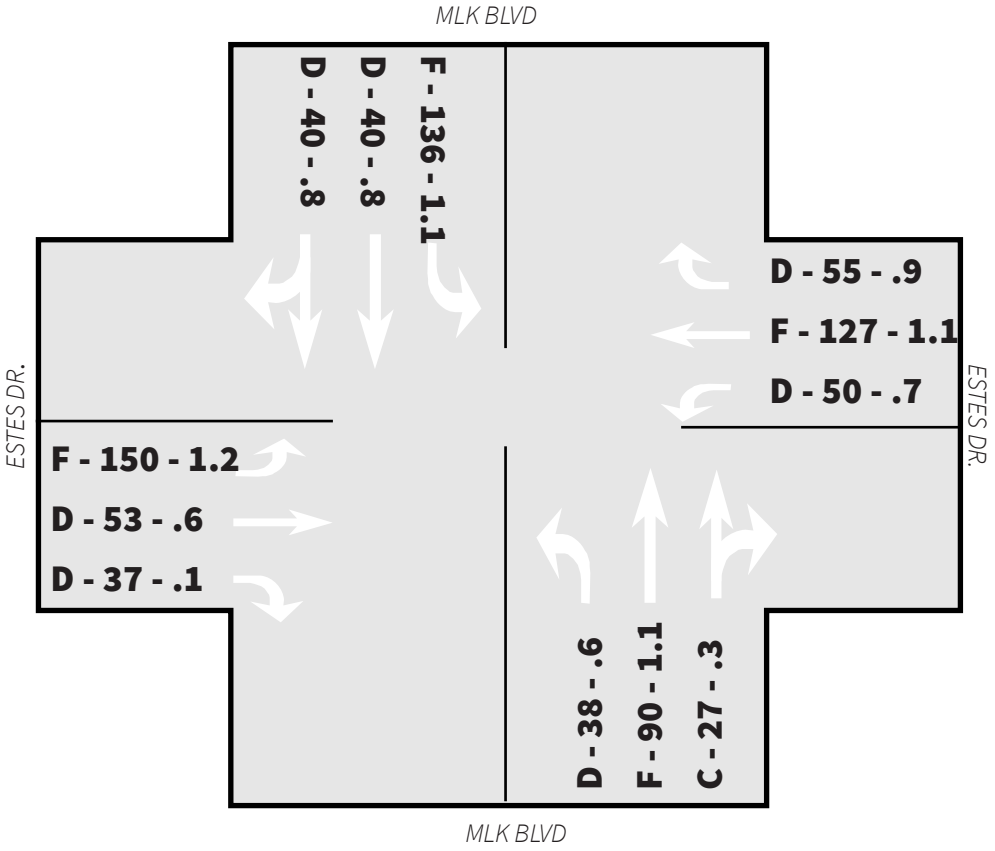
Illustration	Mitigation Description	Existing (2013)	No-Build (2023)	Option A1	Option A2	Option B1	Option B2
	Existing Geometrics	✓	✓	✓	✓	✓	✓
	NB Right-turn lane on MLK		✓	✓	✓	✓	✓
	SB right-turn lane on MLK		✓	✓	✓	✓	✓
	3rd NB through lane on MLK, requiring a 3rd receiving lane on MLK north of Estes		✓	✓	✓	✓	✓
	2nd SB left-turn lane on MLK, requiring a 2nd receiving lane on Estes east of MLK			✓	✓	✓	✓
	2nd EB and WB through lanes on Estes, requiring 2nd receiving lanes on Estes both east and west of MLK				✓	✓	✓
	2nd WB left-turn lane on Estes				✓	✓	✓
	2nd EB left-turn lane on Estes						✓

Summary Table : Before and After Mitigation Measures

Estes Dr/MLK Jr Blvd Intersection						
SCENARIO	AM PEAK HOUR	PM PEAK HOUR				
	LOS	Delay	V/C	LOS	Delay	V/C
No Build: Before Mitigation	E	56.7 sec	0.89	E	75.4 sec	1.1
No Build: After Mitigation	D	45.1 sec	0.84	E	56.1 sec	0.99
Proposed Improvements:						
A1: Before	E	69.6 sec	0.94	F	98.4 sec	1.24
A1: After	D	47.4 sec	0.92	D	53.1 sec	0.93
A2: Before	F	89.7 sec	1.04	F	124.2 sec	1.3
A2: After	D	49.7 sec	0.83	E	55.1 sec	0.97
B1: Before	F	110.2 sec	1.15	F	140.4 sec	1.36
B1: After	D	51.4 sec	0.85	E	56.8 sec	0.93
B2: Before	F	122.8 sec	1.21	F	154.8 sec	1.44
B2: After	D	50.7 sec	0.81	E	55.2 sec	0.93

NO BUILD OPTION : PM peak

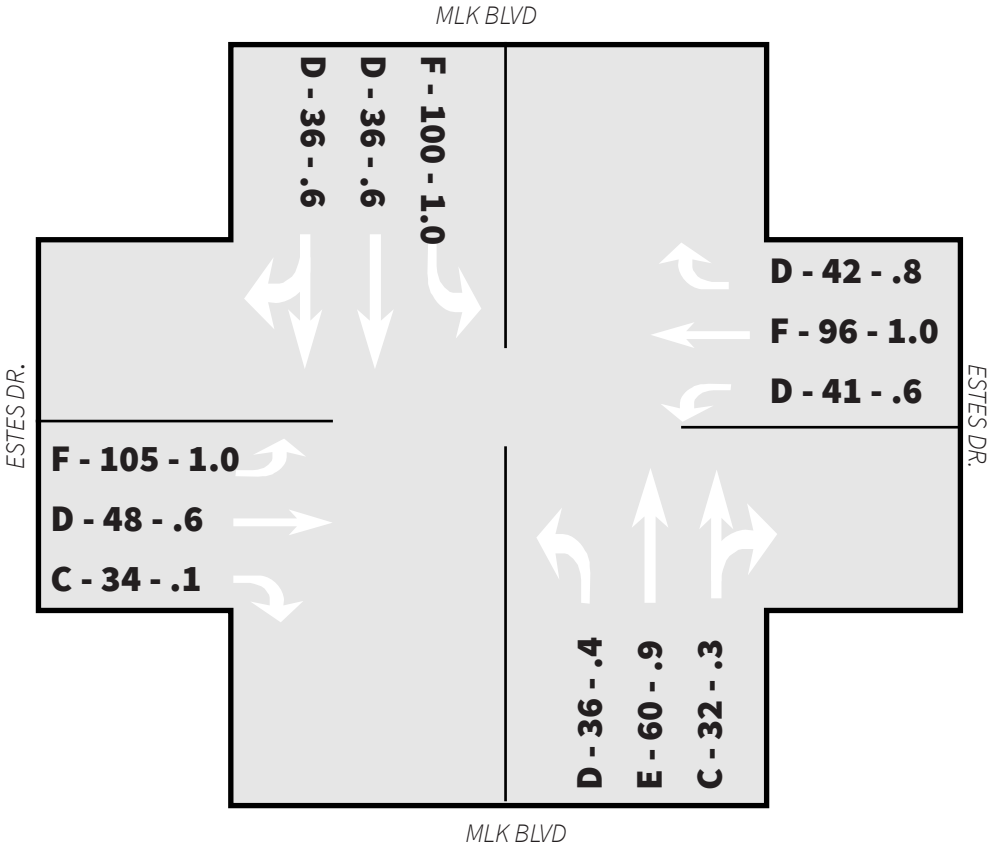
Before Mitigation



Overall Intersection Score

LOS	Delay	V/C
E	**75**	**1.1**

After Mitigation

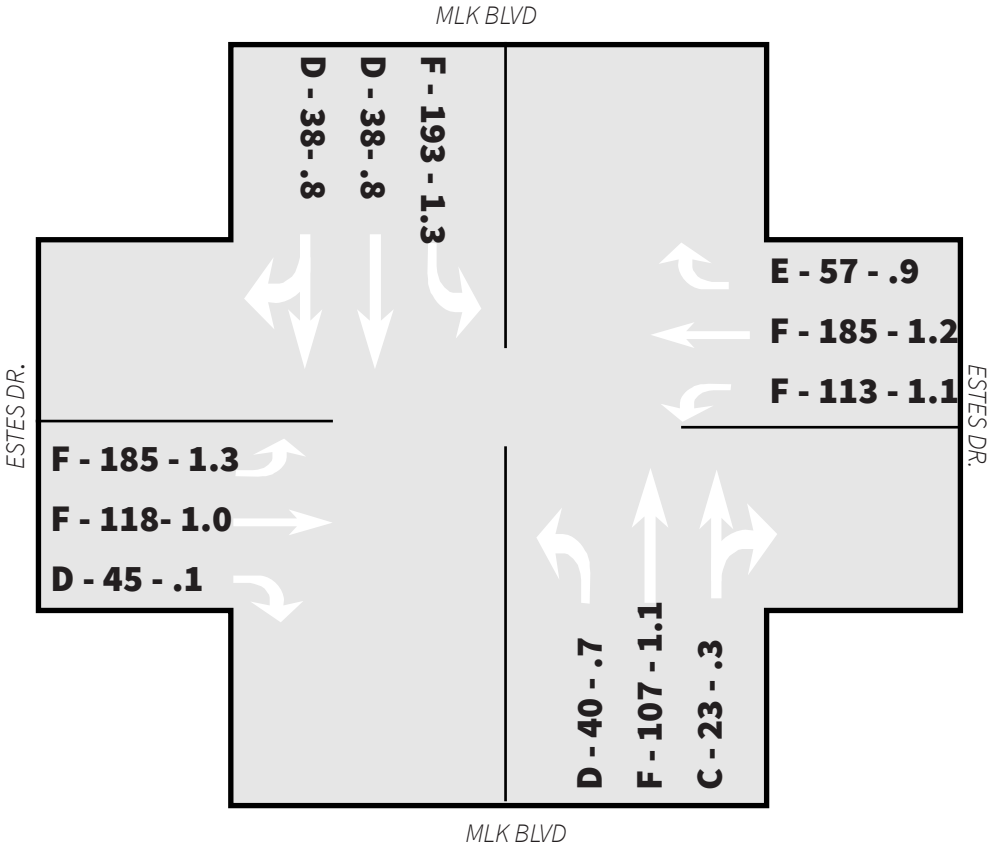


Overall Intersection Score

LOS	Delay	V/C
E	**56**	**.9**

A - 1 : PM peak

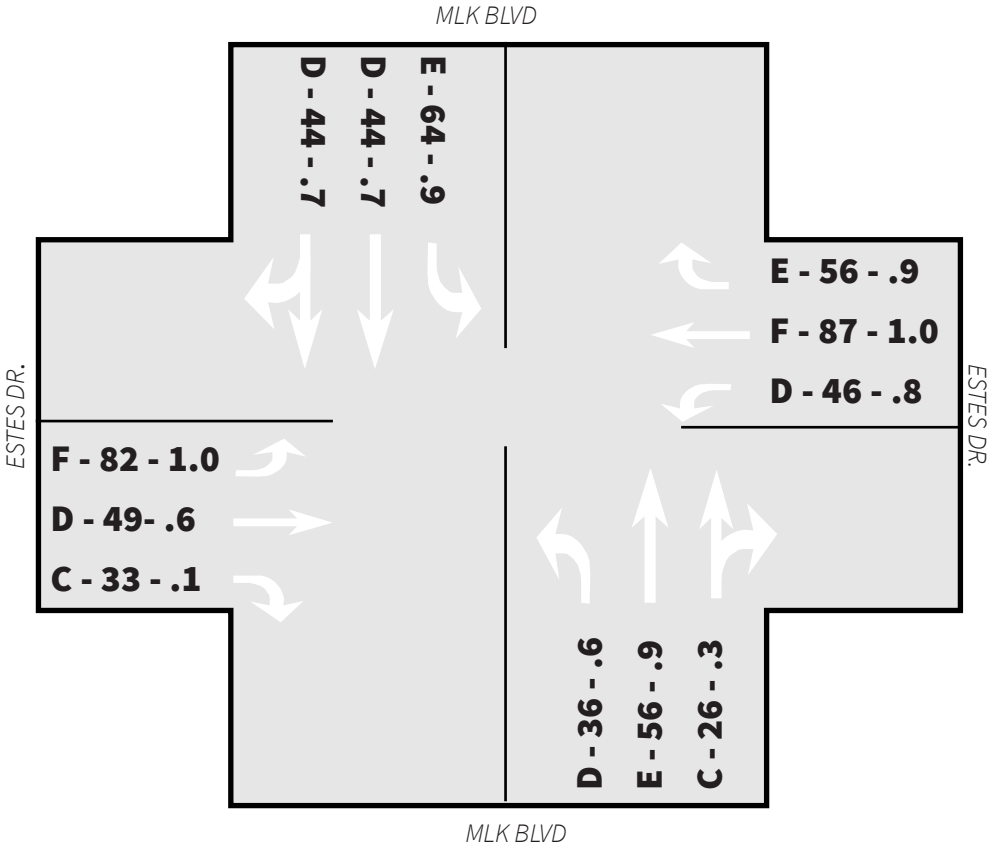
Before Mitigation



Overall Intersection Score

LOS	Delay	V/C
F	**98**	**1.2**

After Mitigation

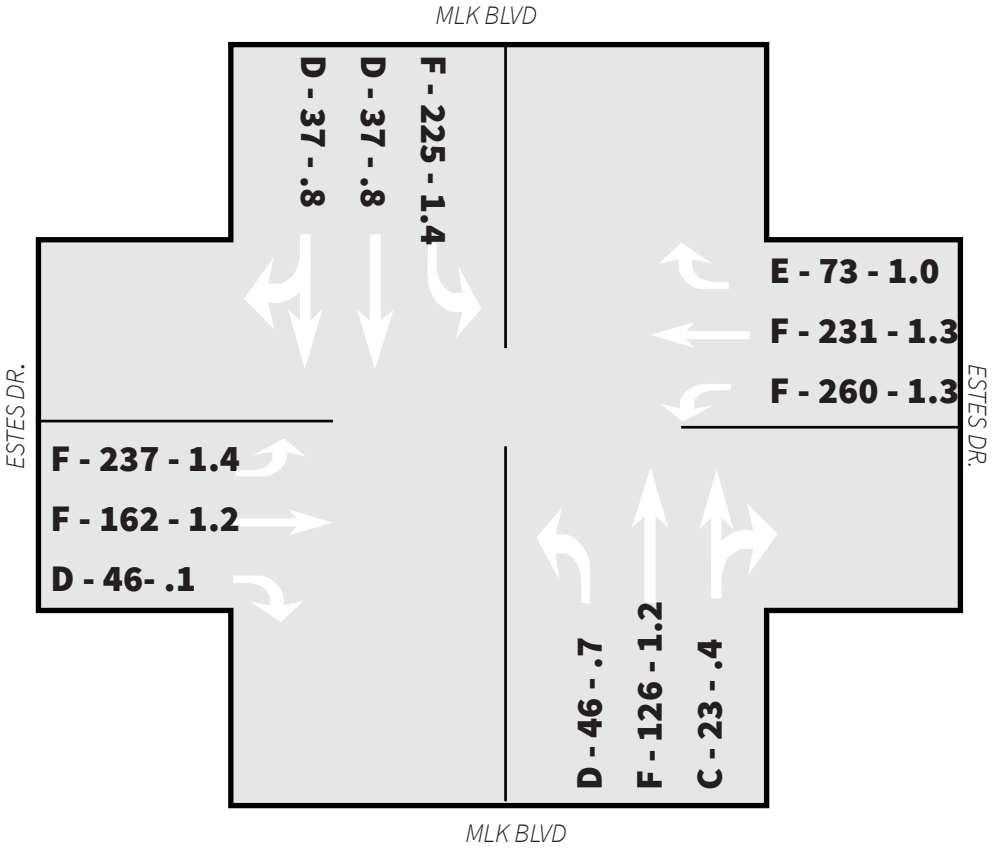


Overall Intersection Score

LOS	Delay	V/C
D	**53**	**.9**

A- 2 : PM peak

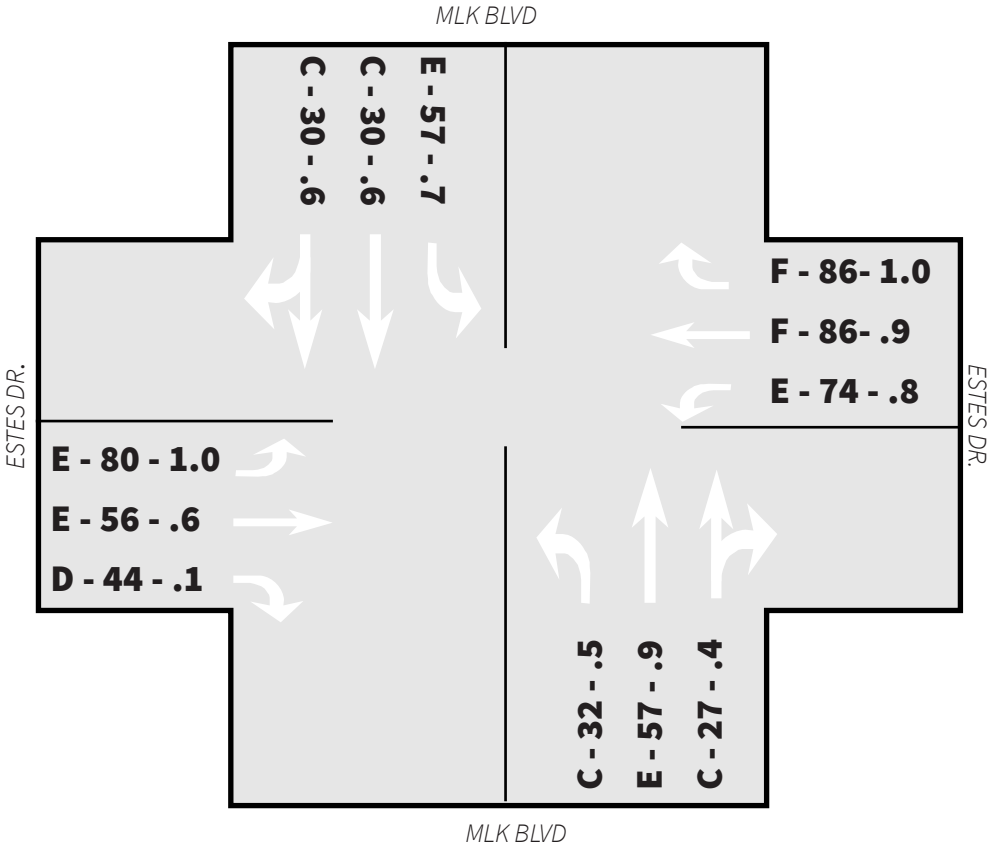
Before Mitigation



Overall Intersection Score

LOS	Delay	V/C
F	**124**	**1.3**

After Mitigation

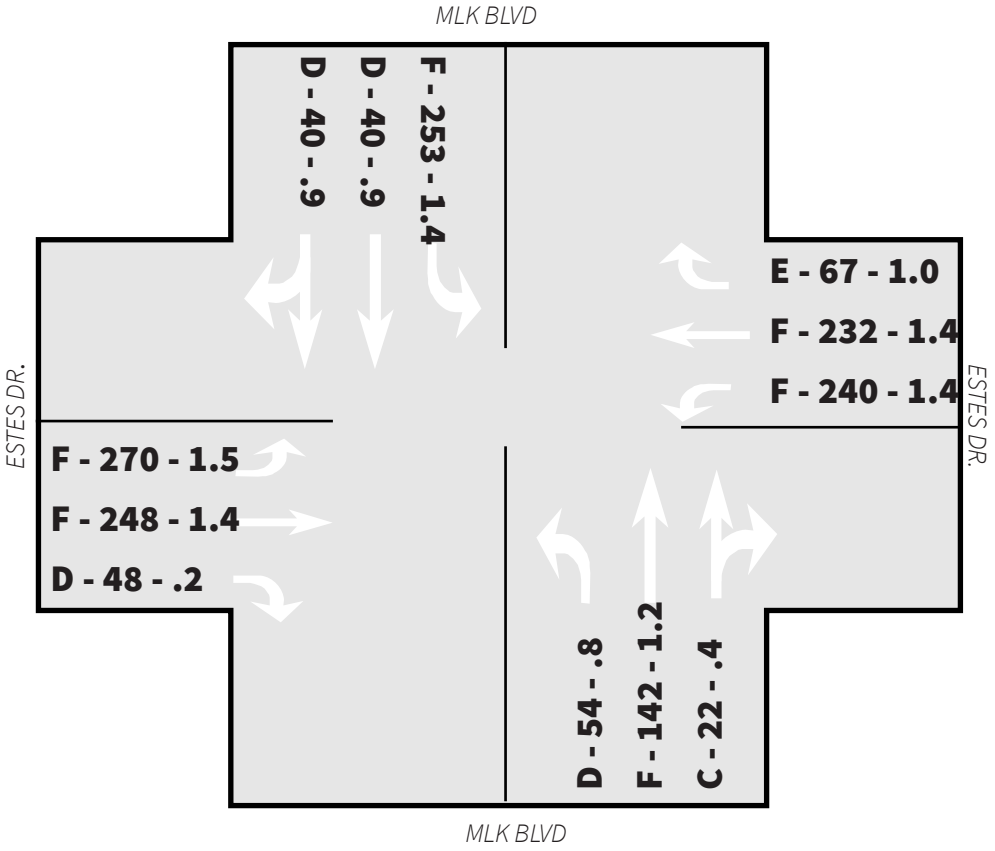


Overall Intersection Score

LOS	Delay	V/C
E	**55**	**1.0**

B- 1 : PM peak

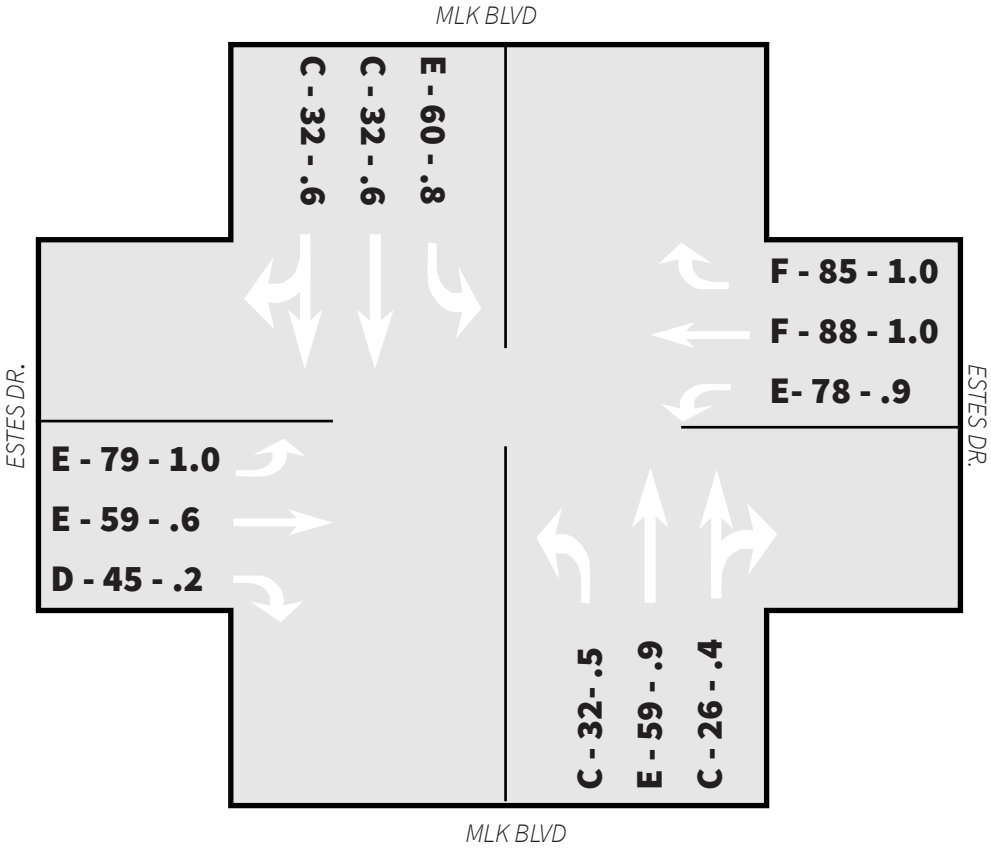
Before Mitigation



Overall Intersection Score

LOS	Delay	V/C
F	**140**	**1.4**

After Mitigation

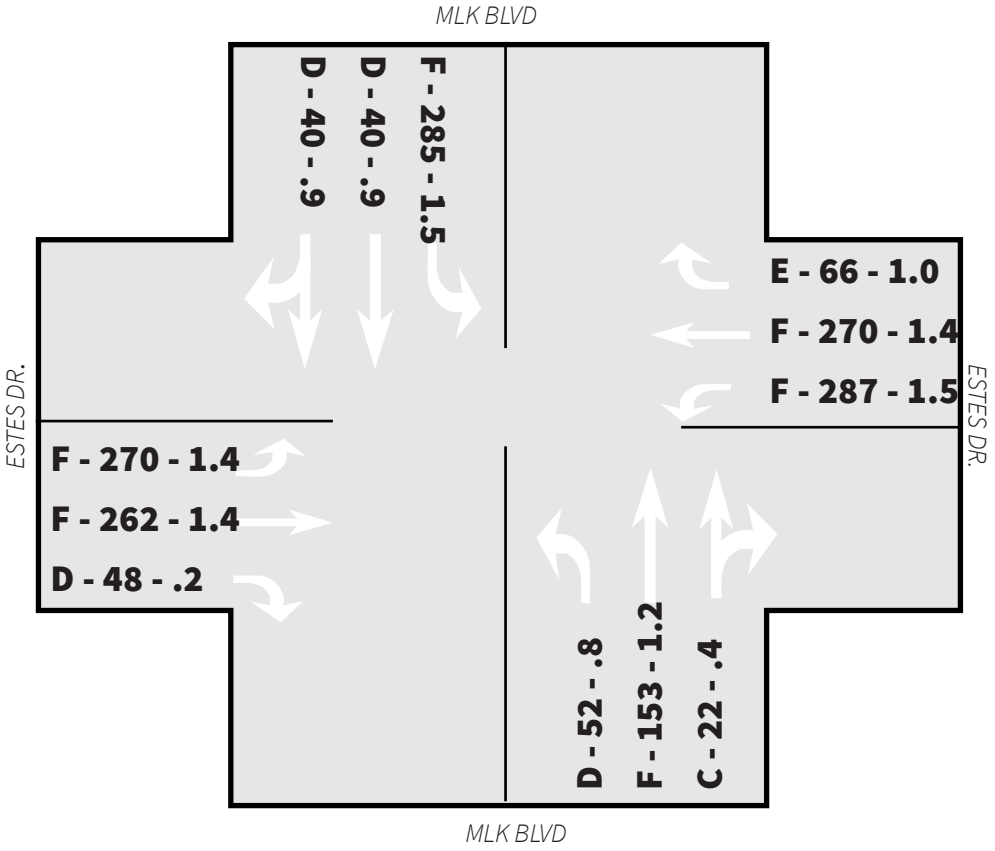


Overall Intersection Score

LOS	Delay	V/C
E	**57**	**.9**

B- 2 : PM peak

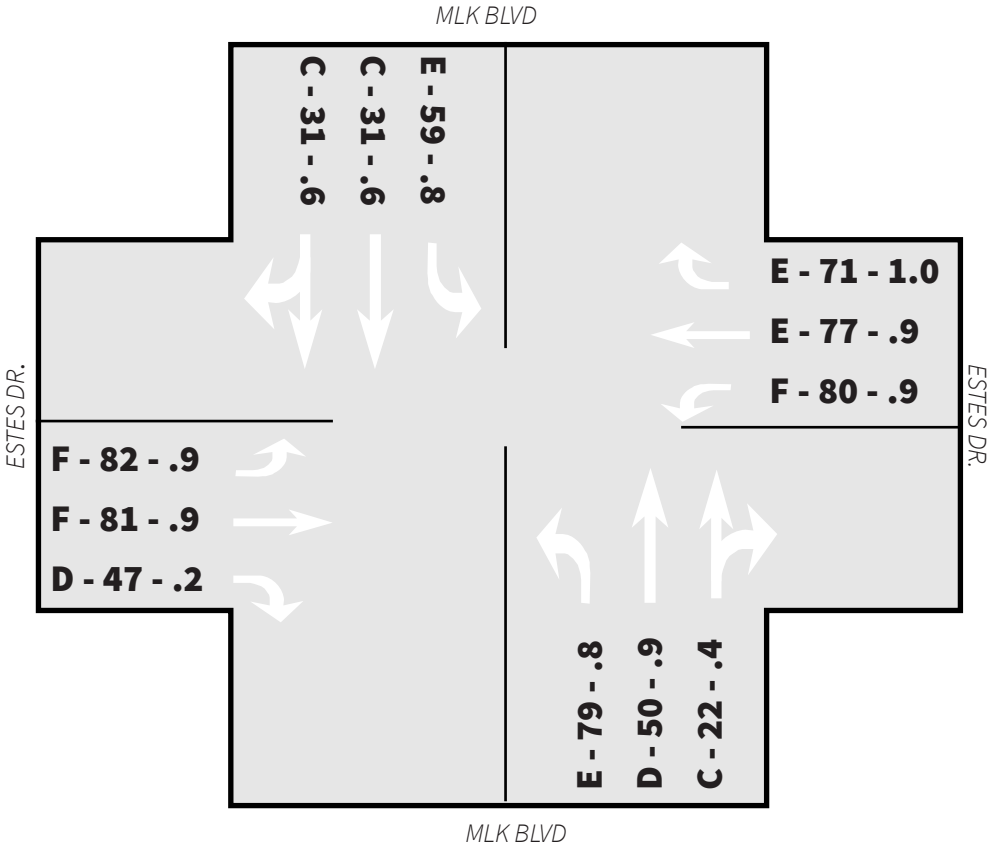
Before Mitigation



Overall Intersection Score

LOS	Delay	V/C
F	**155**	**1.4**

After Mitigation



Overall Intersection Score

LOS	Delay	V/C
E	**55**	**.9**

Traffic Analysis Inputs : Trip Generations Rates Used for Trip Caluculations

Land Use	ITE Code	ITE AM Rate	ITE PM Rate	ITE Weekday Rate
Apt.	220	0.51	0.62	6.65
Comm./Serv.	***	7.9	13.88	121.75
Hotel	310	0.53	0.6	8.17
Inst.	492	1.41	3.53	32.93
Office	710	1.56	1.49	11.03
Retail	****	1.92	4.79	57.71
Senior Hsg.	252	0.2	0.25	3.44
SF	210	0.75	1	9.52
Townhouse	224	0.7	0.72	9.52

*** Comm.Serv Average Rate				
Land Use	ITE Code	AM Rate	PM Rate	Weekday Rate
High Turn Over Sit Down Restaruant	932	10.81	9.85	127.15
Quality Restaurant	931	0.81	7.49	89.95
Drive-in Bank	912	12.08	24.3	148.15
Average		7.9	13.88	121.75

****Retail Average Rate				
Land Use	ITE Code	AM Rate	PM Rate	Weekday Rate
Apparel Store	876	1	3.83	66.4
Shopping Center	820	0.96	3.71	42.7
Variety Store	814	3.81	6.82	64.03
Average		1.92	4.79	57.71

Single-Family Detached Housing
(210)

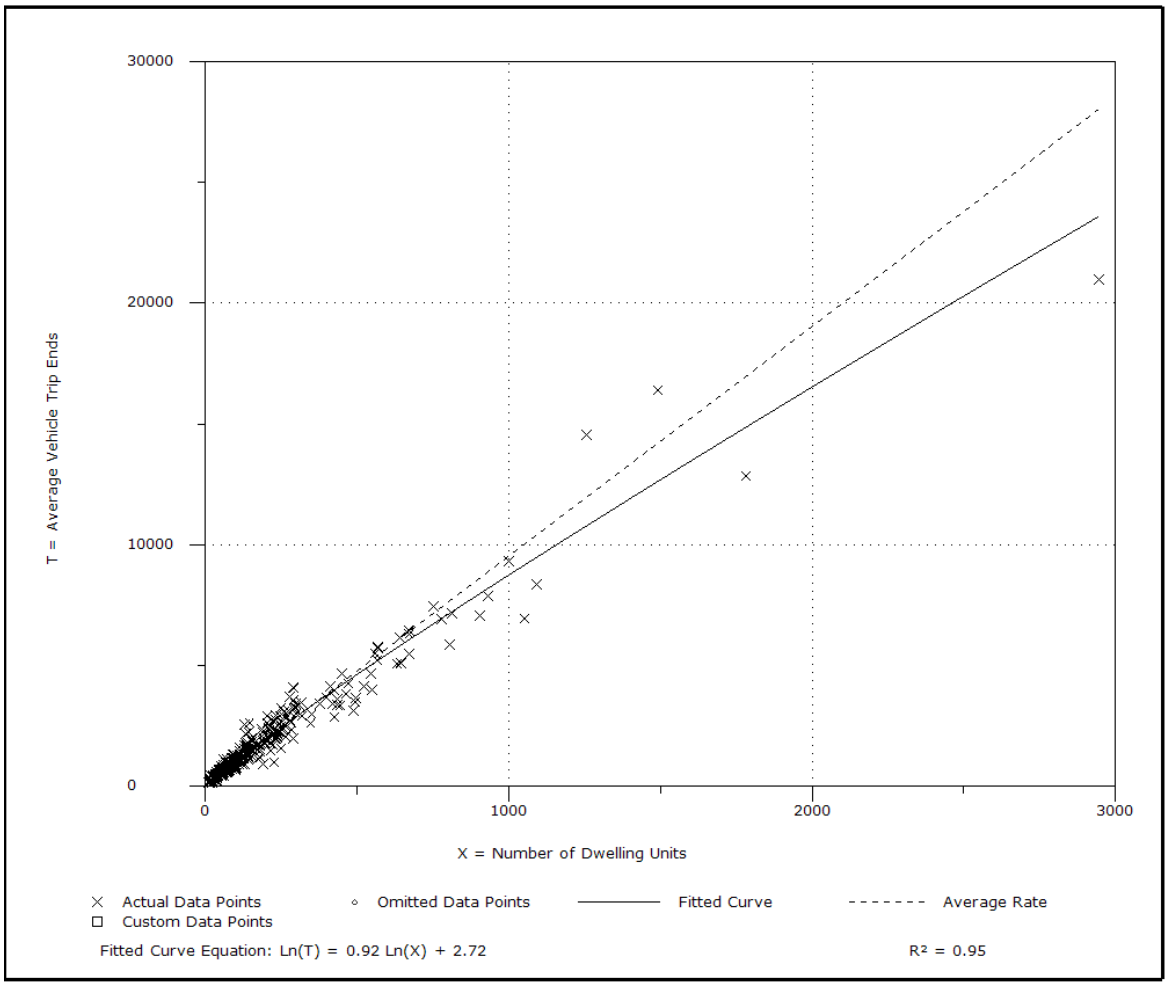
Average Vehicle Trip Ends vs: **Dwelling Units**
On a: **Weekday**

Number of Studies: 355
Avg. Number of Dwelling Units: 198
Directional Distribution: 50% entering, 50% exiting

Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
9.52	4.31 - 21.85	3.70

Data Plot and Equation



Trip Generation, 9th Edition

Elementary School
(520)

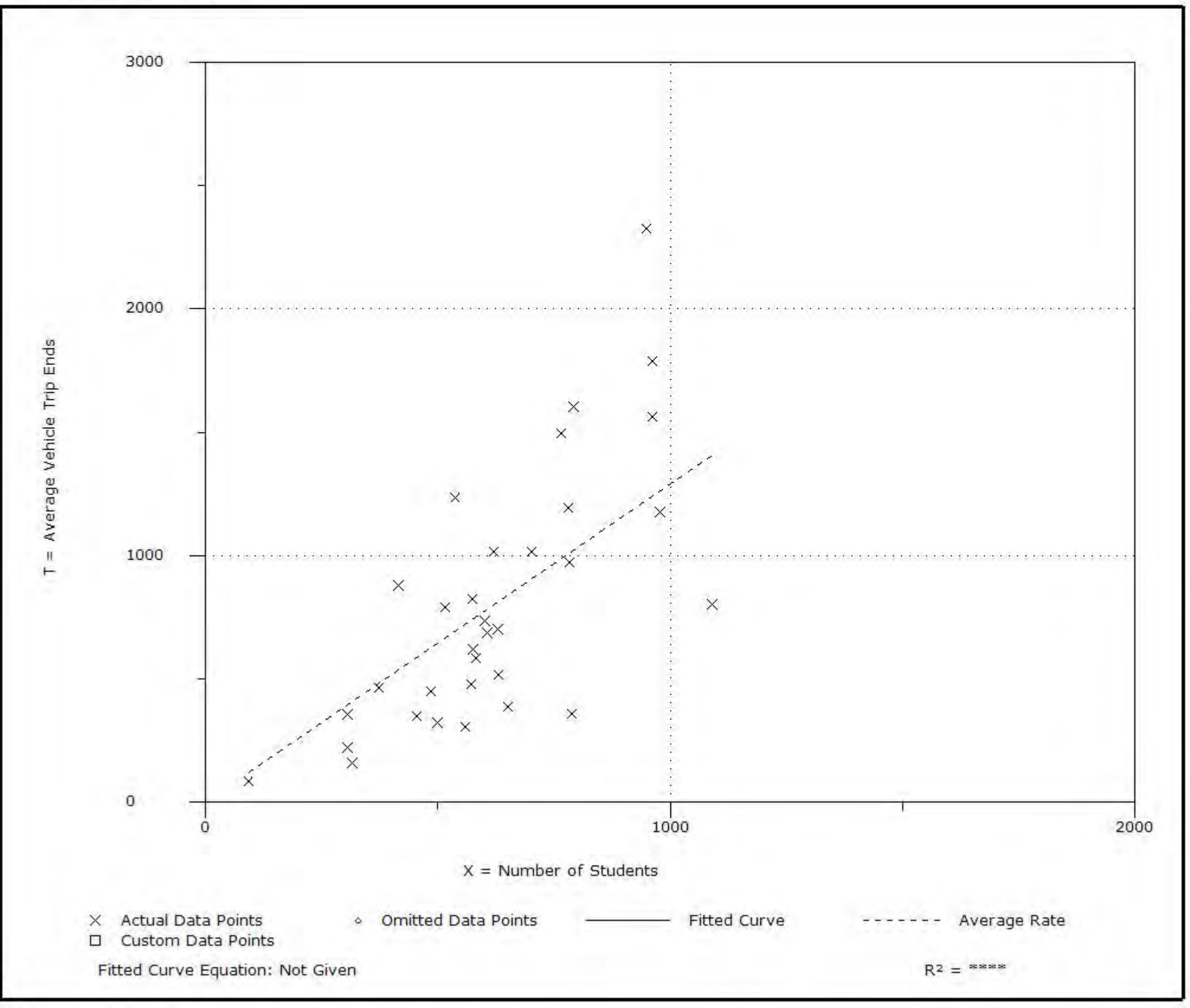
Average Vehicle Trip Ends vs: **Students**
On a: **Weekday**

Number of Studies: 33
Average Number of Students: 620
Directional Distribution: 50% entering, 50% exiting

Trip Generation per Student

Average Rate	Range of Rates	Standard Deviation
1.29	0.45 - 2.45	1.26

Data Plot and Equation



Trip Generation, 9th Edition

Shopping Center
(820)

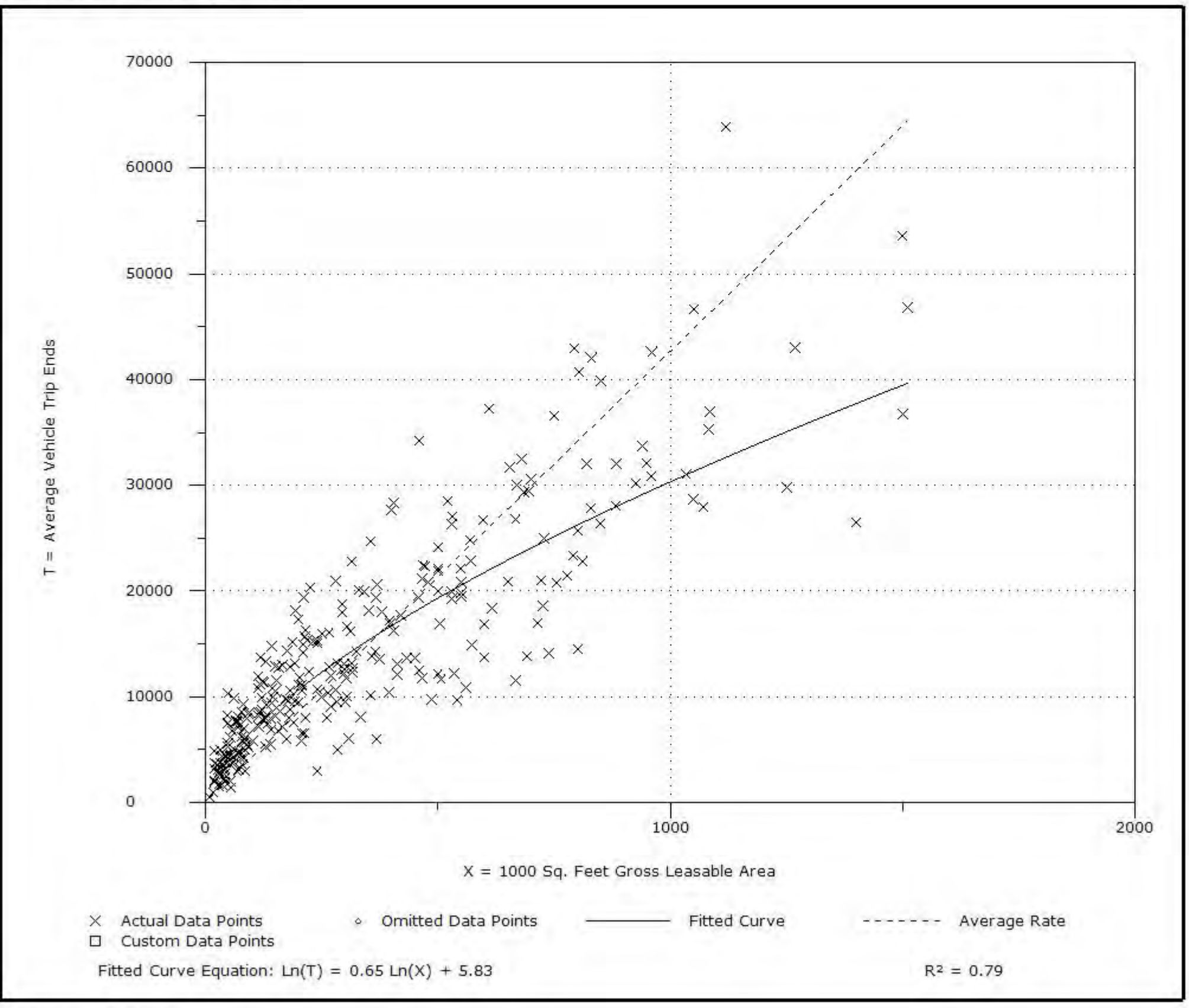
Average Vehicle Trip Ends vs: **1000 Sq. Feet Gross Leasable Area**
On a: **Weekday**

Number of Studies: 302
Average 1000 Sq. Feet GLA: 331
Directional Distribution: 50% entering, 50% exiting

Trip Generation per 1000 Sq. Feet Gross Leasable Area

Average Rate	Range of Rates	Standard Deviation
42.70	12.50 - 270.89	21.25

Data Plot and Equation



Trip Generation, 9th Edition

Quality Restaurant
(931)

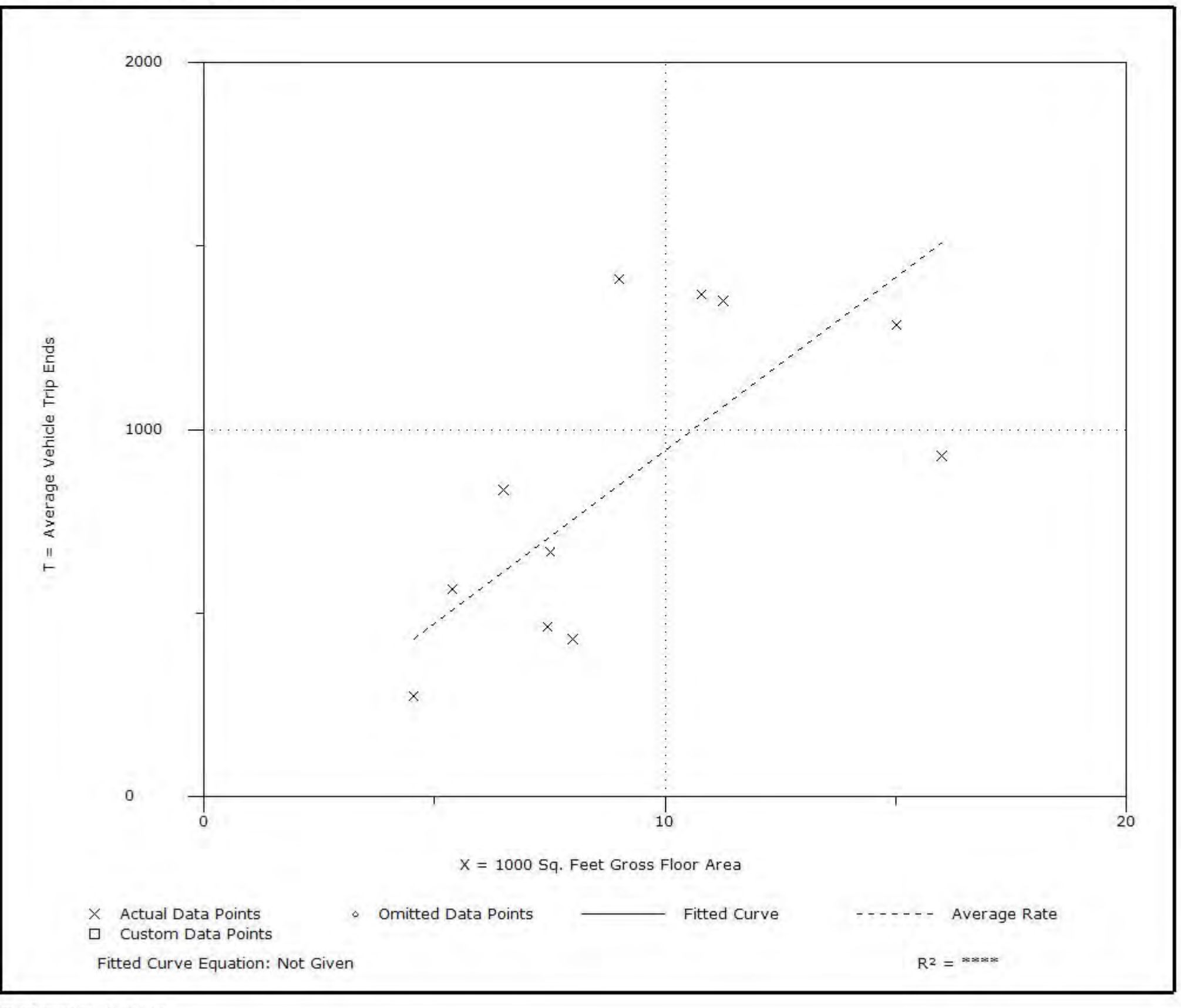
Average Vehicle Trip Ends vs: **1000 Sq. Feet Gross Floor Area**
On a: **Saturday**

Number of Studies: 11
Average 1000 Sq. Feet GFA: 9
Directional Distribution: 50% entering, 50% exiting

Trip Generation per 1000 Sq. Feet Gross Floor Area

Average Rate	Range of Rates	Standard Deviation
94.36	53.63 - 156.67	34.42

Data Plot and Equation



Trip Generation, 9th Edition

Apartment
(220)

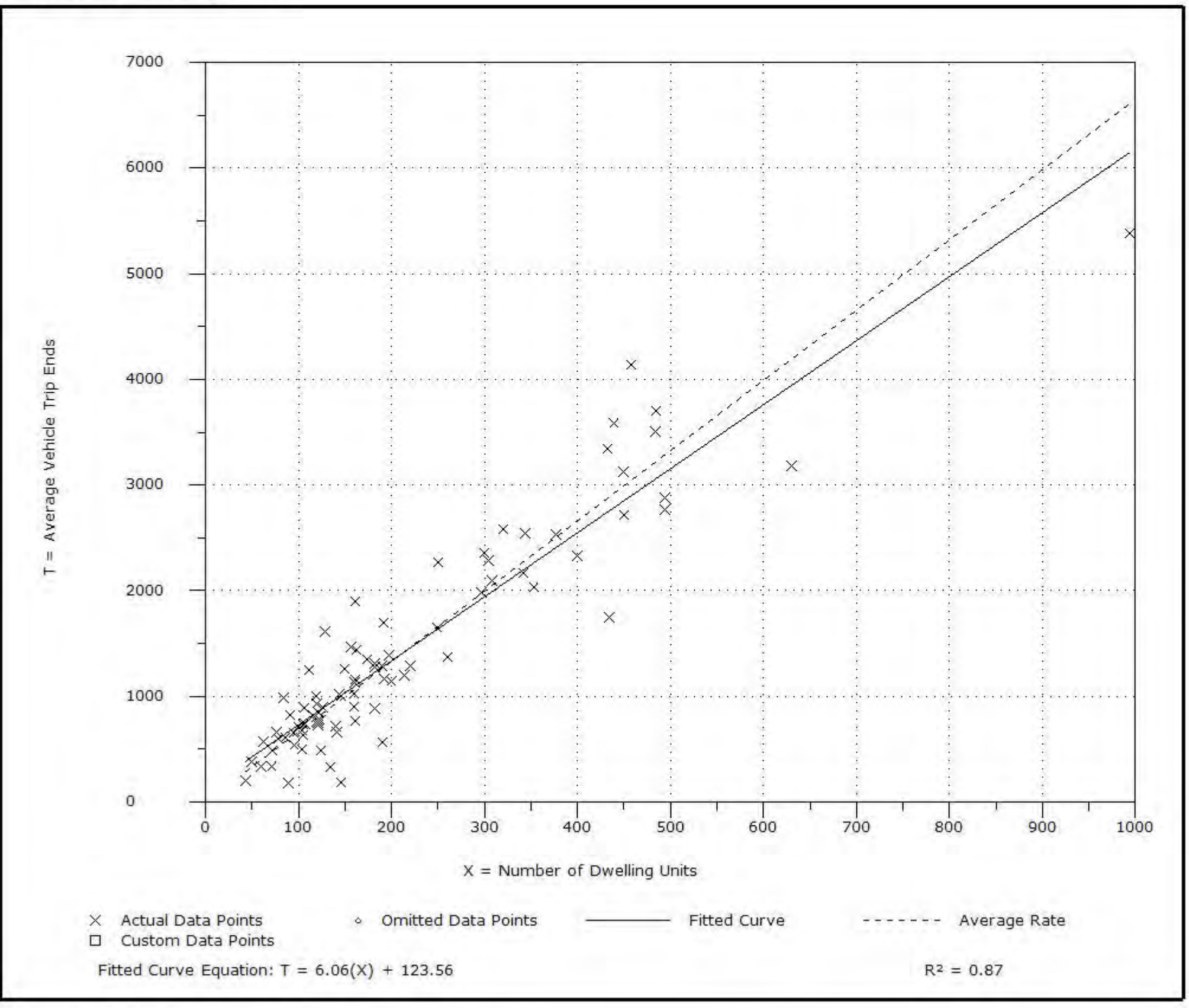
Average Vehicle Trip Ends vs: **Dwelling Units**
On a: **Weekday**

Number of Studies: 88
Avg. Number of Dwelling Units: 210
Directional Distribution: 50% entering, 50% exiting

Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
6.65	1.27 - 12.50	3.07

Data Plot and Equation



Hotel
(310)

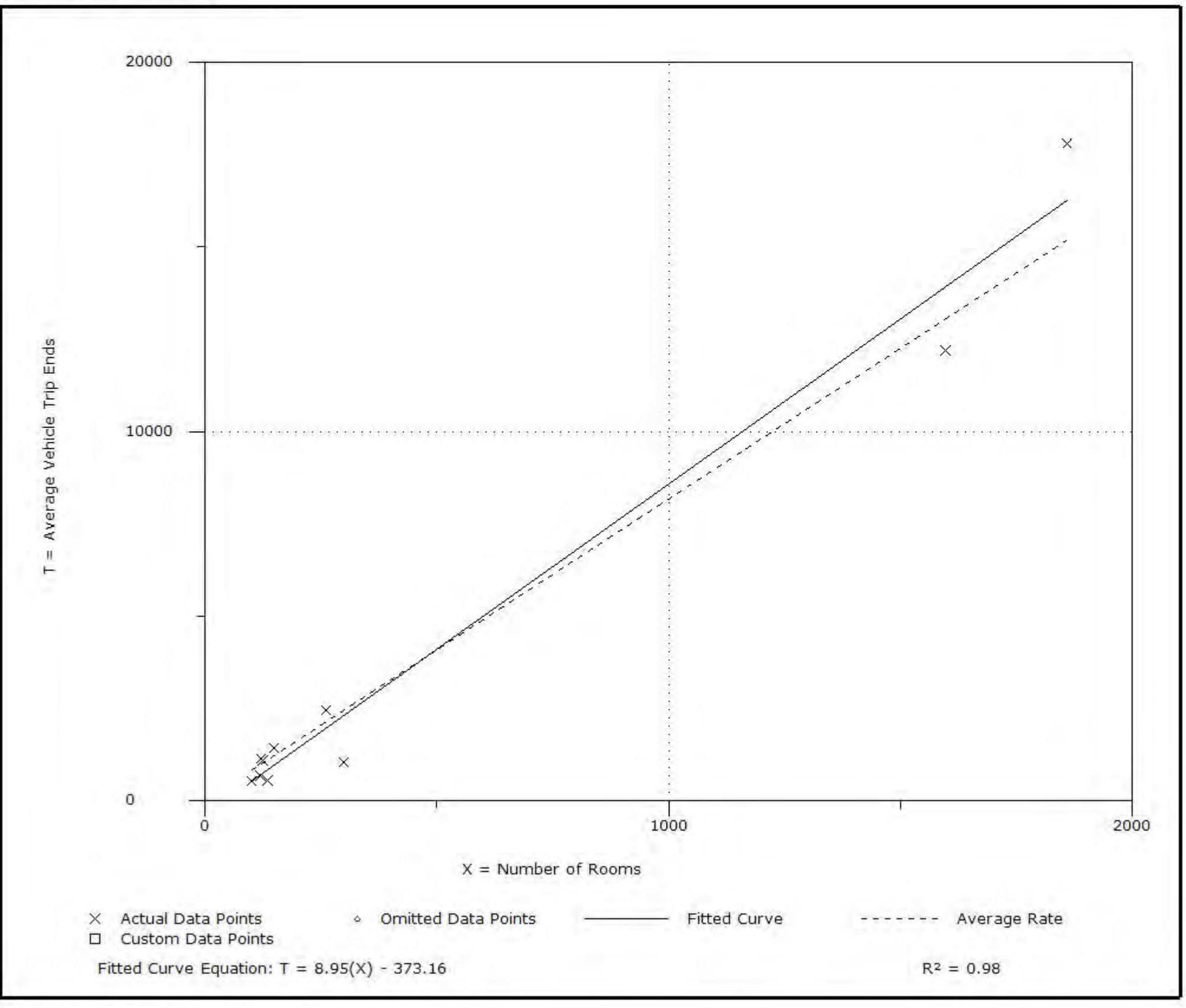
Average Vehicle Trip Ends vs: **Rooms**
On a: **Weekday**

Number of Studies: 10
Average Number of Rooms: 476
Directional Distribution: 50% entering, 50% exiting

Trip Generation per Room

Average Rate	Range of Rates	Standard Deviation
8.17	3.47 - 9.58	3.38

Data Plot and Equation



Trip Generation, 9th Edition

Specialty Retail Center
(826)

Average Vehicle Trip Ends vs: **1000 Sq. Feet Gross Leasable Area**
On a: **Weekday**

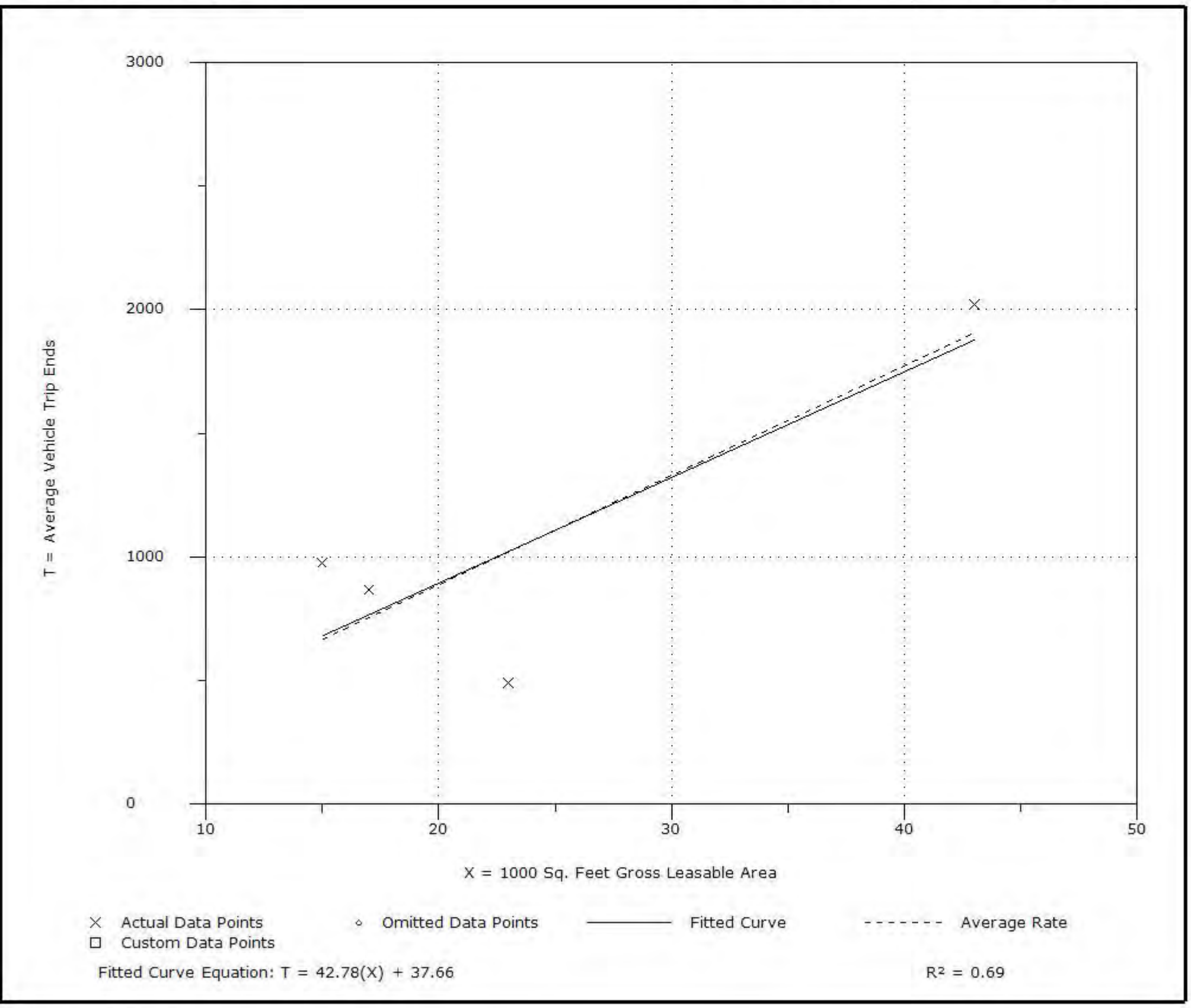
Number of Studies: 4
Average 1000 Sq. Feet GLA: 25
Directional Distribution: 50% entering, 50% exiting

Trip Generation per 1000 Sq. Feet Gross Leasable Area

Average Rate	Range of Rates	Standard Deviation
44.32	21.30 - 64.21	15.52

Data Plot and Equation

Caution - Use Carefully - Small Sample Size



Trip Generation, 9th Edition

Medical-Dental Office Building
(720)

Average Vehicle Trip Ends vs: **Employees**
On a: **Weekday**

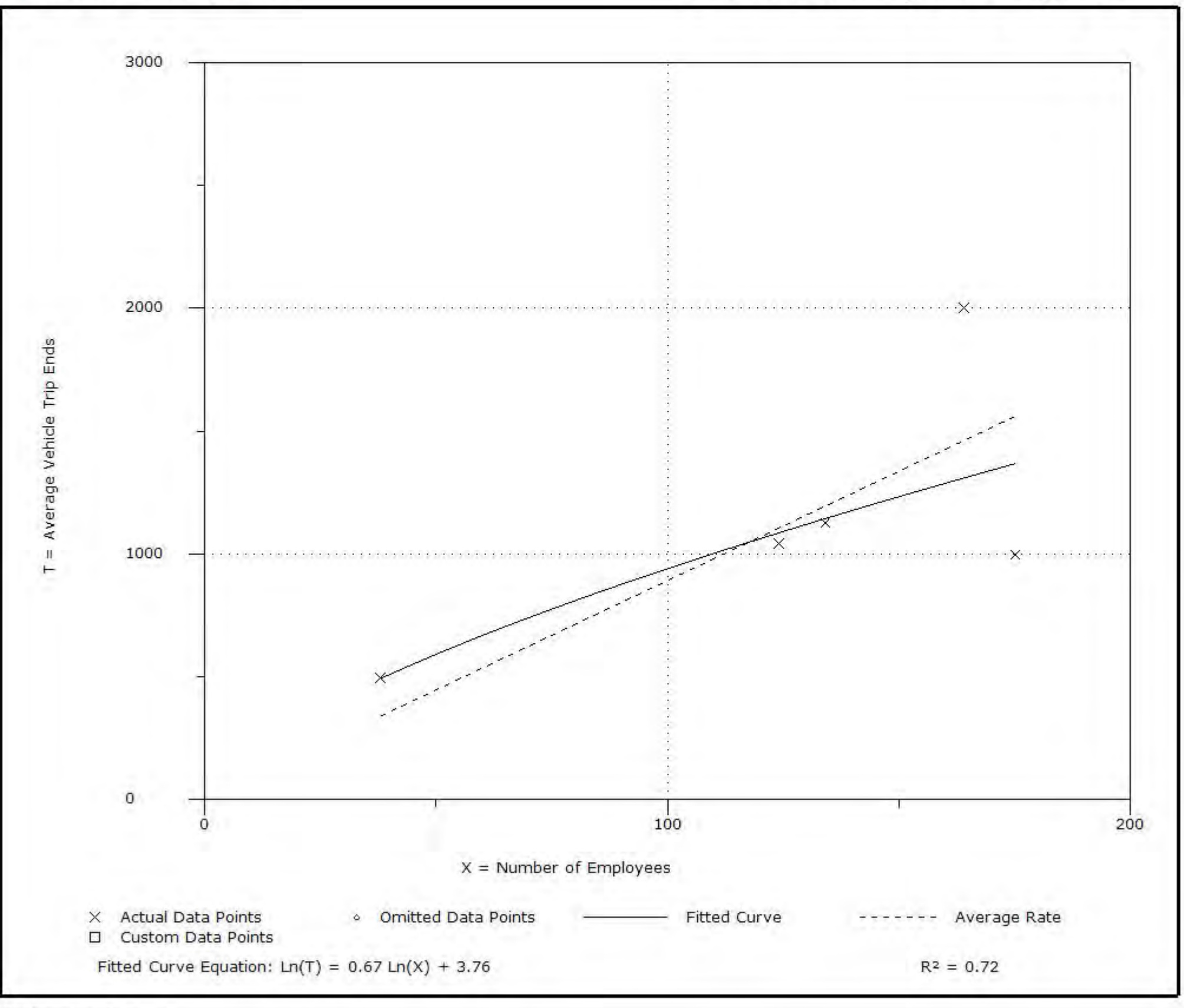
Number of Studies:	5
Avg. Number of Employees:	127
Directional Distribution:	50% entering, 50% exiting

Trip Generation per Employee

Average Rate	Range of Rates	Standard Deviation
8.91	5.69 - 13.03	3.95

Data Plot and Equation

Caution - Use Carefully - Small Sample Size



Trip Generation, 9th Edition

General Office Building
(710)

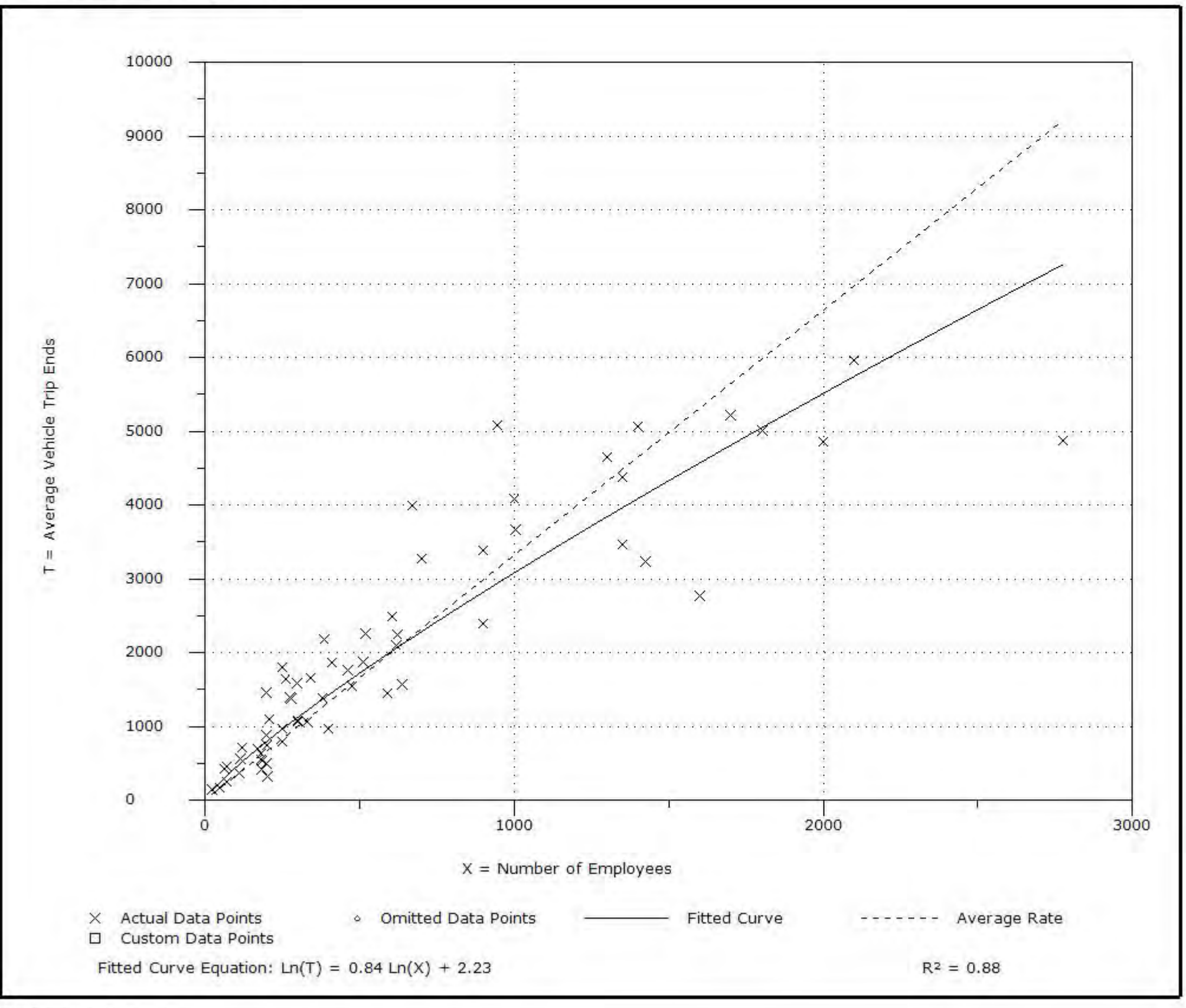
Average Vehicle Trip Ends vs: **Employees**
On a: **Weekday**

Number of Studies: 62
Avg. Number of Employees: 610
Directional Distribution: 50% entering, 50% exiting

Trip Generation per Employee

Average Rate	Range of Rates	Standard Deviation
3.32	1.59 - 7.28	2.16

Data Plot and Equation



Trip Generation, 9th Edition