
VILLAGE OF SUGAR GROVE BOARD REPORT

TO: VILLAGE PRESIDENT & BOARD OF TRUSTEES
FROM: BRENT M. EICHELBERGER, VILLAGE ADMINISTRATOR
SUBJECT: DISCUSSION: INDUSTRIAL TRAFFIC EVALUATION
AGENDA: MAY 3, 2022 VILLAGE BOARD MEETING
DATE: APRIL 28, 2022

ISSUE

Should the Village Board accept the Industrial Traffic Evaluation from Kimley-Horn.

DISCUSSION

At the April 5, 2022 Village Board meeting, a PSA with Kimley-Horn (K-H), was approved to provide a trip generation analysis for the proposed Sugar Grove Commerce Center and estimates for up to ten (10) typical industrial developments or typologies.

K-H has completed a draft memorandum for the first task. Emma Albers from K-H will be at the meeting to discuss the results (attached memorandum), and answer any questions.

The memorandum utilized the Ridgeline plan, which includes six buildings totaling 1.6M s.f. For their analysis K-H assigned two buildings as Warehousing, two as High-Cube Transload & Short-Term Storage Warehousing, and two as Manufacturing.

Staff's review of the memorandum led to several questions that the Board may want to discuss with Emma.

- How does the projected traffic change if the end users don't match the Land Use Code assumptions?
- Are there specific users within the Land Use Codes that have traffic significantly greater than the ITE manual suggests?
- Can you provide real-life examples of end users that match the Land Use Codes?
- How does the analysis change if the right-in right-out to the spine road is denied?

Some of these questions, and others, may be addressed in the second phase of their engagement.

COST

The estimated costs of services is \$8,800.00 to be paid out of TIF 2.

RECOMMENDATION

That the Board discuss the trip generation analysis memorandum and request additional information prior to this phase of the engagement being finalized.



MEMORANDUM

To: Brent Eichelberger, Village Administrator
Village of Sugar Grove

From: Emma Albers, P.E., PTOE
Rory Fancier-Splitt, AICP, PTP
Kimley-Horn and Associates, Inc.

Date: April 22, 2022

Subject: Trip Generation Estimates for the Proposed Ridgeline Development
Sugar Grove, IL

Kimley-Horn was retained by the Village of Sugar Grove to prepare trip generation projections for an industrial development proposed by Ridgeline Property Group on the northwest quadrant of the intersection of US Route 30 (US 30)/Illinois 47 (IL 47) in Sugar Grove, Illinois. A copy of the proposed site plan is provided as **Attachment A**.

DEVELOPMENT CHARACTERISTICS

The proposed industrial development includes three phases, with two buildings proposed for each phase. The industrial park is intended to be used for warehousing, distribution centers, and light manufacturing. The overall industrial park is planned to be 1,637,840 square feet. The development would provide 1,592 parking spaces, 357 trailer stalls, and 367 dock bays split between the six buildings. A summary of the development plan is outlined below.

Table 1. Summary of Proposed Development Plan

Phase	Building	Size (sq. ft.)	Parking Spaces	Trailer Stalls	Docking Bays
1	1	251,680	499	138	113
	2	270,320			
2	3	585,520	778	164	181
	4	220,960			
3	5	141,960	315	49	73
	6	167,400			

Access to this site is planned via four access points, with a 40-foot-wide Spine Road designed to connect the access points on US 30 and Galena Boulevard and create a truck staging area within the park. Currently, the proposed site is undeveloped.

TRIP GENERATION

The Institute of Transportation Engineers (ITE) Trip Generation Manual, 11th Edition is a compilation of traffic count data collected at sites throughout the United States for a range of land uses based on building floor area, unit count, and other relevant variables. For purposes of this review, Phase 1 (Building 1 and Building 2) was assumed to be warehouse use based on the size of the buildings and planned clear height (36 feet). Therefore, ITE Land Use Code (LUC) 150 – Warehousing was selected as most closely representative of Phase 1. For Phase 2, the larger building size of Building 3 is most accurately represented by LUC 154 – High-Cube Transload and Short-Term Storage Warehouse, with Building 4 assumed to operate as LUC 140 – Manufacturing. Buildings in Phase 3 are anticipated to be used for manufacturing (LUC 140 – Manufacturing). A summary of the ITE data is provided in **Table 2**. Copies of the ITE data are provided as **Attachment B**.

Table 2. ITE Trip Generation Data

ITE Land Use	Unit	Type	Weekday		
			Daily	AM Peak Hour	PM Peak Hour
Warehousing (LUC 150)	Per 1,000 sq. ft	Passenger Vehicles ¹	1.11X 50% in/50% out	0.15X 77% in/23% out	0.15X 28% in/72% out
		Heavy Vehicles	0.6X 50% in/50% out	0.02X 52% in/48% out	0.03X 52% in/48% out
High-Cube Transload and Short-Term Storage Warehouse (LUC 154)	Per 1,000 sq. ft	Passenger Vehicles ¹	1.18X 50% in/50% out	0.06X 77% in/23% out	0.09X 28% in/72% out
		Heavy Vehicles	0.22X 50% in/50% out	0.02X 49% in/51% out	0.01X 49% in/51% out
Manufacturing (LUC 140)	Per 1,000 sq. ft	Passenger Vehicles ¹	4.30X 50% in/50% out	0.65X 76% in/24% out	0.71X 31% in/69% out
		Heavy Vehicles	0.45X 50% in/50% out	0.03X 56% in/44% out	0.03X 41% in/59% out

X = 1,000 square feet gross floor area

¹The ITE Trip Generation Manual, 11th Edition does not provide data specifically for passenger vehicles. To calculate daily and peak hour trip generation rates for passenger vehicles, data for heavy vehicles was subtracted from overall total vehicle data to produce data pertaining solely for passenger vehicles.

Per the rates provided in Table 2, trip generation estimates for each phase of the Ridgeline development are provided in **Table 3**. The site-generated peak hour trip generation is based on ITE data provided for the Peak Hour of Adjacent Street Traffic. The site-generated trips projected during the peak hours were rounded to the nearest multiple of five for the purposes of this analysis, and daily trips were rounded to the nearest multiple of ten.

Table 3. Site-Generated Traffic Projections

Building	Size	Trip Type	Site-Generated Trips (Weekday)						
			Daily	AM Peak Hour			PM Peak Hour		
				In	Out	Total	In	Out	Total
<u>Phase 1</u>									
Building 1	251,680 sq. ft.	Cars	280	30	10	40	10	30	40
		Trucks	150	5	0	5	5	5	10
Building 2	270,320 sq. ft.	Cars	300	30	10	40	10	30	40
		Trucks	160	5	0	5	5	5	10
Phase 1 Total Trips			890	70	20	90	30	70	100
<u>Phase 2</u>									
Building 3	585,520 sq. ft.	Cars	690	25	10	35	15	40	55
		Trucks	130	5	5	10	0	5	5
Building 4	220,960 sq. ft.	Cars	950	110	35	145	50	105	155
		Trucks	100	5	5	10	5	5	10
Phase 2 Total Trips			1,870	145	55	200	70	155	225
<u>Phase 3</u>									
Building 5	141,960 sq. ft.	Cars	610	70	20	90	30	70	100
		Trucks	60	5	0	5	0	5	5
Building 6	167,400 sq. ft.	Cars	720	85	25	110	35	85	120
		Trucks	80	5	0	5	0	5	5
Phase 3 Total Trips			1,470	165	45	210	65	165	230
Total Trips			4,230	380	120	500	165	390	555

AVERAGE DAILY TRAFFIC (ADT) REVIEW

In order to estimate the potential impact of daily site-generated traffic on the adjacent roadway network, an estimated trip distribution was developed. The trip distribution was then compared to available daily traffic volume data for the area roadway network.

Trip Distribution

The estimated distribution of site-generated traffic on the surrounding roadway network as it approaches and departs the development is a function of several variables, such as the nature of the surrounding land uses, prevailing traffic volumes/patterns, characteristics of the street system, and the ease with which motorists can travel over various sections of that system. The anticipated directional distribution of site-generated trips is outlined in **Table 4**.

Table 4. Estimated Trip Distribution

Traveling to/from:	Trip Type	
	Passenger Vehicles	Heavy Vehicles
North via IL 47	30%	30%
South via US 30 / IL 47	15%	20%
West via US 30	15%	20%
East via IL 56	30%	30%
East via Galena Blvd	10%	--
Total	100%	100%

For purposes of this review, site-generated traffic was assumed to be generally evenly distributed to IL 47 and US 30. The closest interstate, Interstate-88 (I-88), is located approximately 2.5 miles north of the site. Therefore, a higher percentage of site-generated traffic was assumed to travel to/from the north via IL 47 and to/from the east via IL 56, which respectively provide access to a full and partial interchange with I-88. All trucks were assumed to travel to/from the arterial roads; however, for purposes of a conservative approach, 10% of passenger vehicle trips were assigned to Galena Boulevard.

Existing and Future Traffic Conditions

Annual average daily traffic (AADT) data was obtained from the Illinois Department of Transportation (IDOT) for the surrounding roadway network to determine the projected increase in traffic with the addition of site-generated trips. The total number of trips from all three phases were used and dispersed among the network based on the estimated trip distribution (Table 4).

Using this distribution, the estimated daily increase of traffic from site-generated trips on the surrounding roadway network is presented in **Table 5**.

Table 5. Existing and Build AADTs

Roadway Segment	Existing AADT ¹ (veh/day)	Site-Trips (veh/day)	Build AADT (veh/day)	% Increase
IL 47 (North of interchange with US 30)	15,800	1,260	17,060	8.0%
US 30 / IL 47 (South of interchange with US 30)	17,700	670	18,360	3.8%
US 30 (West of interchange with IL 47)	10,650	670	11,320	6.3%
IL 56 (East of interchange with IL 47)	16,900	1,230	18,170	7.5%
Galena Blvd (East of IL 47)	8,900	355	9,255	4.0%

¹ AADT data was obtained from the Illinois Department of Transportation (IDOT) from the year 2021.

As shown in Table 5, the estimated increase to daily traffic on the area roadway network ranges from 4% to 8%.

Using the existing and build AADT data, the estimated Level of Service (LOS) for the surrounding roadways was determined. LOS for roadway segments can be estimated based on traffic volume, roadway classification, and number of lanes. Using these variables, a volume to capacity (v/c) ratio can be calculated and a

corresponding LOS is identified. As shown in **Table 6**, the majority of roadway segments would continue operating at the same level of service with the addition of development traffic as under existing conditions. The exception is IL 47 north of US 30, which is expected to operate at LOS C under build conditions, compared to LOS B under existing traffic volumes.

Table 6. Surrounding Roadway Level of Service Estimation

Roadway	Number of Lanes	Roadway Classification	Existing AADT	Estimated LOS (based on AADT)	Build AADT	Estimated LOS (based on AADT)
IL 47 (North of interchange with US 30)	4-lane divided	Principal Arterial	15,800	B	17,060	C
US 30 / IL 47 (South of interchange with US 30)	4-lane divided	Principal Arterial	17,700	C	18,360	C
US 30 (West of interchange with IL 47)	4-lane divided	Minor Arterial	10,650	B	11,320	B
IL 56 (East of interchange with IL 47)	4-lane divided	Freeway	16,900	A	18,170	A
Galena Blvd (East of IL 47)	2-lane	Minor Arterial	8,900	D	9,255	D

SITE ACCESS CONSIDERATIONS

In general, the site access locations along Galena Boulevard and Municipal Drive are reasonable. Turn lane warrants should be evaluated to identify potential auxiliary lanes. Special consideration for turn lanes should be considered at any access points that will be used by trucks.

The proposed right-in/right-out to US 30 presents challenges and should be coordinated with IDOT. The proposed driveway is located approximately 150 feet west of the termination of the westbound acceleration lane from the southbound I-47 off-ramp at the IL 47/US 30 interchange. Installation of the proposed access in this location could create an undesirable weave within a short distance between traffic reaching free-flow speeds after the interchange and vehicles slowing to make a right-turn movement into the site. US 30 is classified as a minor arterial west of IL 47; and therefore, commercial access is allowed. However, IL 56 is classified as a freeway east of IL 47 and the location of the proposed access driveway may be considered within the influence area of the interchange and/or limited access control. A formal traffic impact study should be completed and submitted to IDOT for review and approval of the final access configuration.

SUMMARY

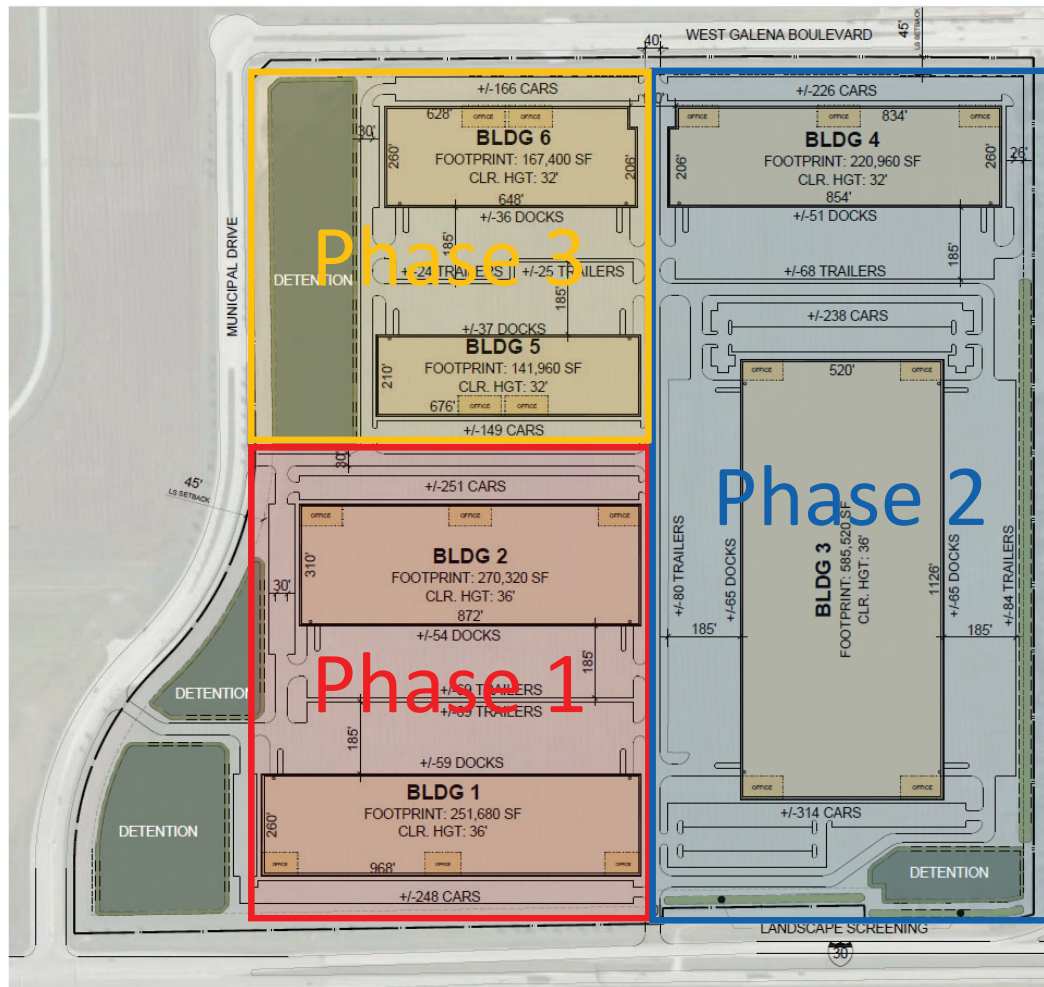
The findings of this evaluation are based on Ridgeline's proposed development plan dated March 2022 and assumptions regarding the potential uses of each building as future tenants are unknown at this time. A formal traffic impact study should be prepared as the site plan is finalized to determine the potential traffic impacts and identify appropriate offsite mitigation.

Please do not hesitate to contact us with any questions related to the information in this memorandum.

ATTACHMENT A

Conceptual Site Plan

Sugar Grove – Conceptual Site Plan



Highlights

- Total Project Size of 1,637,840 SF
- Varying Building Sizes to cast a wider net for companies ranging between 25,000 SF to 550,000 SF
- 40' Wide Spine Road designed to connect Hwy 30 to West Galena Blvd and to create truck staging within the park, thus reducing truck traffic on Hwy 30
- 4 Ingress/Egress Access Points for Improved Circulation
- Modern Building Aesthetic Design to attract institutional companies
- Truck courts set in the interior of the business park, screened by buildings to hide from visual view
- Landscape screening on Hwy 30 and north side of the park to hide truck courts

ATTACHMENT B

Data from ITE Trip Generation, Eleventh Edition

Land Use: 140

Manufacturing

Description

A manufacturing facility is an area where the primary activity is the conversion of raw materials or parts into finished products. Size and type of activity may vary substantially from one facility to another. In addition to the actual production of goods, a manufacturing facility typically has an office and may provide space for warehouse, research, and associated functions. General light industrial (Land Use 110) and industrial park (Land Use 130) are related uses.

Additional Data

The technical appendices provide supporting information on time-of-day distributions for this land use. The appendices can be accessed through either the ITETripGen web app or the trip generation resource page on the ITE website (<https://www.ite.org/technical-resources/topics/trip-and-parking-generation/>).

The sites were surveyed in the 1980s, the 1990s, the 2000s, and the 2010s in Alberta (CAN), California, Minnesota, Missouri, New Jersey, New York, Oregon, Pennsylvania, South Dakota, Texas, Vermont, Washington, and West Virginia.

Source Numbers

177, 179, 184, 241, 357, 384, 418, 443, 583, 598, 611, 728, 747, 875, 879, 940, 969, 1067, 1068, 1082

Manufacturing (140)

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

Setting/Location: General Urban/Suburban

Number of Studies: 53

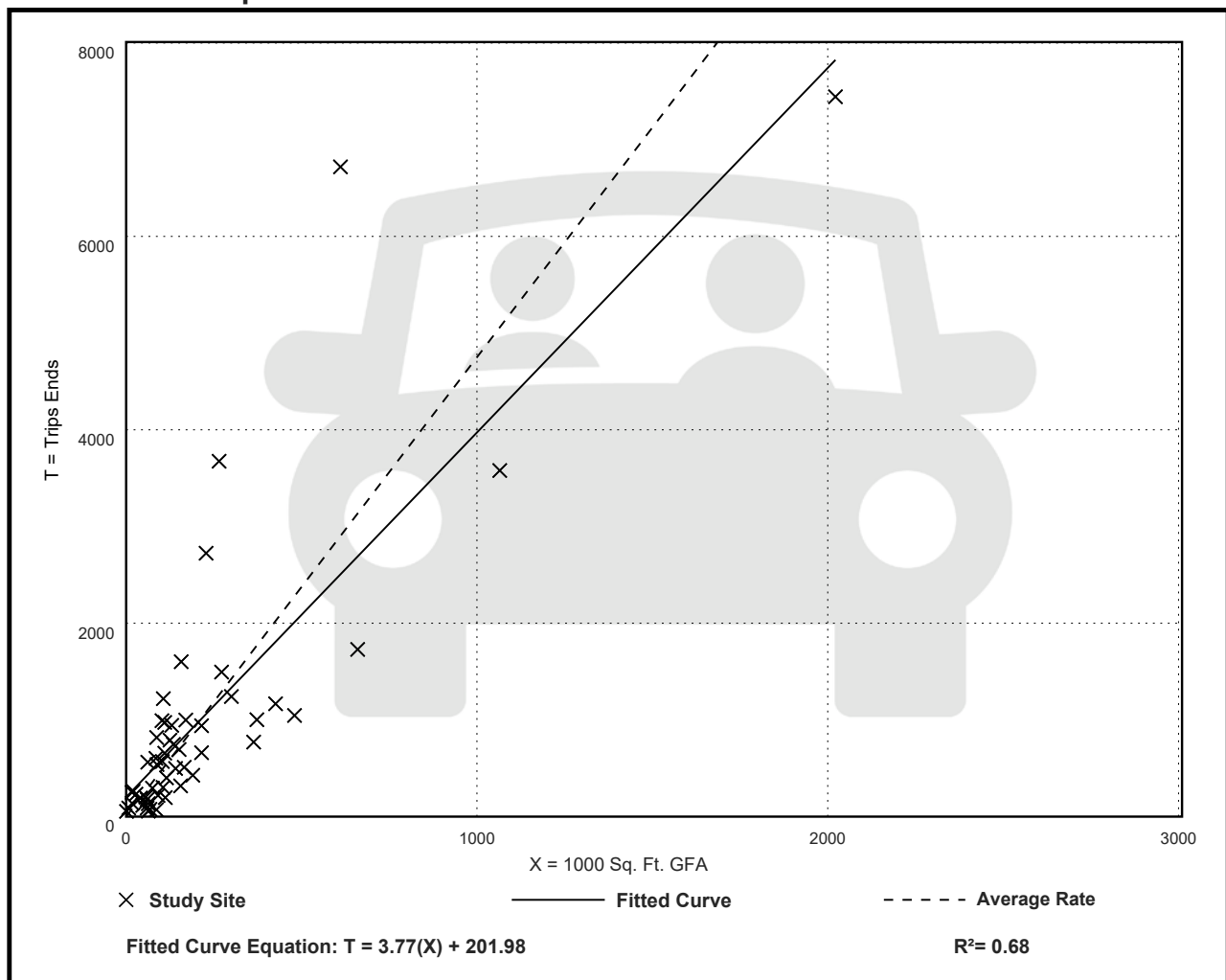
Avg. 1000 Sq. Ft. GFA: 208

Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
4.75	0.83 - 49.50	3.20

Data Plot and Equation



Manufacturing (140)

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: 48

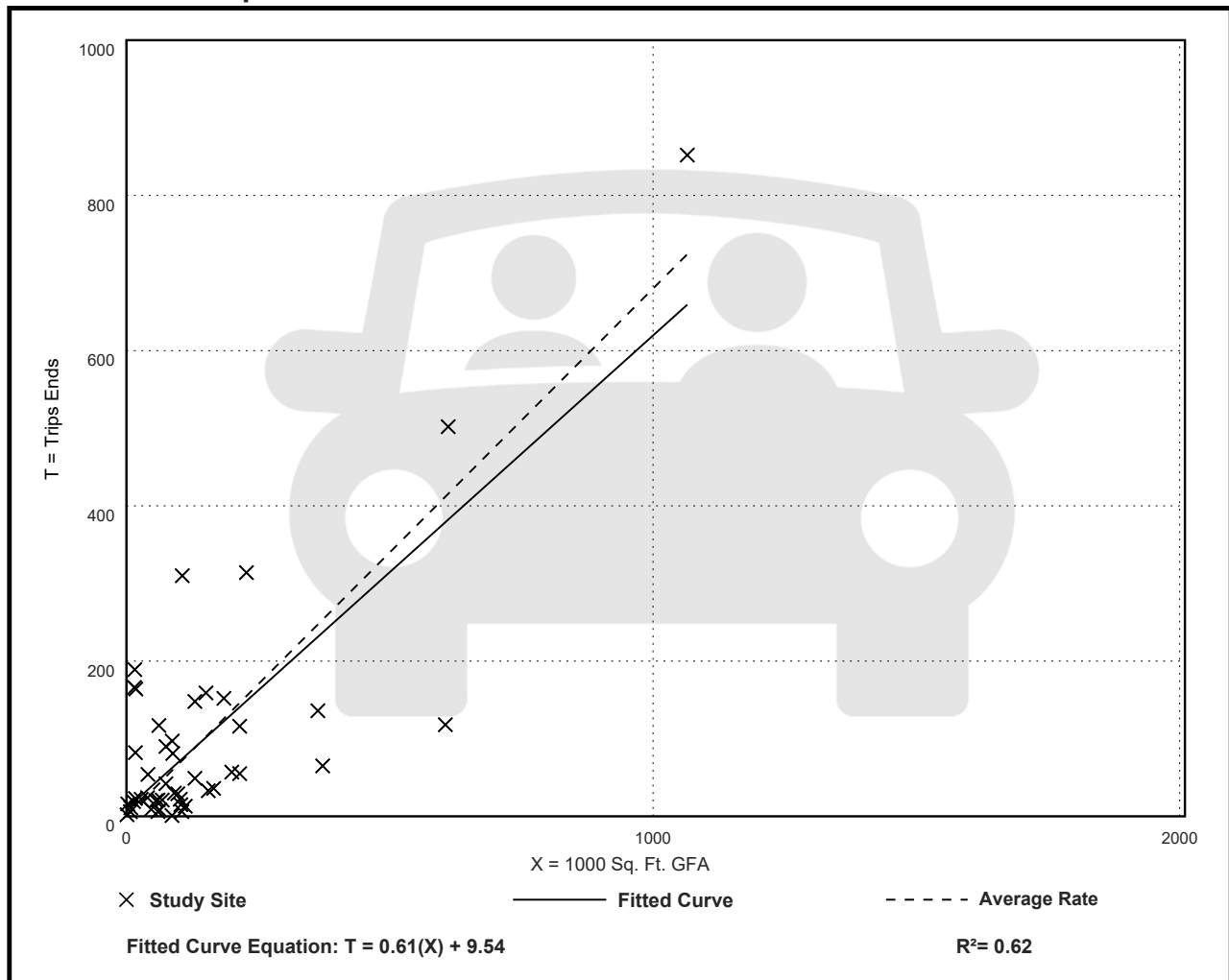
Avg. 1000 Sq. Ft. GFA: 138

Directional Distribution: 76% entering, 24% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
0.68	0.01 - 11.93	1.03

Data Plot and Equation



Manufacturing (140)

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: 55

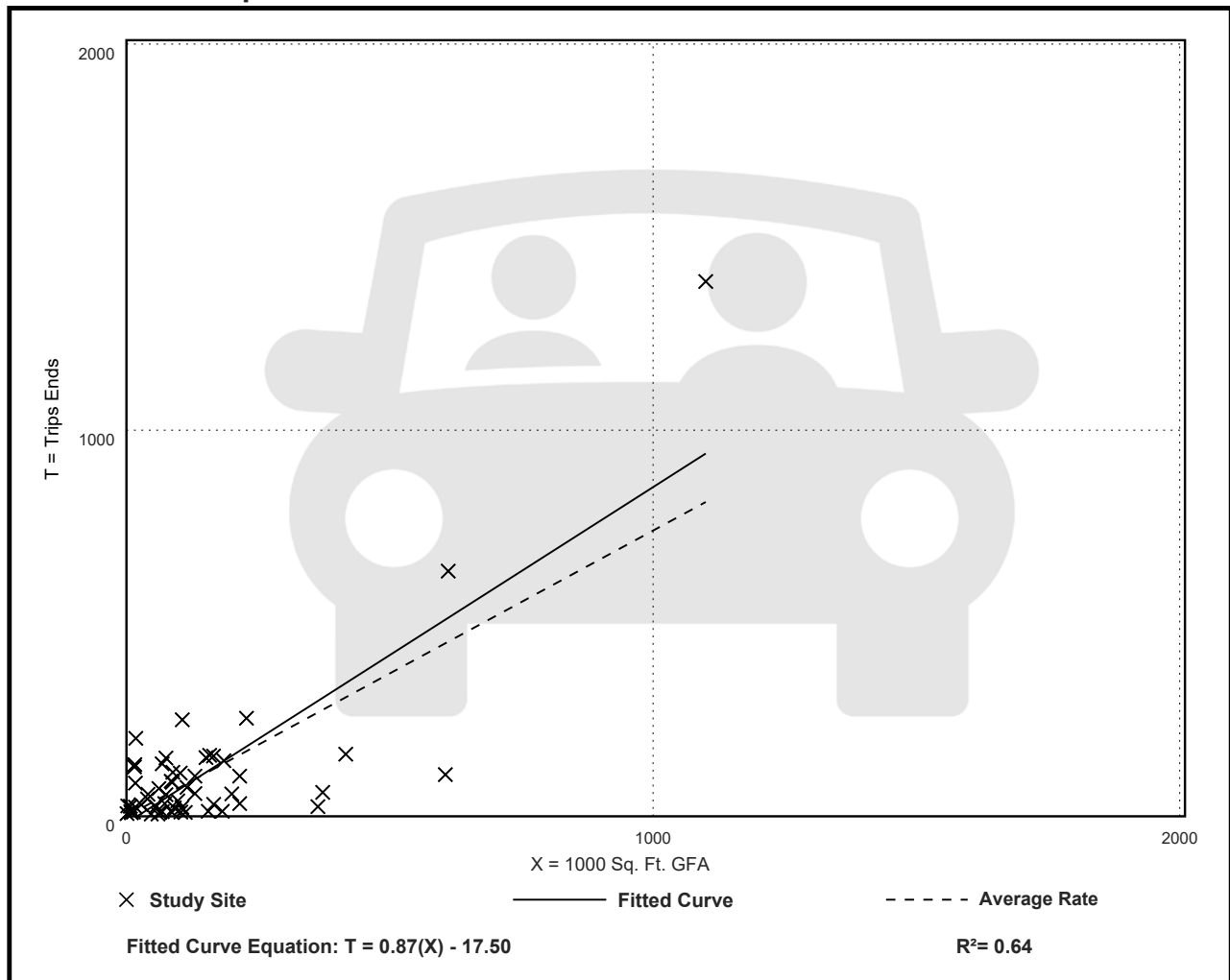
Avg. 1000 Sq. Ft. GFA: 142

Directional Distribution: 31% entering, 69% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
0.74	0.07 - 11.37	0.93

Data Plot and Equation



Manufacturing (140)

Vehicle Trip Ends vs: 1000 Sq. Ft. GFA

On a: Weekday,

AM Peak Hour of Generator

Setting/Location: General Urban/Suburban

Number of Studies: 62

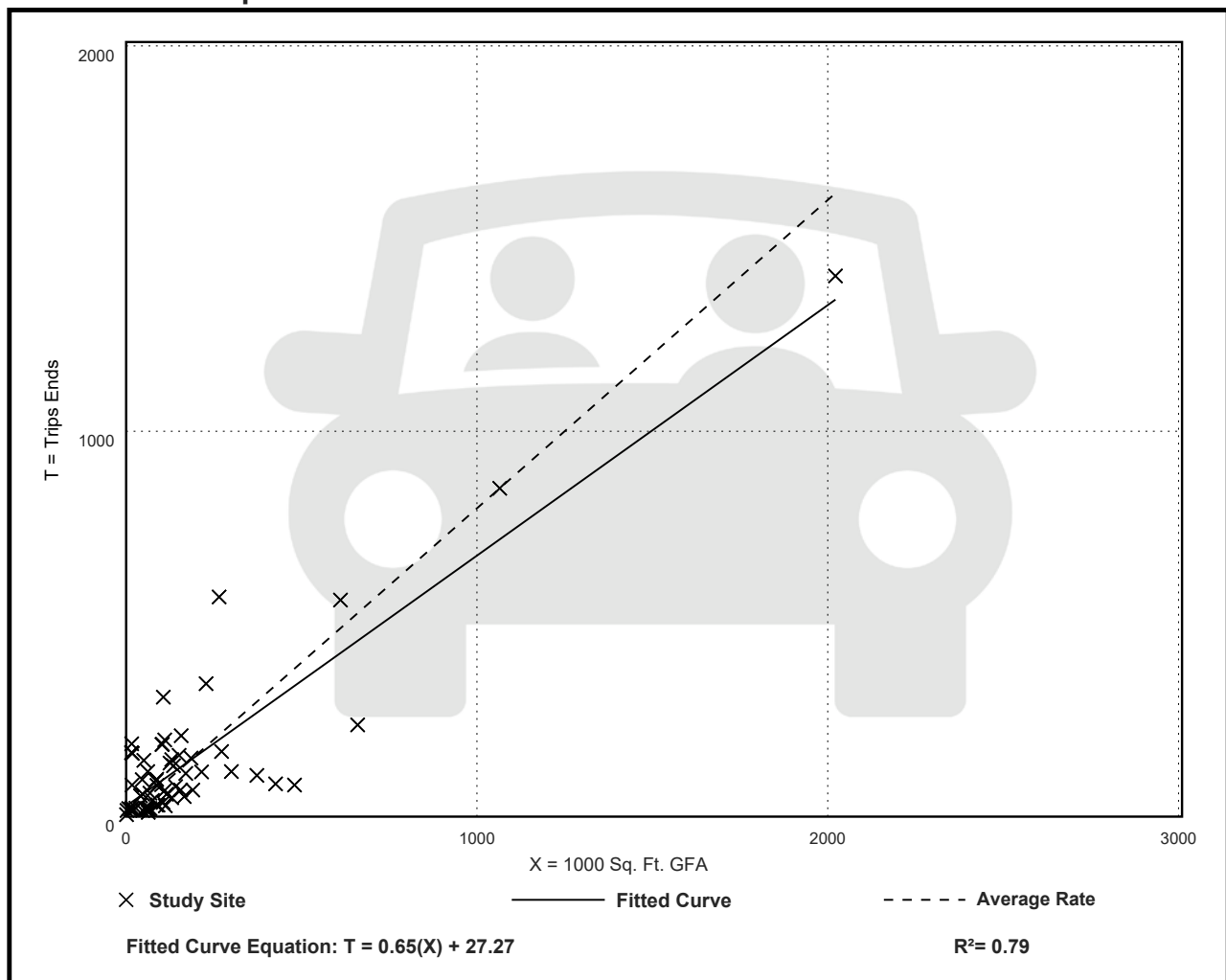
Avg. 1000 Sq. Ft. GFA: 178

Directional Distribution: 73% entering, 27% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
0.80	0.17 - 11.93	0.87

Data Plot and Equation



Manufacturing (140)

Vehicle Trip Ends vs: 1000 Sq. Ft. GFA

On a: Weekday,

PM Peak Hour of Generator

Setting/Location: General Urban/Suburban

Number of Studies: 62

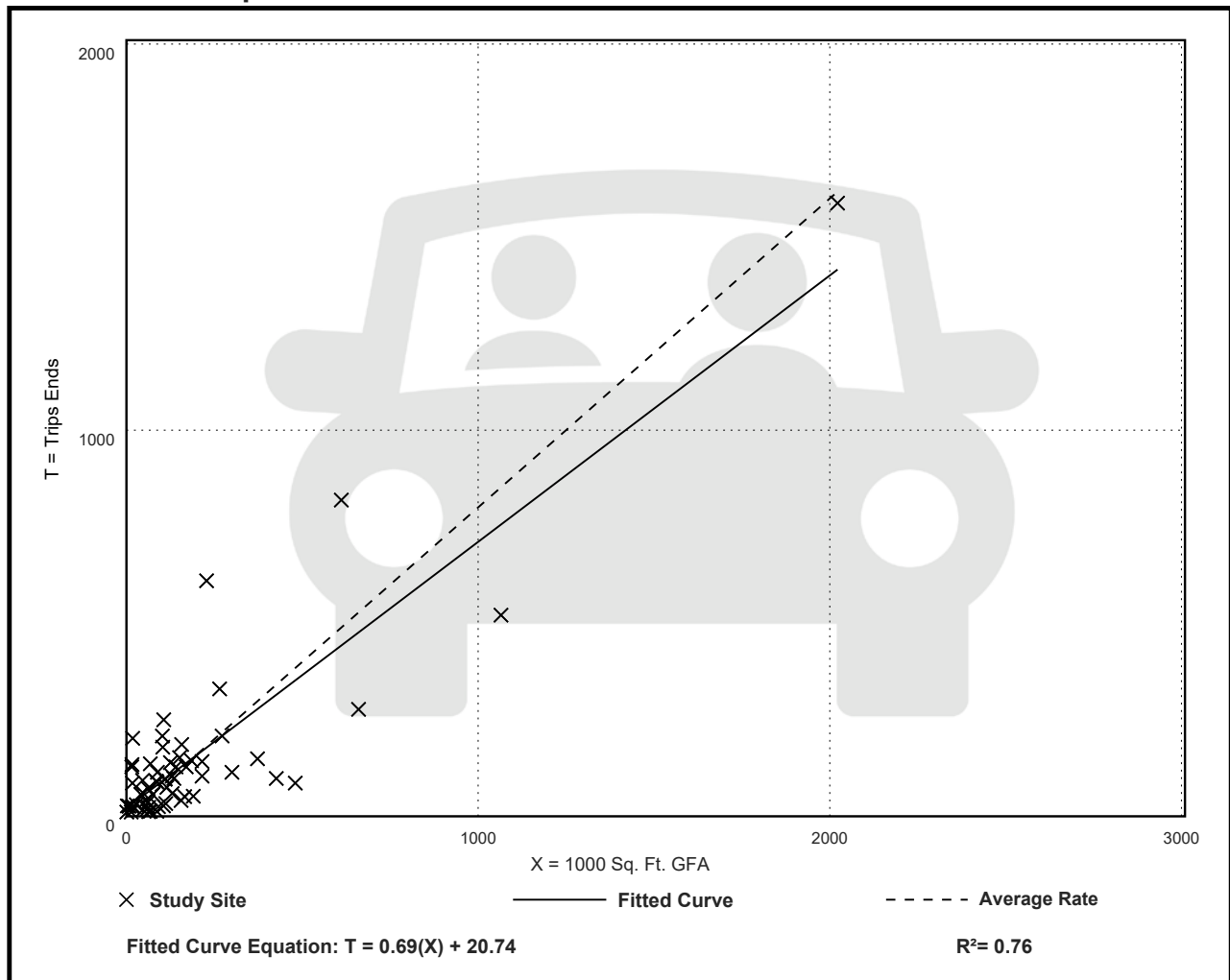
Avg. 1000 Sq. Ft. GFA: 180

Directional Distribution: 42% entering, 58% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
0.80	0.15 - 11.37	0.82

Data Plot and Equation



Manufacturing (140)

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

Setting/Location: General Urban/Suburban

Number of Studies: 5

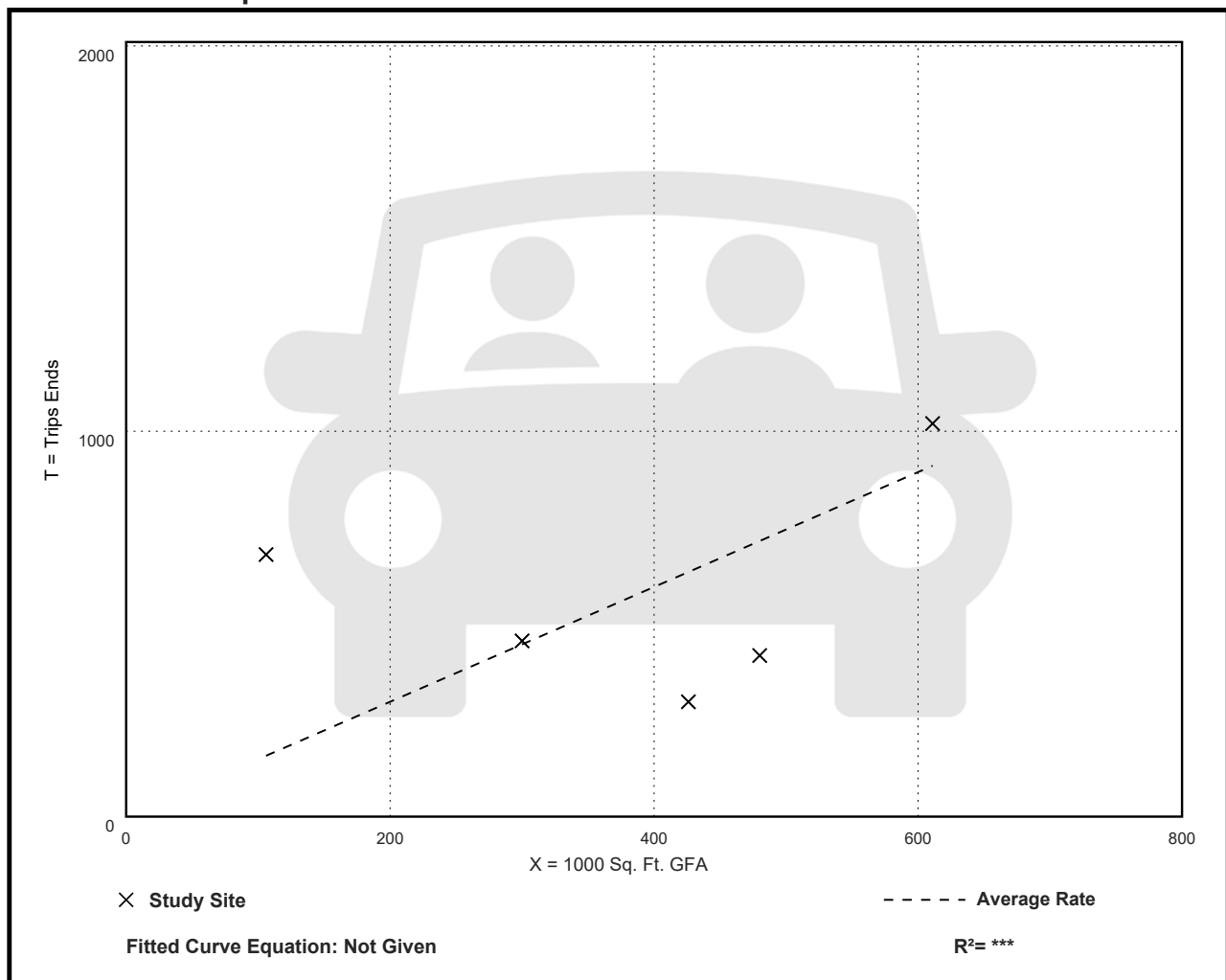
Avg. 1000 Sq. Ft. GFA: 385

Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
1.49	0.70 - 6.42	1.41

Data Plot and Equation



Manufacturing (140)

Vehicle Trip Ends vs: 1000 Sq. Ft. GFA

On a: Saturday, Peak Hour of Generator

Setting/Location: General Urban/Suburban

Number of Studies: 5

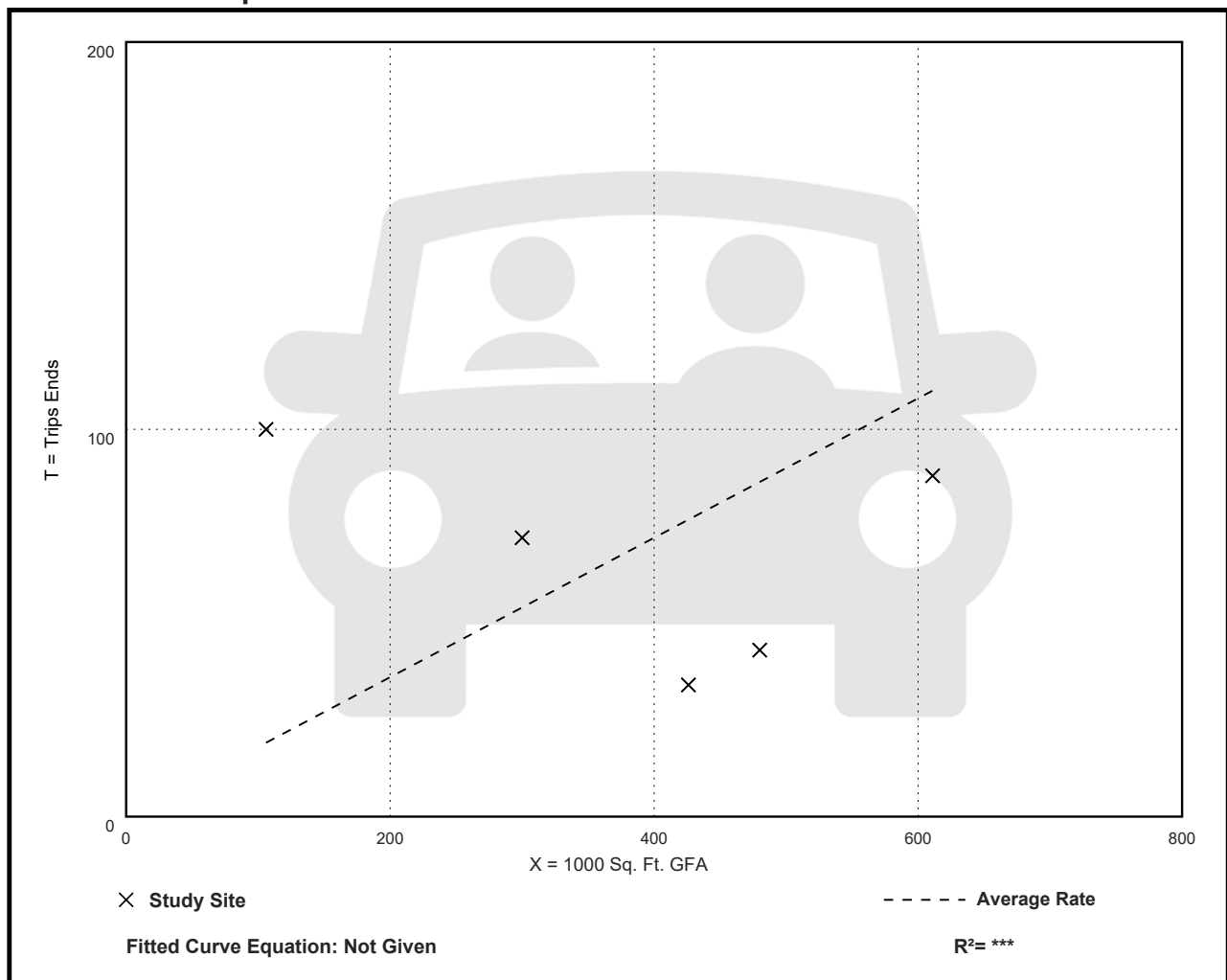
Avg. 1000 Sq. Ft. GFA: 385

Directional Distribution: 52% entering, 48% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
0.18	0.08 - 0.94	0.22

Data Plot and Equation



Manufacturing (140)

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

Setting/Location: General Urban/Suburban

Number of Studies: 5

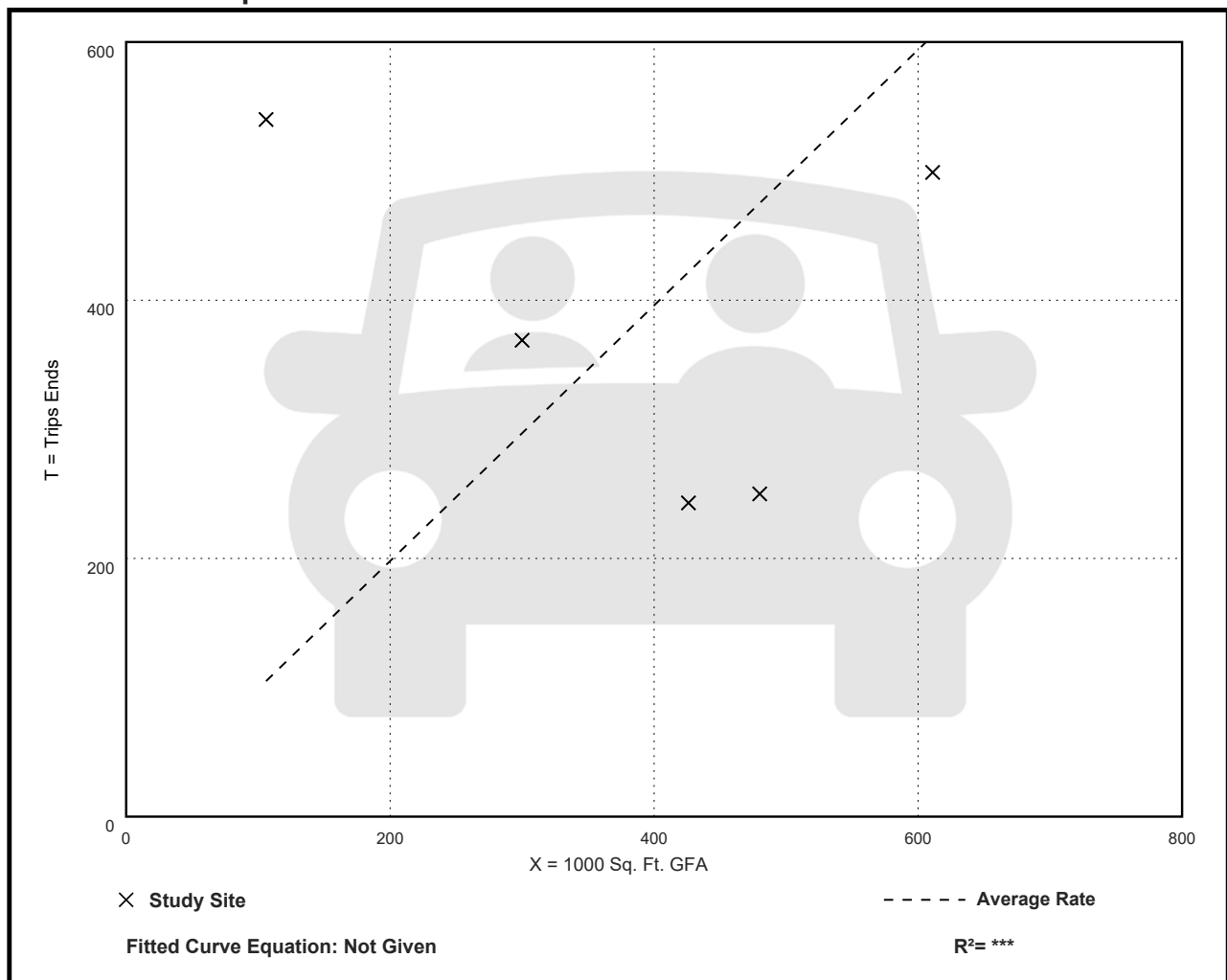
Avg. 1000 Sq. Ft. GFA: 385

Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
0.99	0.52 - 5.09	1.14

Data Plot and Equation



Manufacturing (140)

Vehicle Trip Ends vs: 1000 Sq. Ft. GFA

On a: Sunday, Peak Hour of Generator

Setting/Location: General Urban/Suburban

Number of Studies: 5

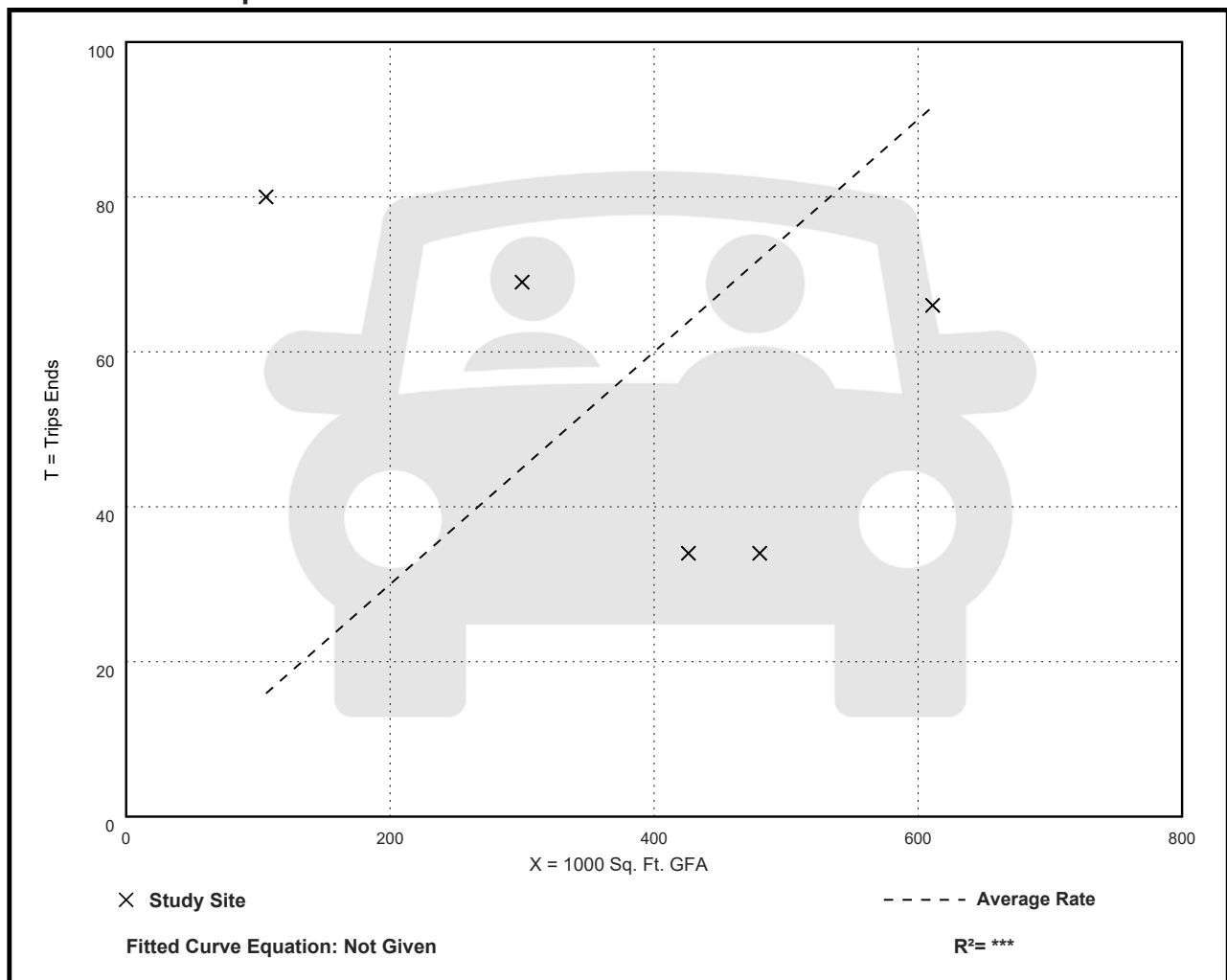
Avg. 1000 Sq. Ft. GFA: 385

Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
0.15	0.07 - 0.75	0.17

Data Plot and Equation



Manufacturing (140)

Vehicle Trip Ends vs: Employees
On a: Weekday

Setting/Location: General Urban/Suburban

Number of Studies: 53

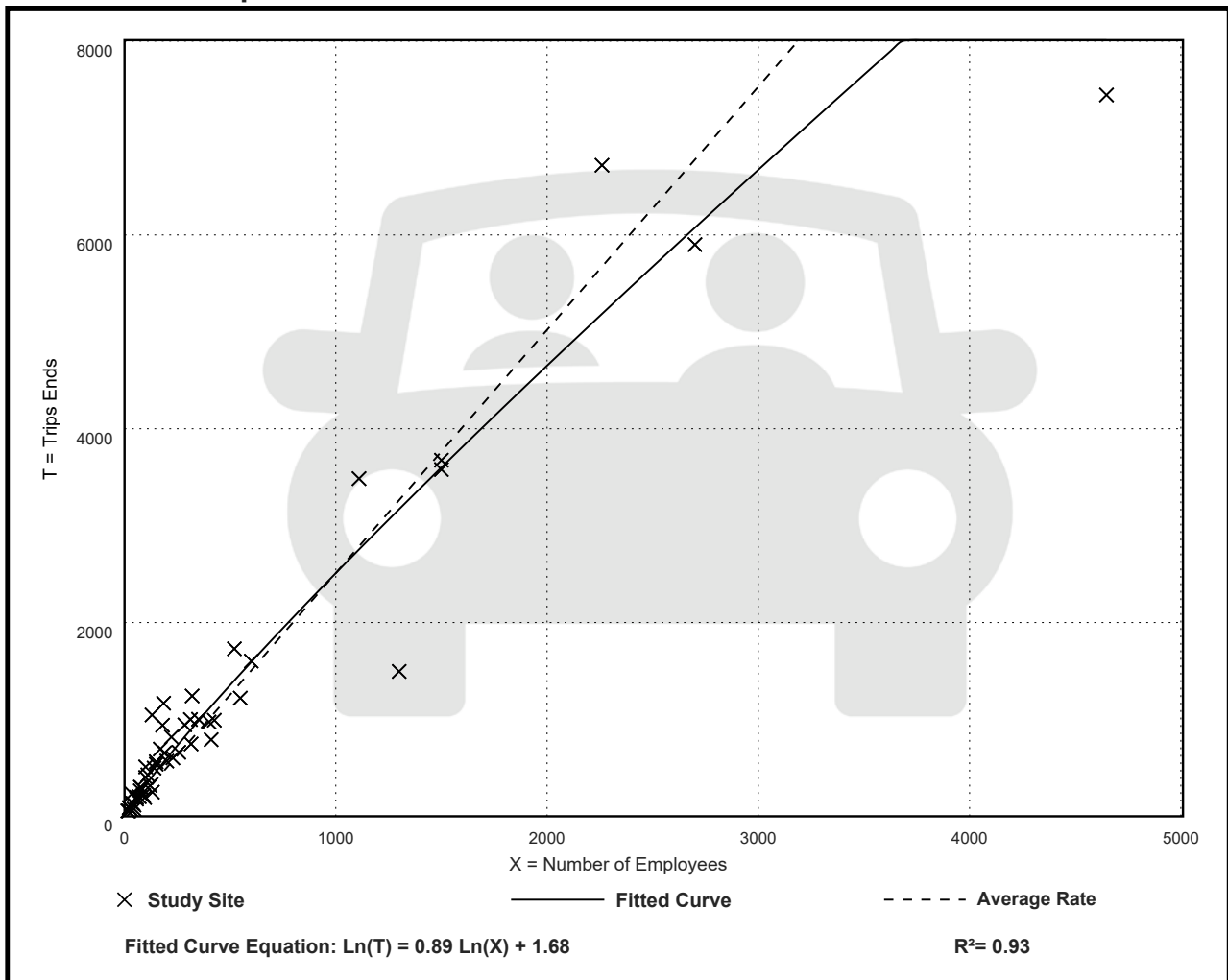
Avg. Num. of Employees: 437

Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per Employee

Average Rate	Range of Rates	Standard Deviation
2.51	1.15 - 8.05	0.96

Data Plot and Equation



Manufacturing (140)

Vehicle Trip Ends vs: Employees

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: 37

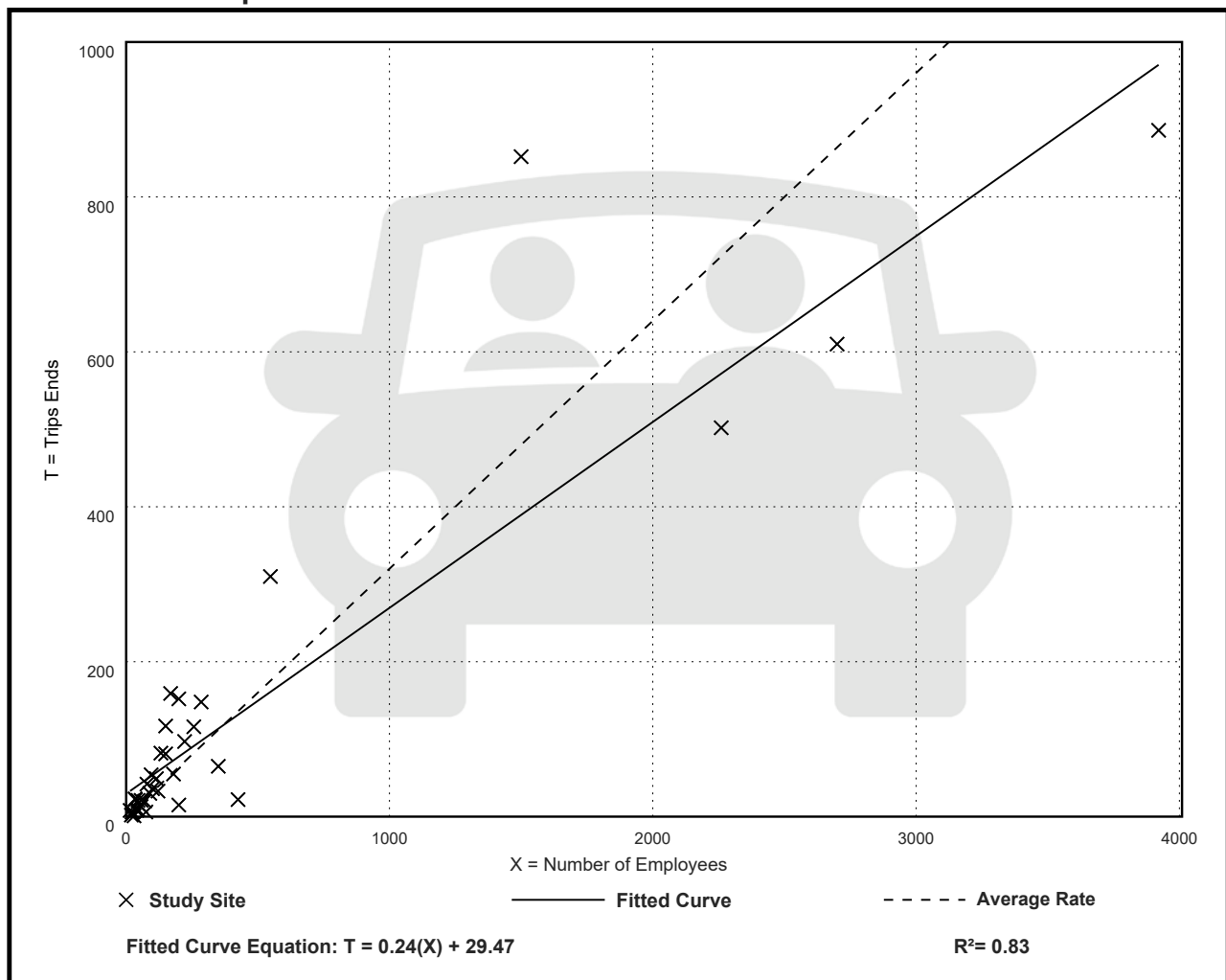
Avg. Num. of Employees: 400

Directional Distribution: 73% entering, 27% exiting

Vehicle Trip Generation per Employee

Average Rate	Range of Rates	Standard Deviation
0.32	0.03 - 0.94	0.18

Data Plot and Equation



Manufacturing (140)

Vehicle Trip Ends vs: Employees

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: 37

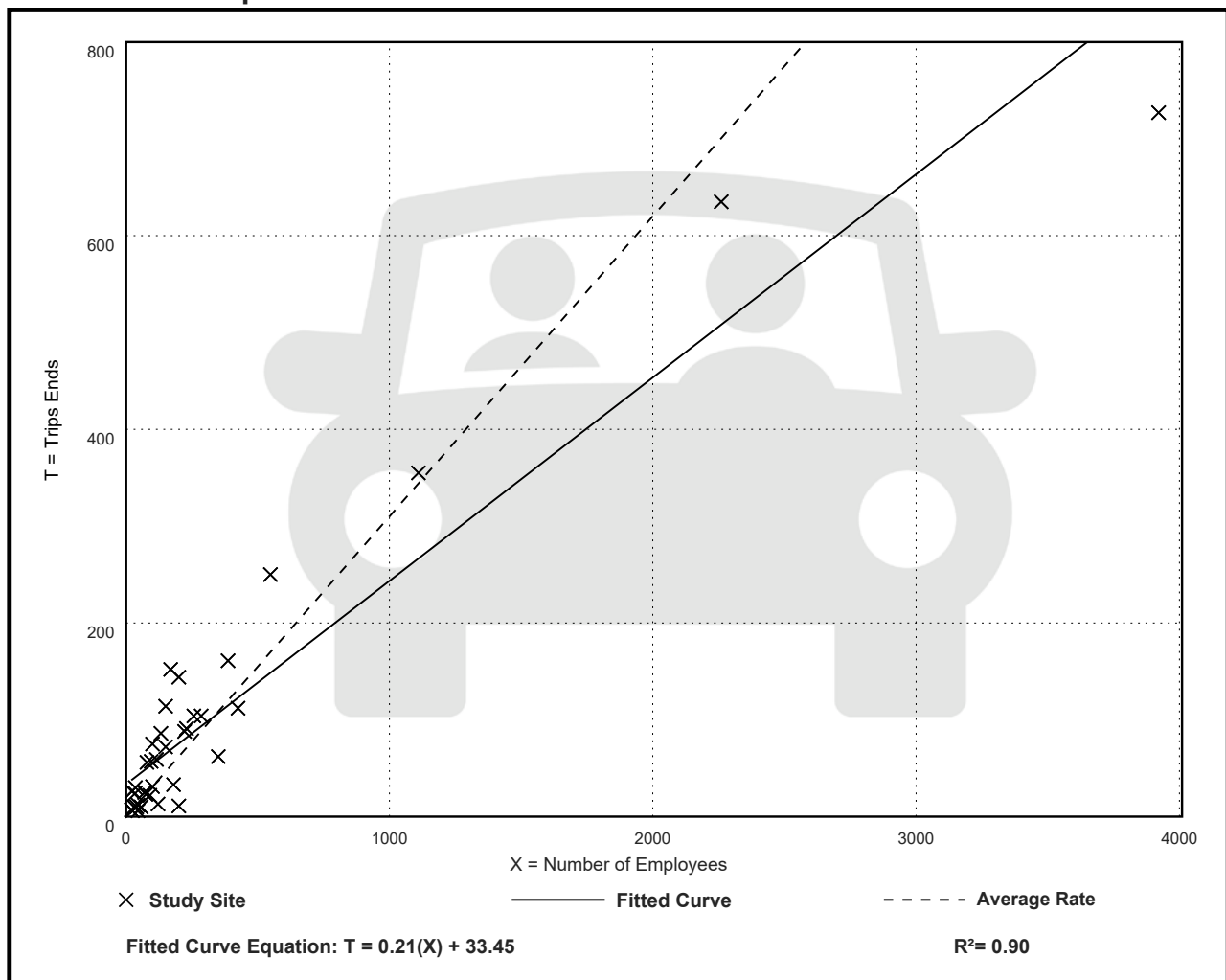
Avg. Num. of Employees: 334

Directional Distribution: 37% entering, 63% exiting

Vehicle Trip Generation per Employee

Average Rate	Range of Rates	Standard Deviation
0.31	0.06 - 1.18	0.17

Data Plot and Equation



Manufacturing (140)

Vehicle Trip Ends vs: Employees

On a: Weekday,

AM Peak Hour of Generator

Setting/Location: General Urban/Suburban

Number of Studies: 54

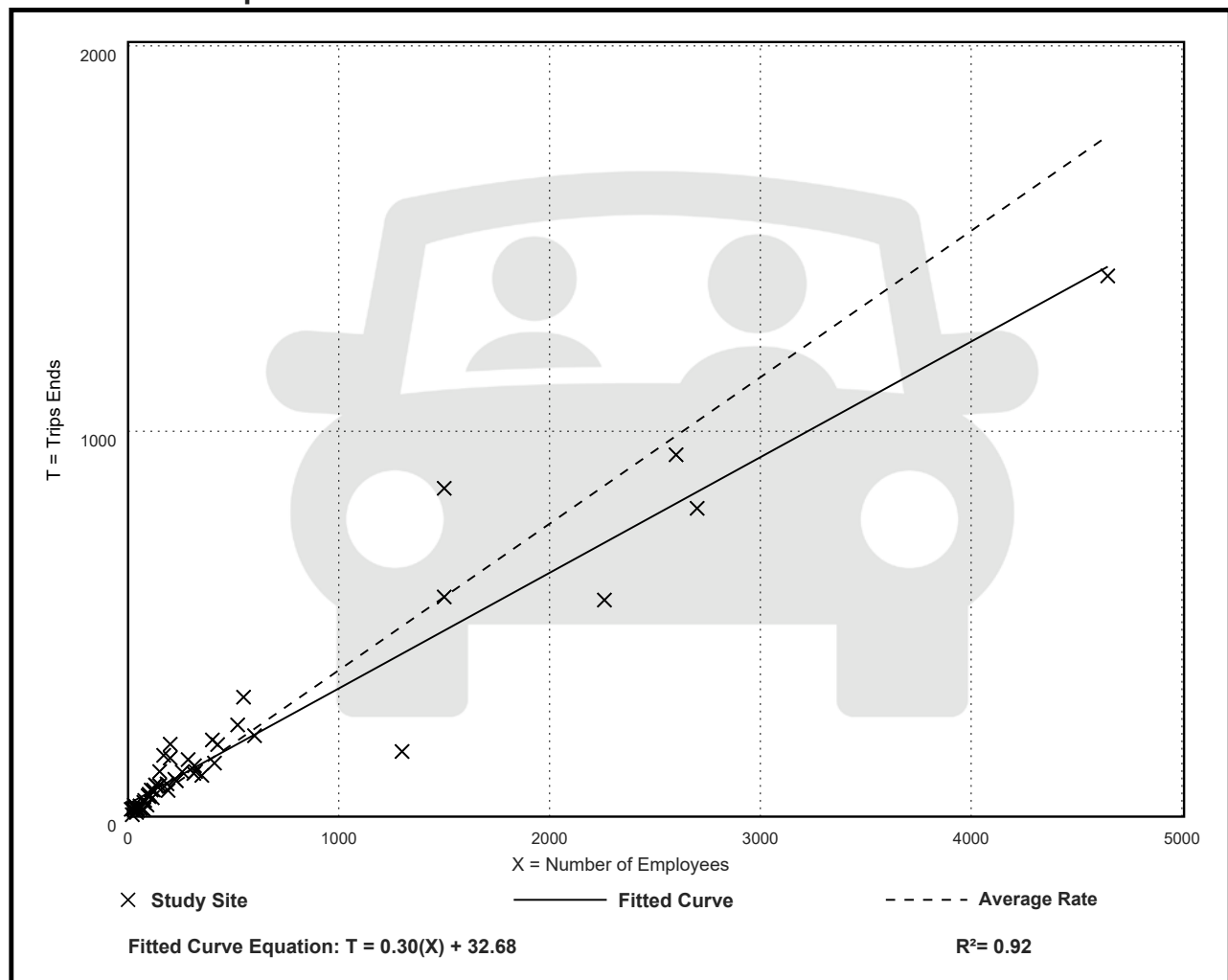
Avg. Num. of Employees: 459

Directional Distribution: 83% entering, 17% exiting

Vehicle Trip Generation per Employee

Average Rate	Range of Rates	Standard Deviation
0.38	0.13 - 1.27	0.15

Data Plot and Equation



Manufacturing (140)

Vehicle Trip Ends vs: Employees

On a: Weekday,

PM Peak Hour of Generator

Setting/Location: General Urban/Suburban

Number of Studies: 55

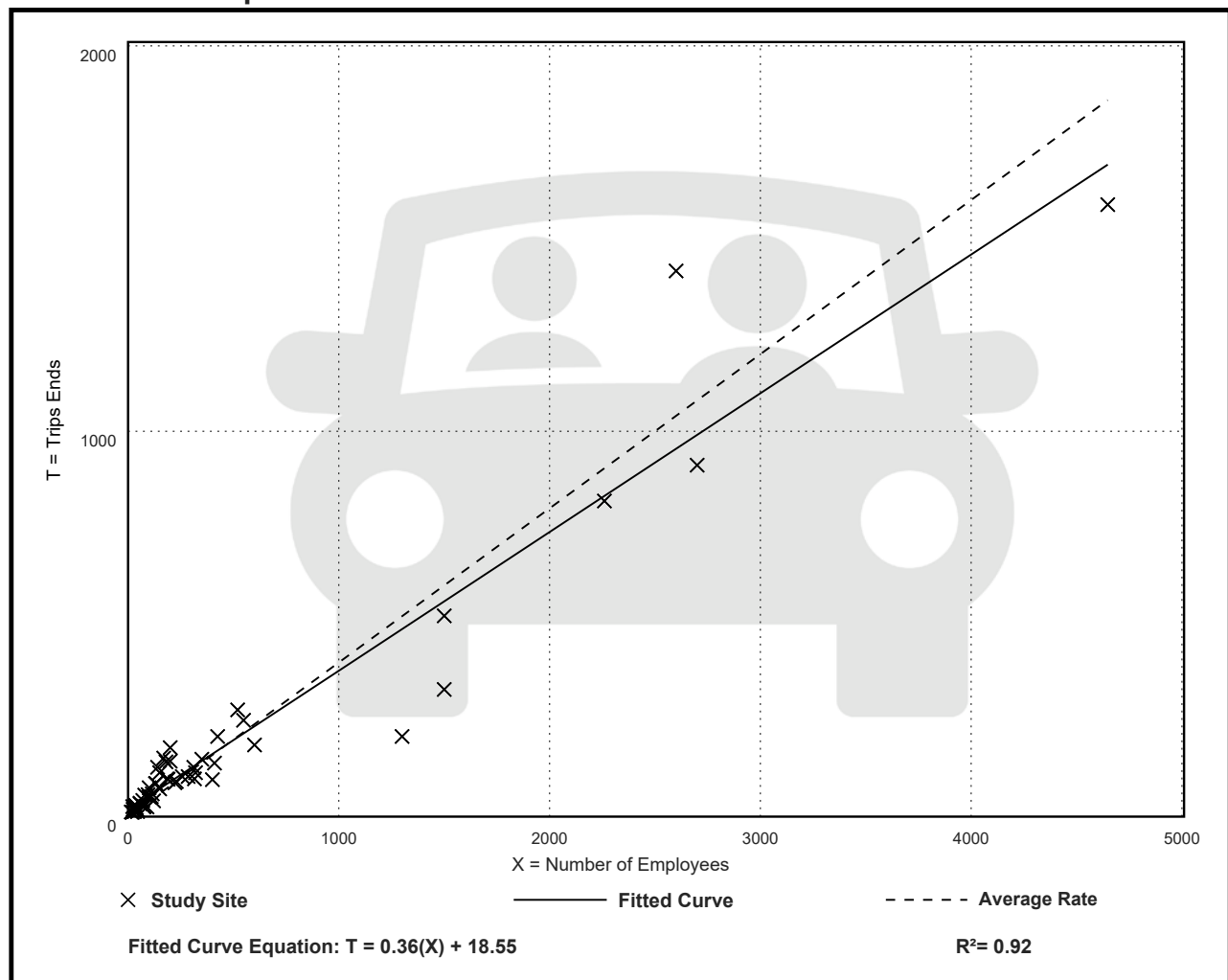
Avg. Num. of Employees: 454

Directional Distribution: 39% entering, 61% exiting

Vehicle Trip Generation per Employee

Average Rate	Range of Rates	Standard Deviation
0.40	0.16 - 1.18	0.15

Data Plot and Equation



Manufacturing (140)

Vehicle Trip Ends vs: Employees
On a: Saturday

Setting/Location: General Urban/Suburban

Number of Studies: 5

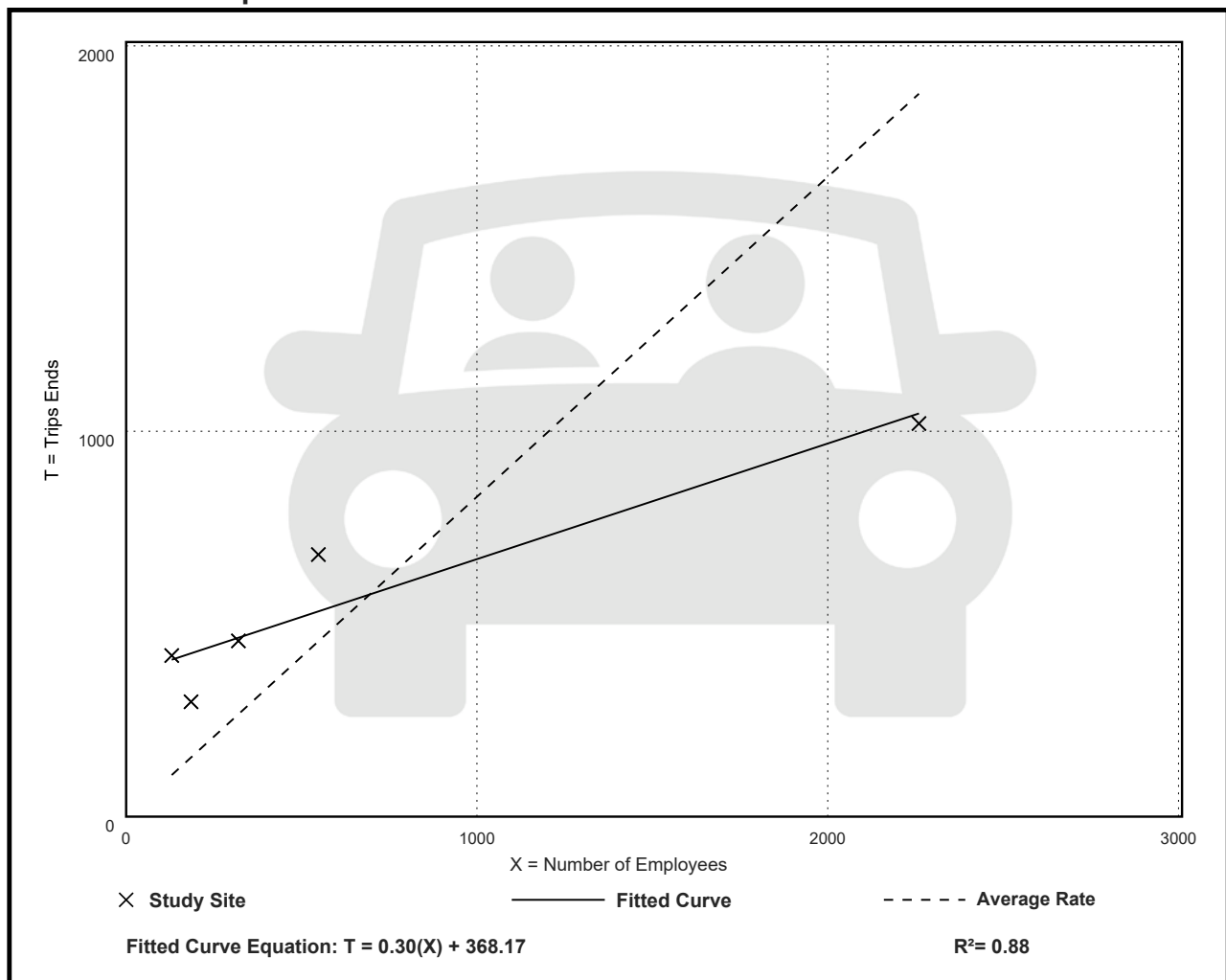
Avg. Num. of Employees: 689

Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per Employee

Average Rate	Range of Rates	Standard Deviation
0.83	0.45 - 3.22	0.71

Data Plot and Equation



Manufacturing (140)

Vehicle Trip Ends vs: Employees

On a: Saturday, Peak Hour of Generator

Setting/Location: General Urban/Suburban

Number of Studies: 5

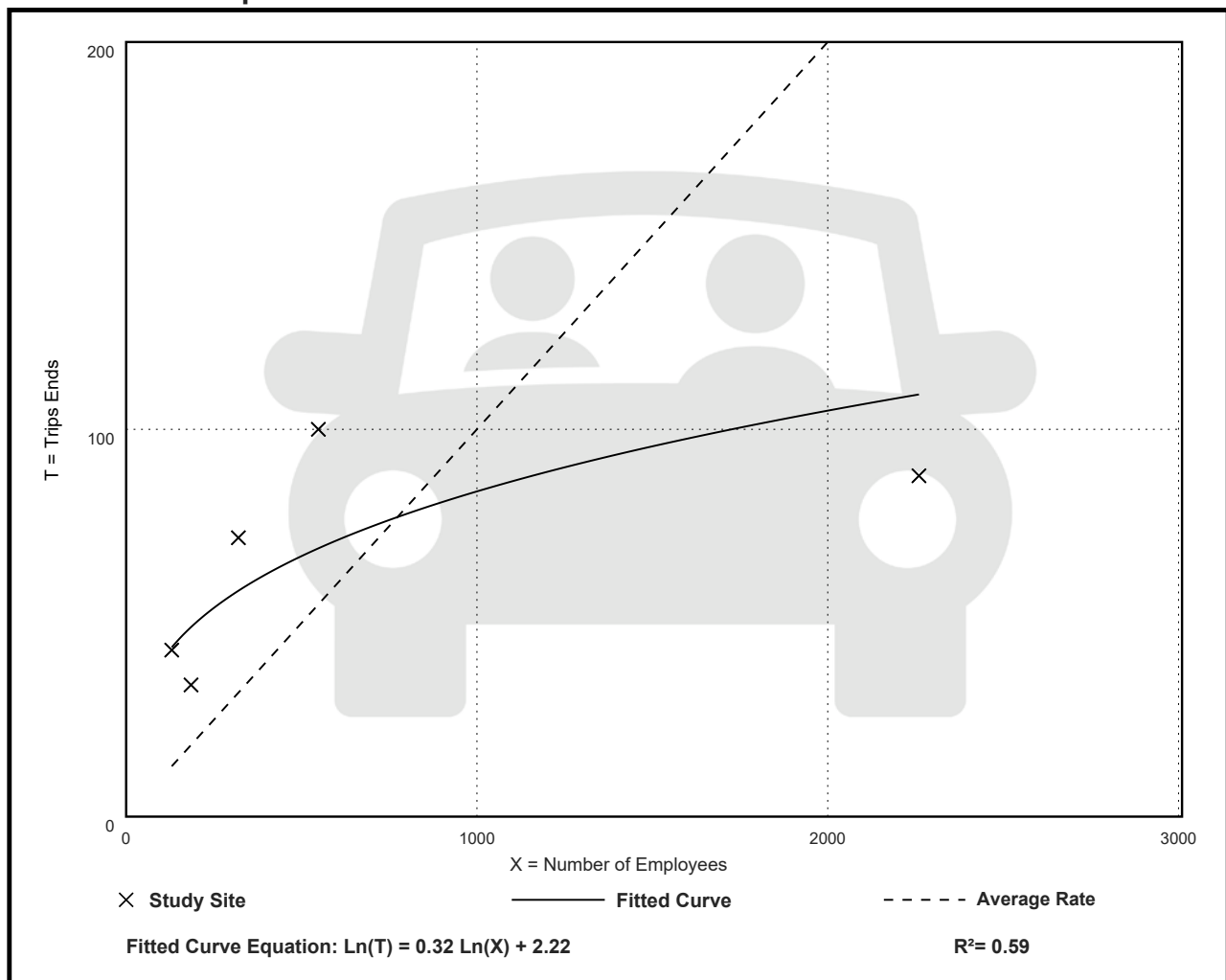
Avg. Num. of Employees: 689

Directional Distribution: 52% entering, 48% exiting

Vehicle Trip Generation per Employee

Average Rate	Range of Rates	Standard Deviation
0.10	0.04 - 0.33	0.10

Data Plot and Equation



Manufacturing (140)

Vehicle Trip Ends vs: Employees
On a: Sunday

Setting/Location: General Urban/Suburban

Number of Studies: 5

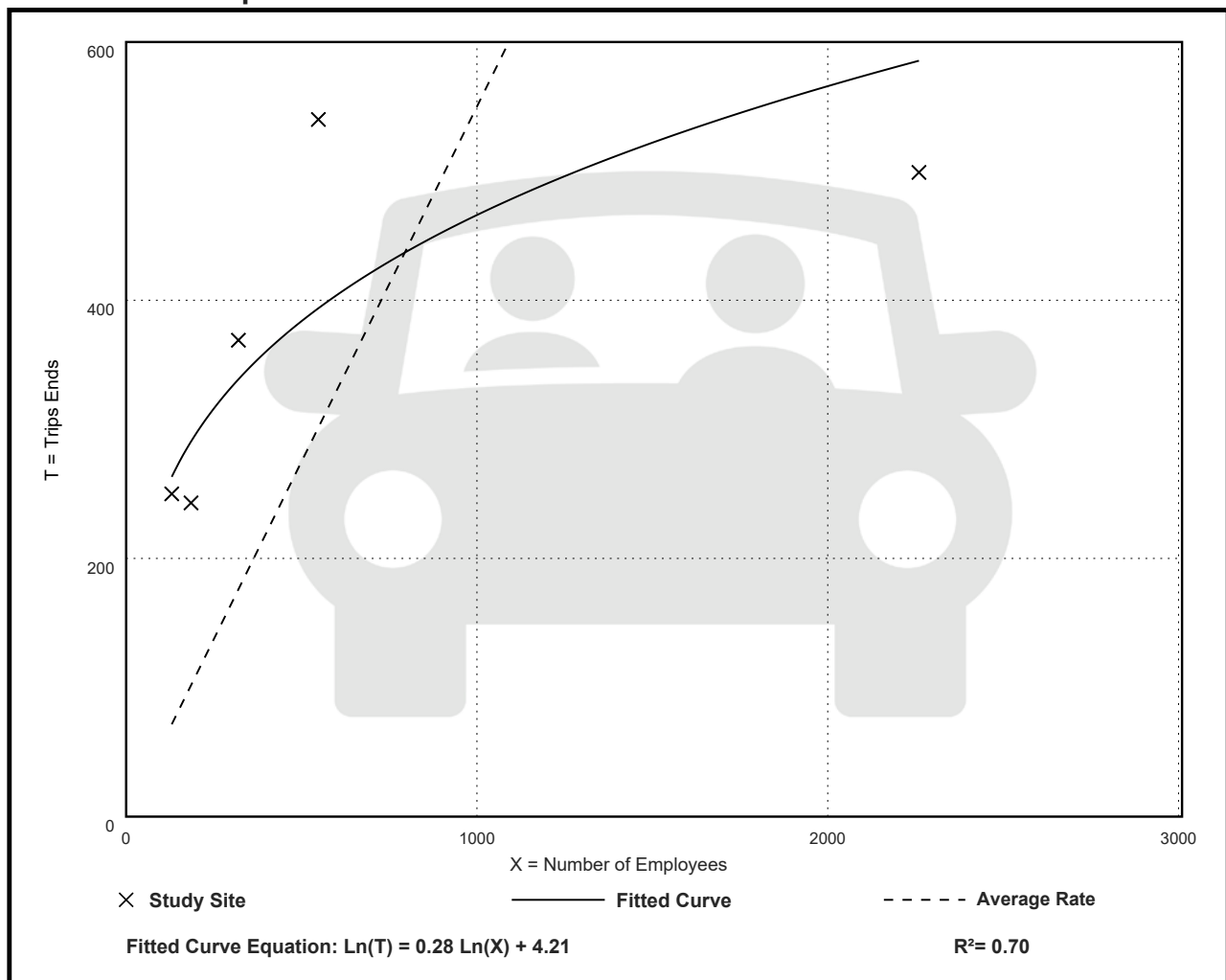
Avg. Num. of Employees: 689

Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per Employee

Average Rate	Range of Rates	Standard Deviation
0.55	0.22 - 1.92	0.55

Data Plot and Equation



Manufacturing (140)

Vehicle Trip Ends vs: Employees

On a: Sunday, Peak Hour of Generator

Setting/Location: General Urban/Suburban

Number of Studies: 5

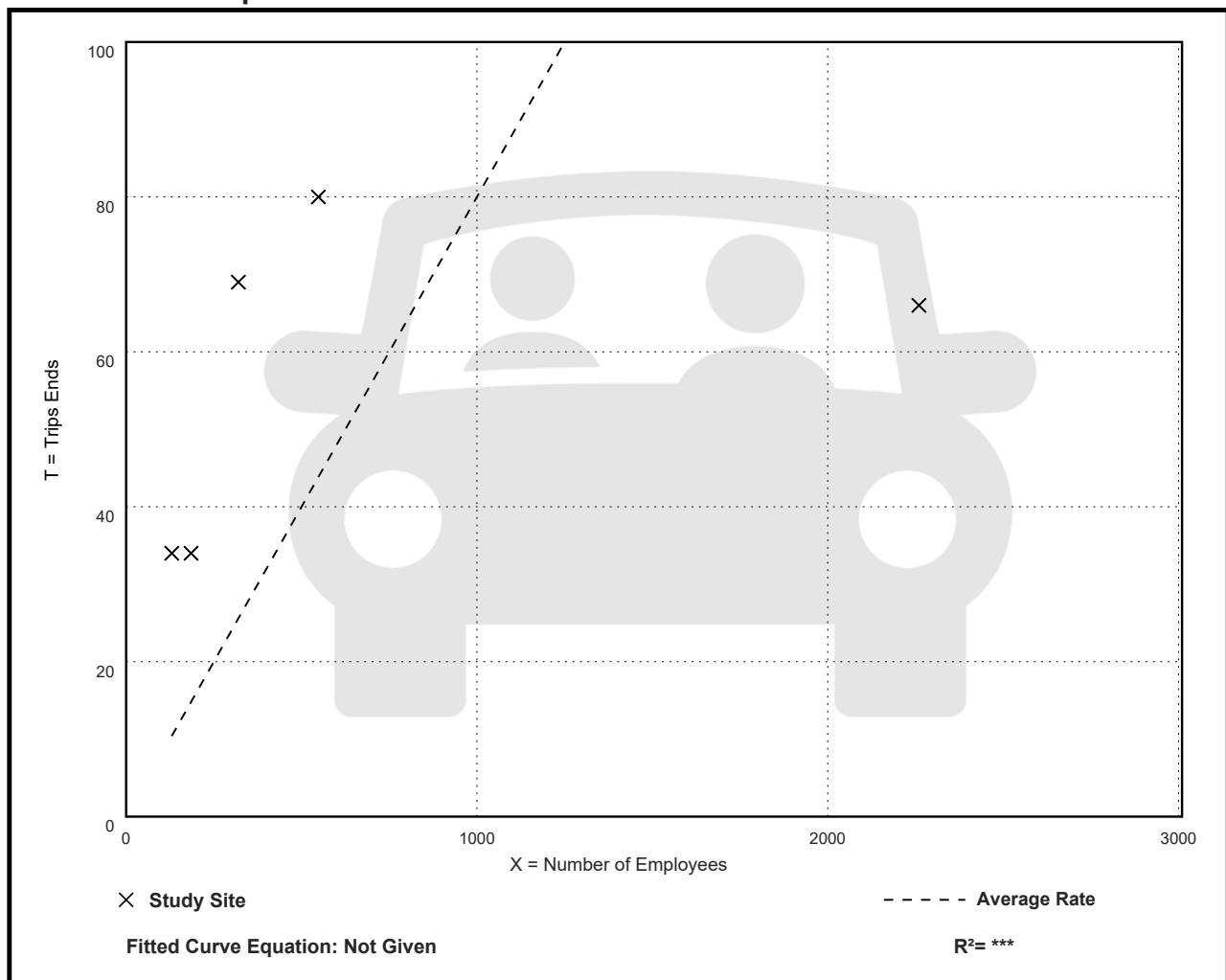
Avg. Num. of Employees: 689

Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per Employee

Average Rate	Range of Rates	Standard Deviation
0.08	0.03 - 0.26	0.09

Data Plot and Equation



Manufacturing (140)

Vehicle Trip Ends vs: Acres
On a: Weekday

Setting/Location: General Urban/Suburban

Number of Studies: 37

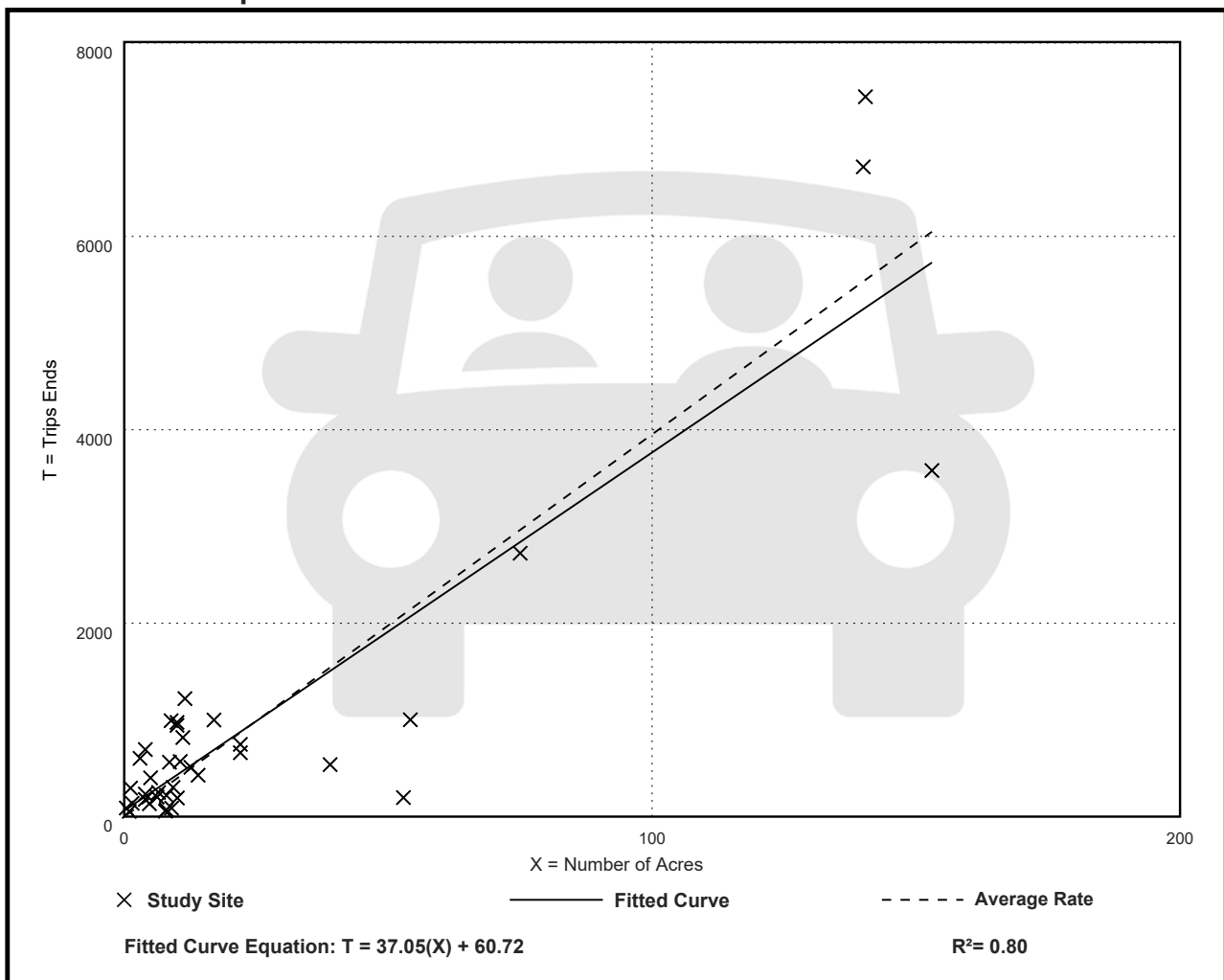
Avg. Num. of Acres: 24

Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per Acre

Average Rate	Range of Rates	Standard Deviation
39.53	3.72 - 245.83	27.04

Data Plot and Equation



Manufacturing (140)

Vehicle Trip Ends vs: Acres

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: 32

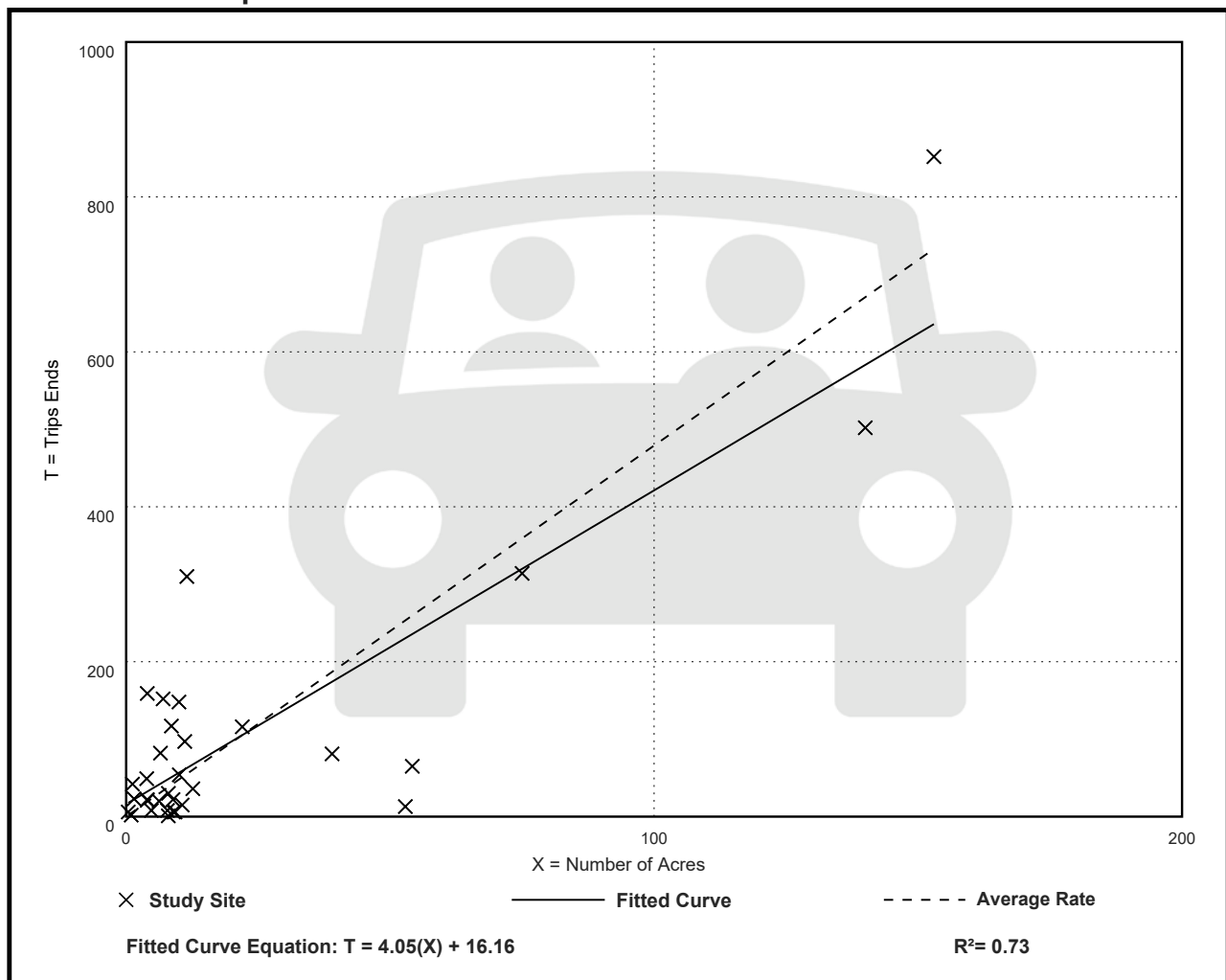
Avg. Num. of Acres: 22

Directional Distribution: 86% entering, 14% exiting

Vehicle Trip Generation per Acre

Average Rate	Range of Rates	Standard Deviation
4.79	0.13 - 39.75	5.36

Data Plot and Equation



Manufacturing (140)

Vehicle Trip Ends vs: Acres

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: 32

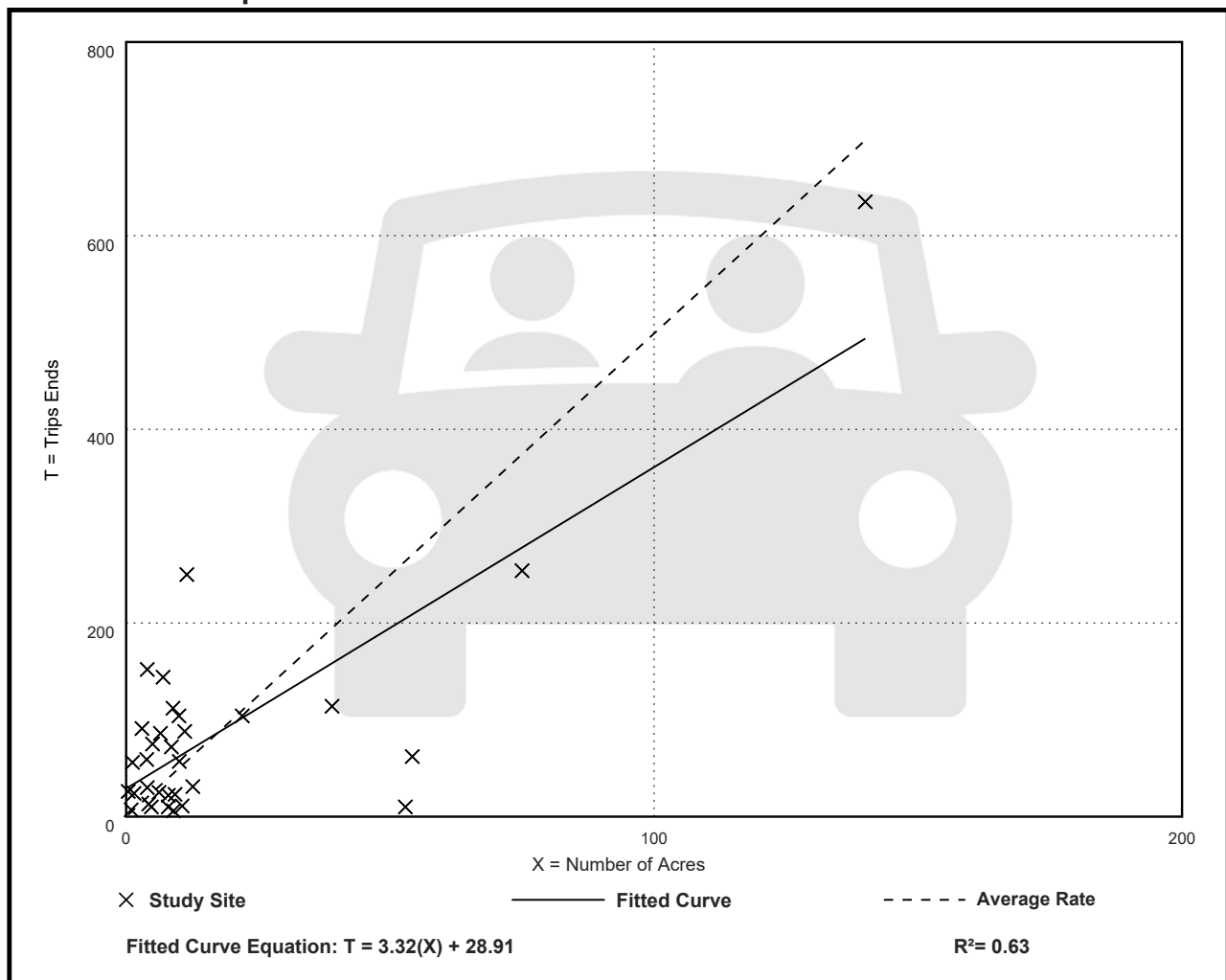
Avg. Num. of Acres: 17

Directional Distribution: 39% entering, 61% exiting

Vehicle Trip Generation per Acre

Average Rate	Range of Rates	Standard Deviation
4.99	0.19 - 65.00	6.17

Data Plot and Equation



Manufacturing (140)

Vehicle Trip Ends vs: Acres

On a: Weekday,
AM Peak Hour of Generator

Setting/Location: General Urban/Suburban

Number of Studies: 40

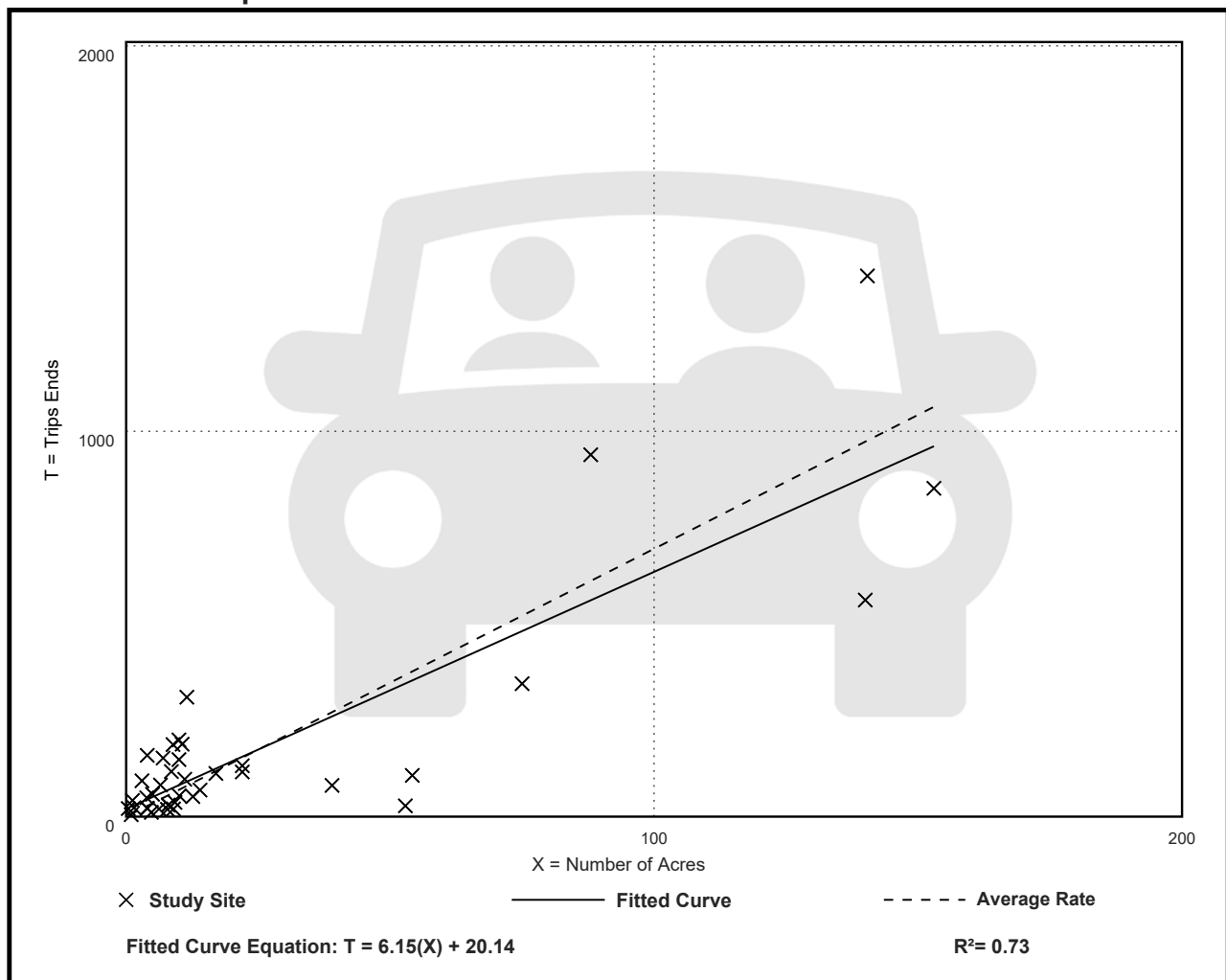
Avg. Num. of Acres: 25

Directional Distribution: 75% entering, 25% exiting

Vehicle Trip Generation per Acre

Average Rate	Range of Rates	Standard Deviation
6.95	0.53 - 52.50	5.55

Data Plot and Equation



Manufacturing (140)

Vehicle Trip Ends vs: Acres

On a: Weekday,

PM Peak Hour of Generator

Setting/Location: General Urban/Suburban

Number of Studies: 40

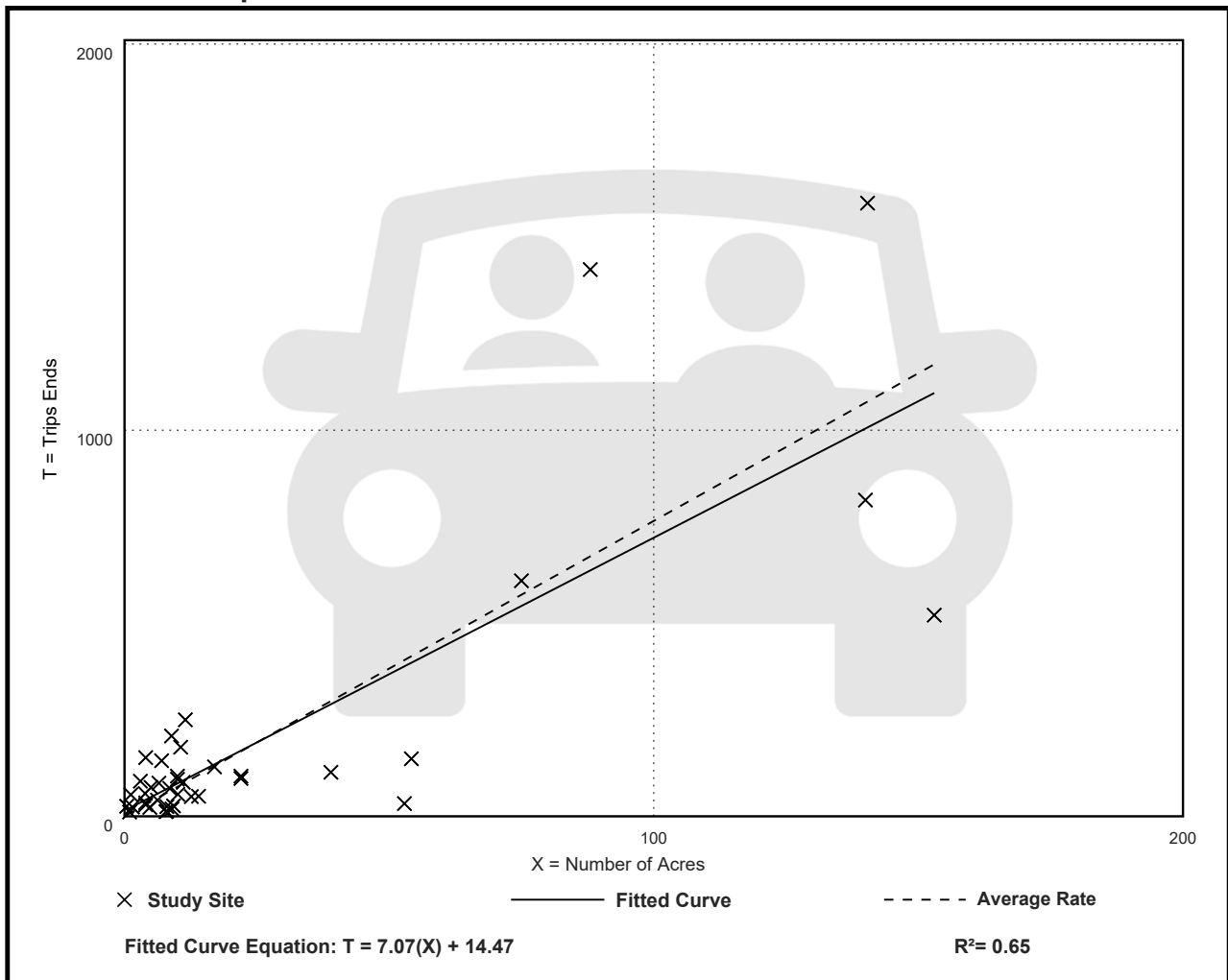
Avg. Num. of Acres: 25

Directional Distribution: 44% entering, 56% exiting

Vehicle Trip Generation per Acre

Average Rate	Range of Rates	Standard Deviation
7.65	0.62 - 65.00	5.90

Data Plot and Equation



Manufacturing (140)

Vehicle Trip Ends vs: Acres

On a: Saturday

Setting/Location: General Urban/Suburban

Number of Studies: 2

Avg. Num. of Acres: 76

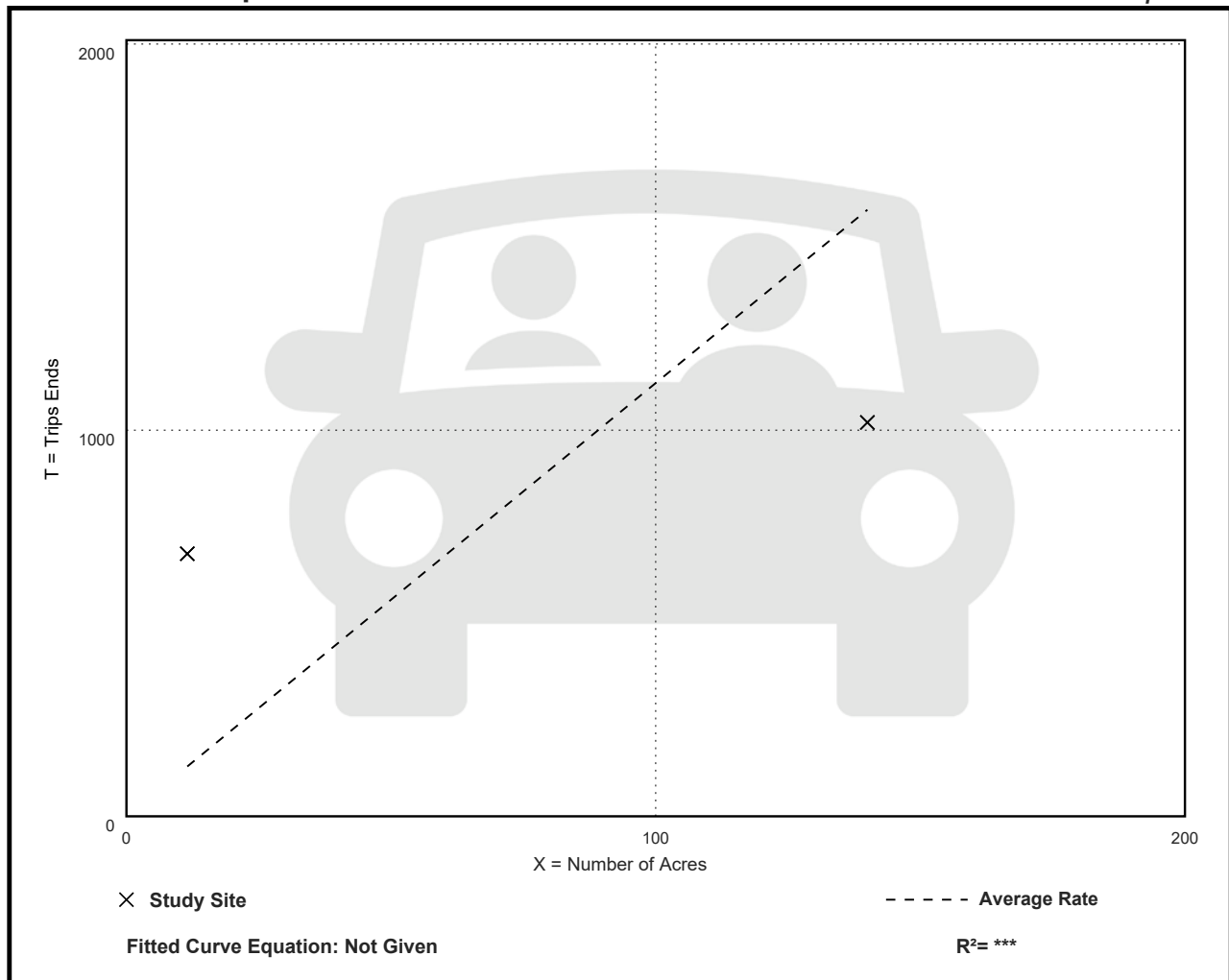
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per Acre

Average Rate	Range of Rates	Standard Deviation
11.22	7.29 - 59.13	***

Data Plot and Equation

Caution – Small Sample Size



Manufacturing (140)

Vehicle Trip Ends vs: Acres

On a: Saturday, Peak Hour of Generator

Setting/Location: General Urban/Suburban

Number of Studies: 2

Avg. Num. of Acres: 76

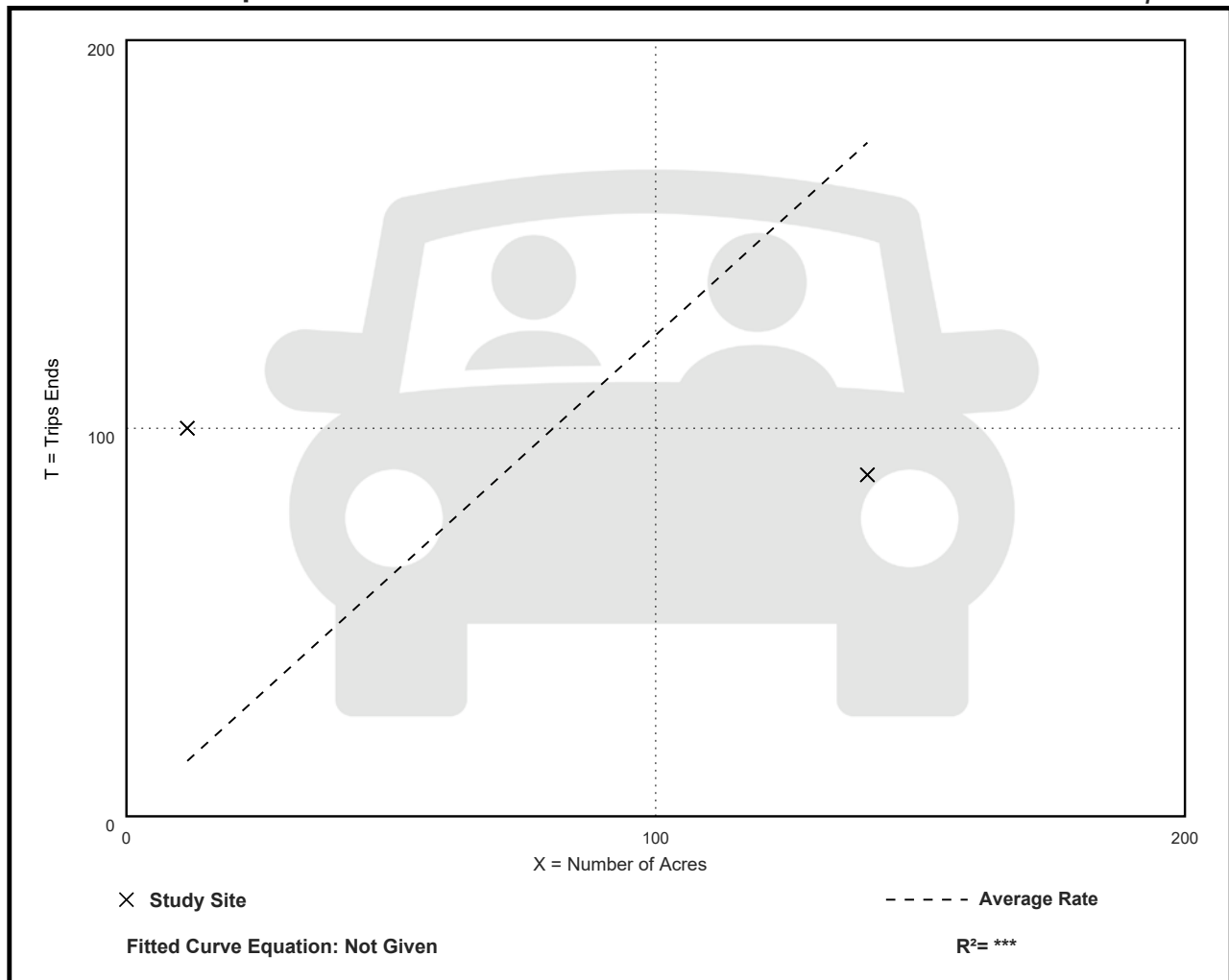
Directional Distribution: 52% entering, 48% exiting

Vehicle Trip Generation per Acre

Average Rate	Range of Rates	Standard Deviation
1.24	0.63 - 8.70	***

Data Plot and Equation

Caution – Small Sample Size



Manufacturing (140)

Vehicle Trip Ends vs: Acres
On a: Sunday

Setting/Location: General Urban/Suburban

Number of Studies: 2

Avg. Num. of Acres: 76

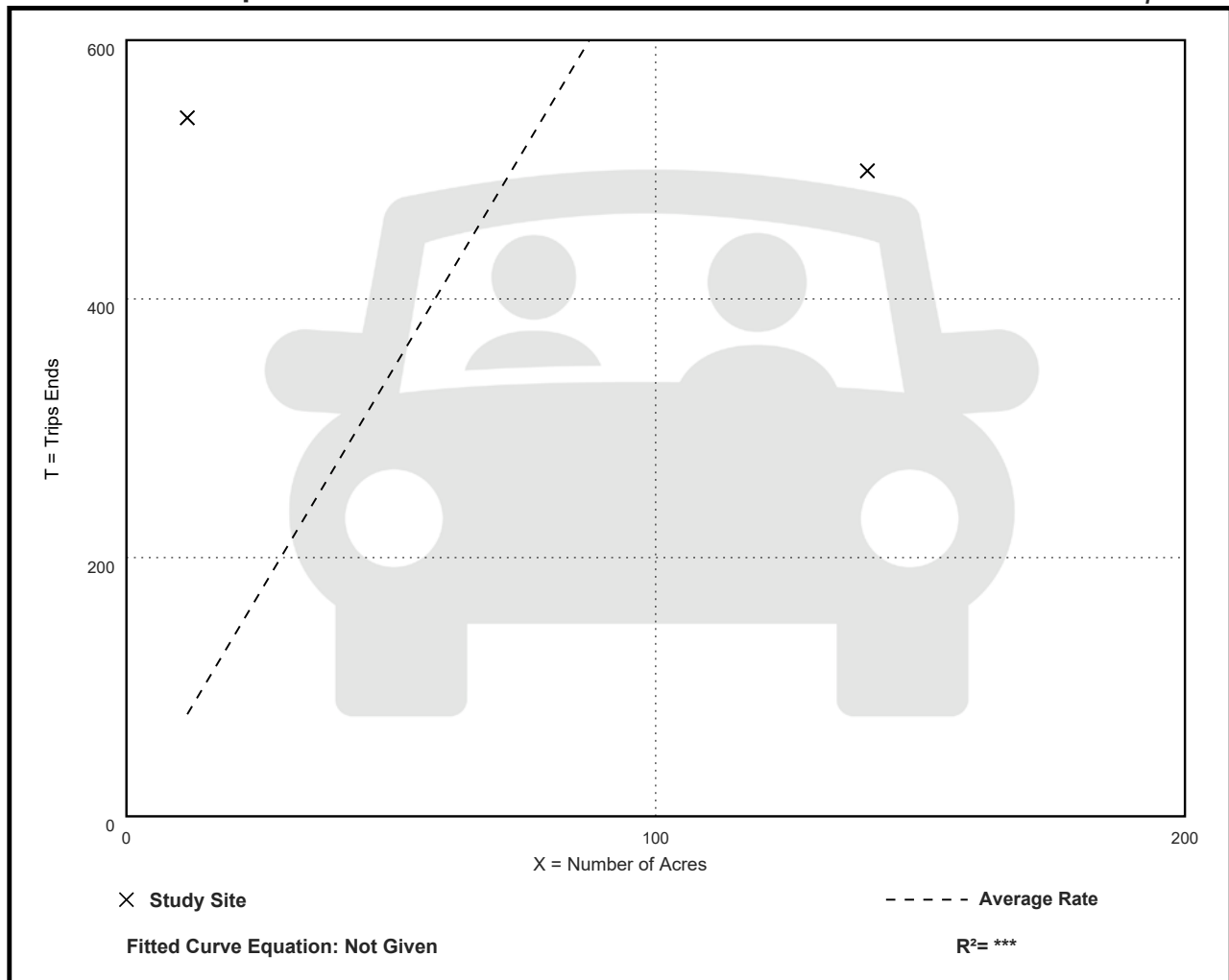
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per Acre

Average Rate	Range of Rates	Standard Deviation
6.86	3.56 - 46.96	***

Data Plot and Equation

Caution – Small Sample Size



Manufacturing (140)

Vehicle Trip Ends vs: Acres

On a: Sunday, Peak Hour of Generator

Setting/Location: General Urban/Suburban

Number of Studies: 2

Avg. Num. of Acres: 76

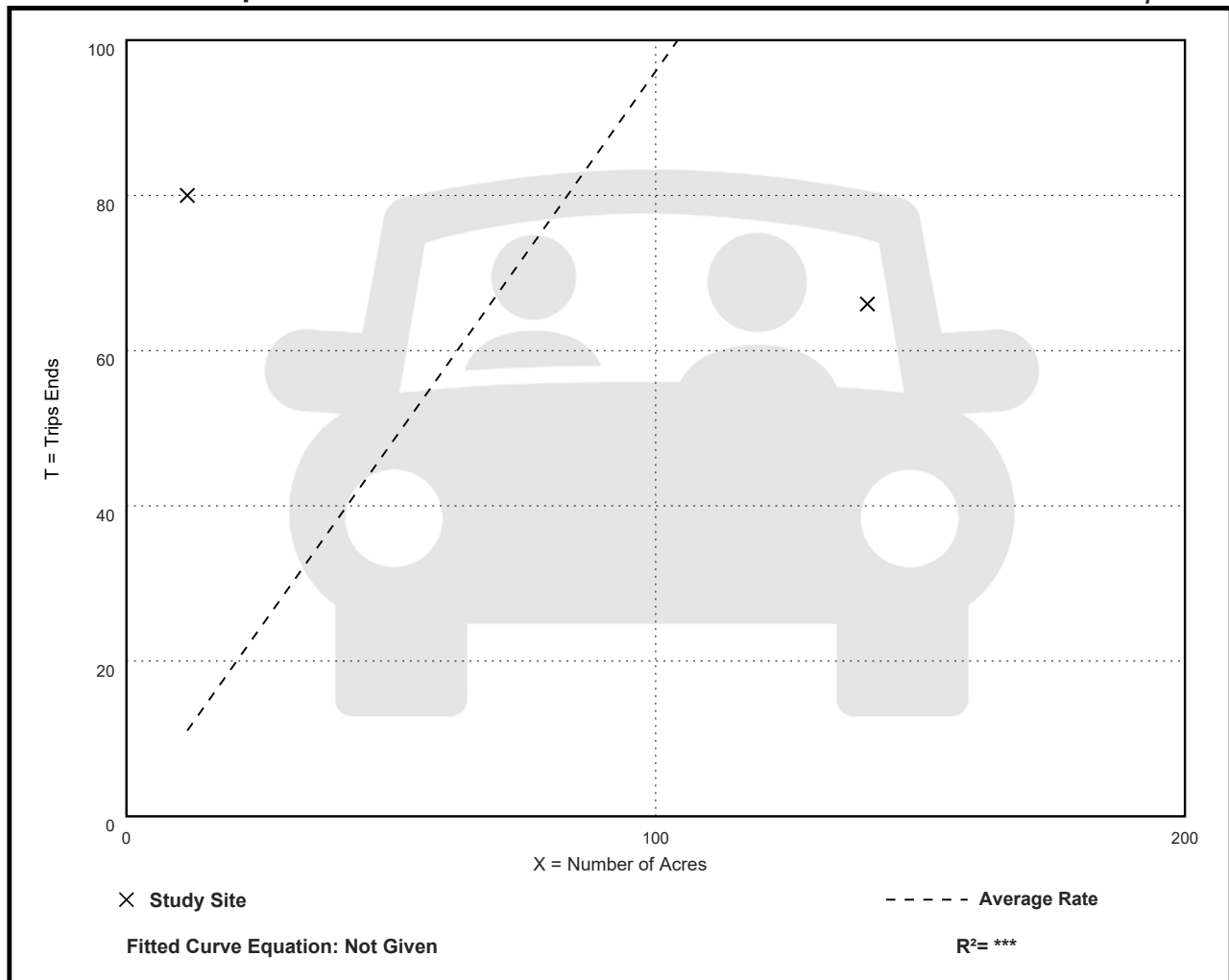
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per Acre

Average Rate	Range of Rates	Standard Deviation
0.96	0.47 - 6.96	***

Data Plot and Equation

Caution – Small Sample Size



Manufacturing (140)

Truck Trip Ends vs: 1000 Sq. Ft. GFA

On a: Weekday

Setting/Location: General Urban/Suburban

Number of Studies: 19

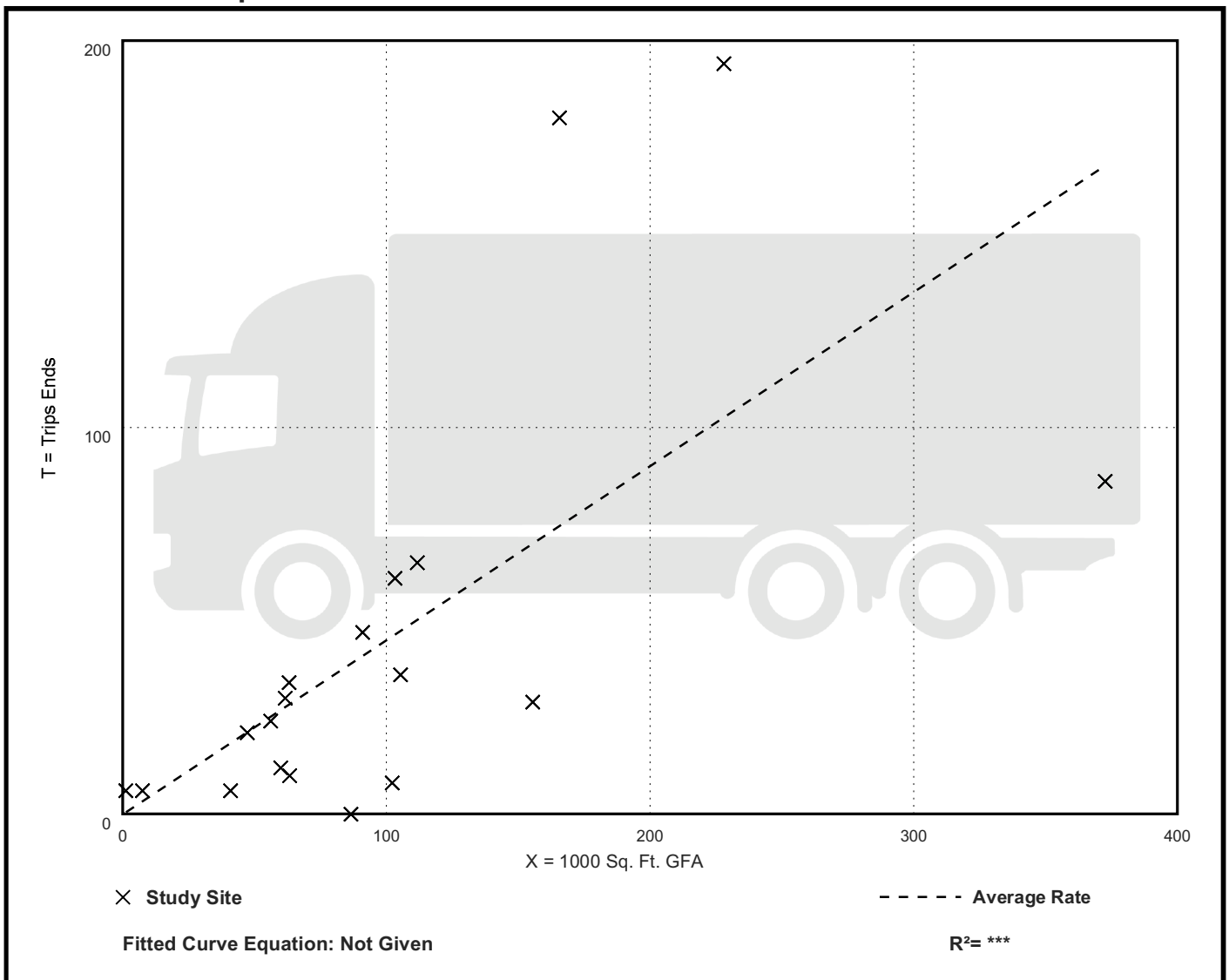
Avg. 1000 Sq. Ft. GFA: 101

Directional Distribution: 50% entering, 50% exiting

Truck Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
0.45	0.00 - 5.50	0.34

Data Plot and Equation



Manufacturing (140)

Truck 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: 19

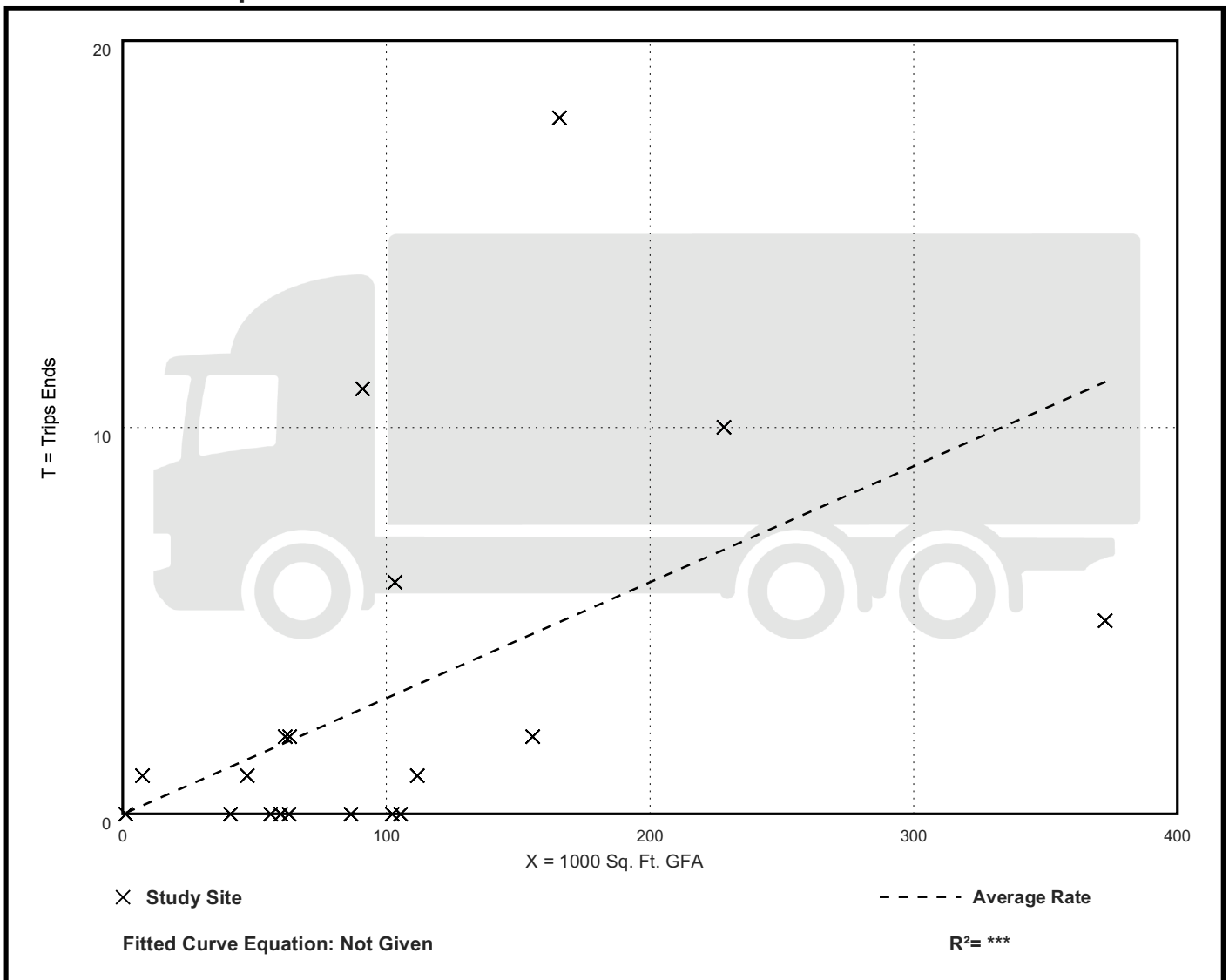
Avg. 1000 Sq. Ft. GFA: 101

Directional Distribution: 56% entering, 44% exiting

Truck Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
0.03	0.00 - 0.14	0.04

Data Plot and Equation



Manufacturing (140)

Truck 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: 18

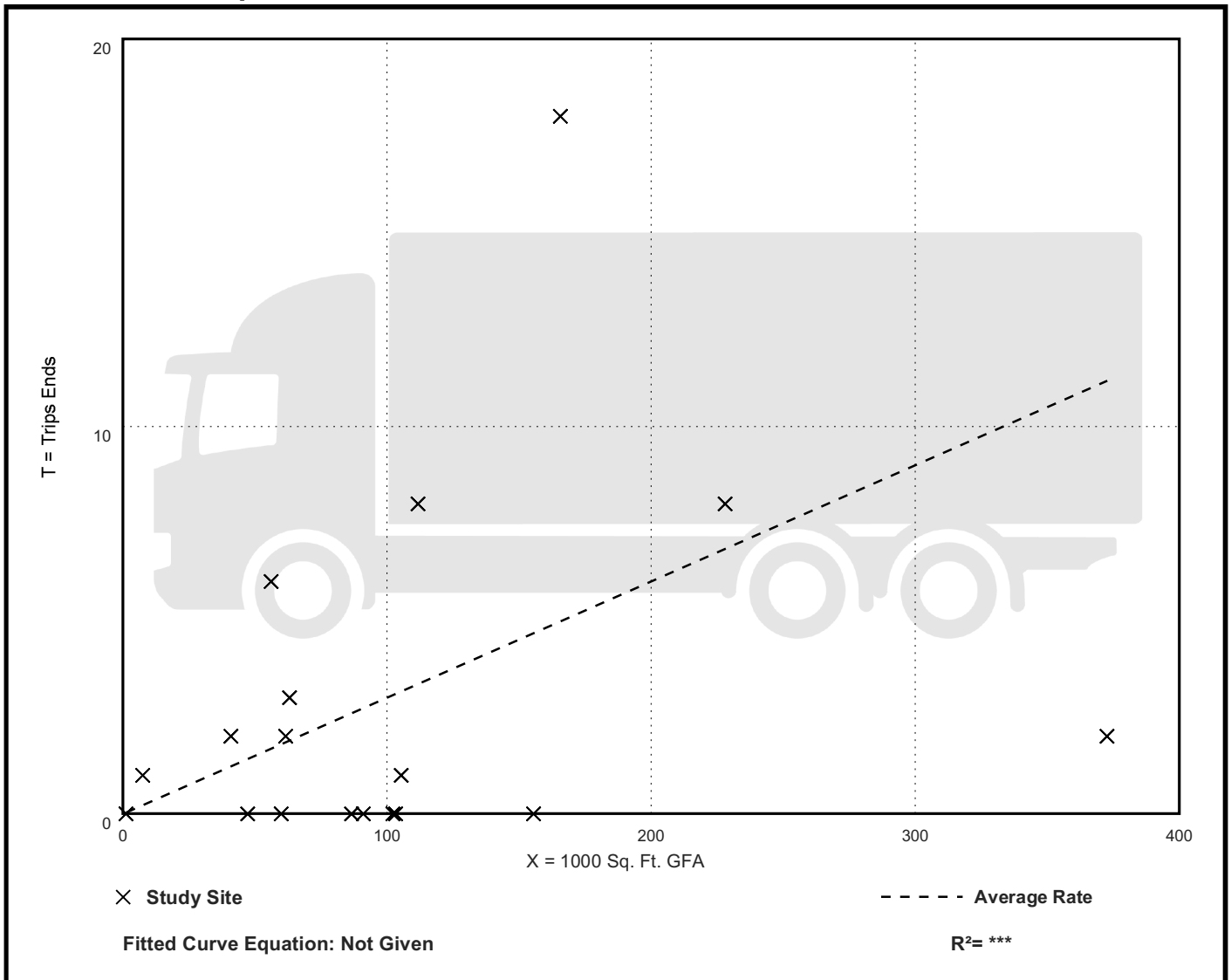
Avg. 1000 Sq. Ft. GFA: 103

Directional Distribution: 41% entering, 59% exiting

Truck Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
0.03	0.00 - 0.14	0.04

Data Plot and Equation



Manufacturing (140)

Truck Trip Ends vs: 1000 Sq. Ft. GFA

On a: Weekday,

AM Peak Hour of Generator

Setting/Location: General Urban/Suburban

Number of Studies: 19

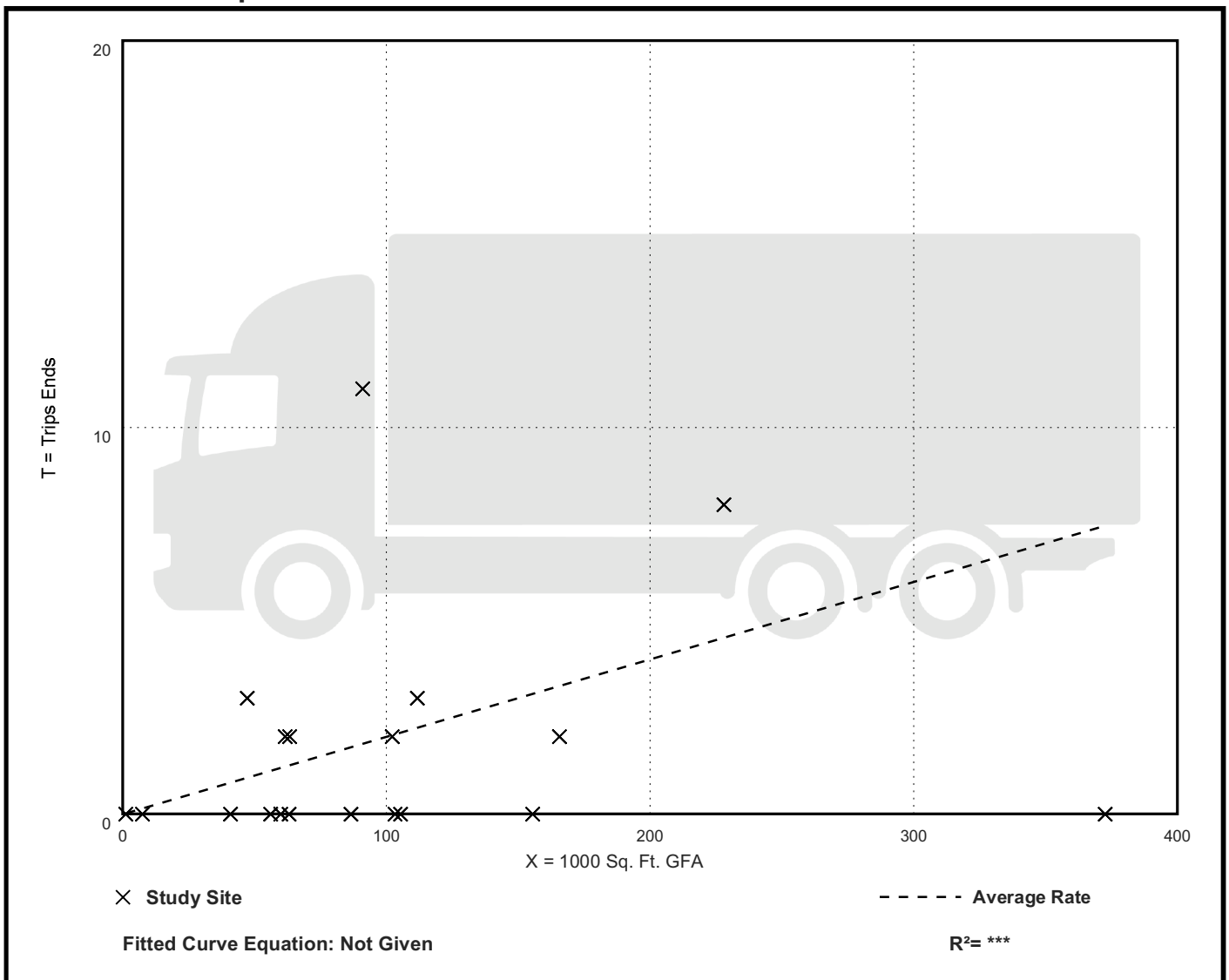
Avg. 1000 Sq. Ft. GFA: 101

Directional Distribution: 42% entering, 58% exiting

Truck Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
0.02	0.00 - 0.12	0.03

Data Plot and Equation



Manufacturing (140)

Truck Trip Ends vs: 1000 Sq. Ft. GFA

On a: Weekday,

PM Peak Hour of Generator

Setting/Location: General Urban/Suburban

Number of Studies: 19

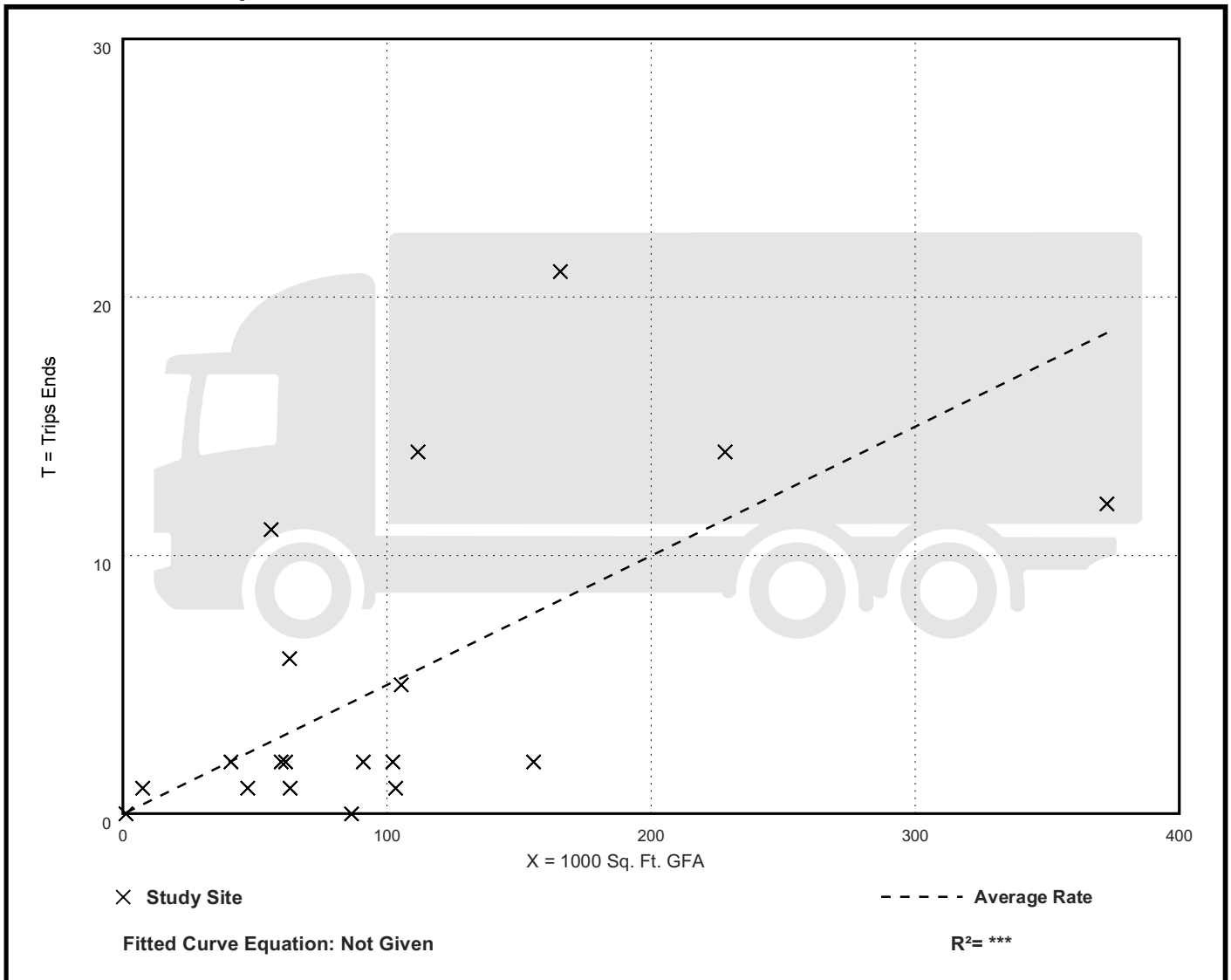
Avg. 1000 Sq. Ft. GFA: 101

Directional Distribution: 43% entering, 57% exiting

Truck Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
0.05	0.00 - 0.20	0.05

Data Plot and Equation



Manufacturing (140)

Truck Trip Ends vs: Employees
On a: Weekday

Setting/Location: General Urban/Suburban

Number of Studies: 18

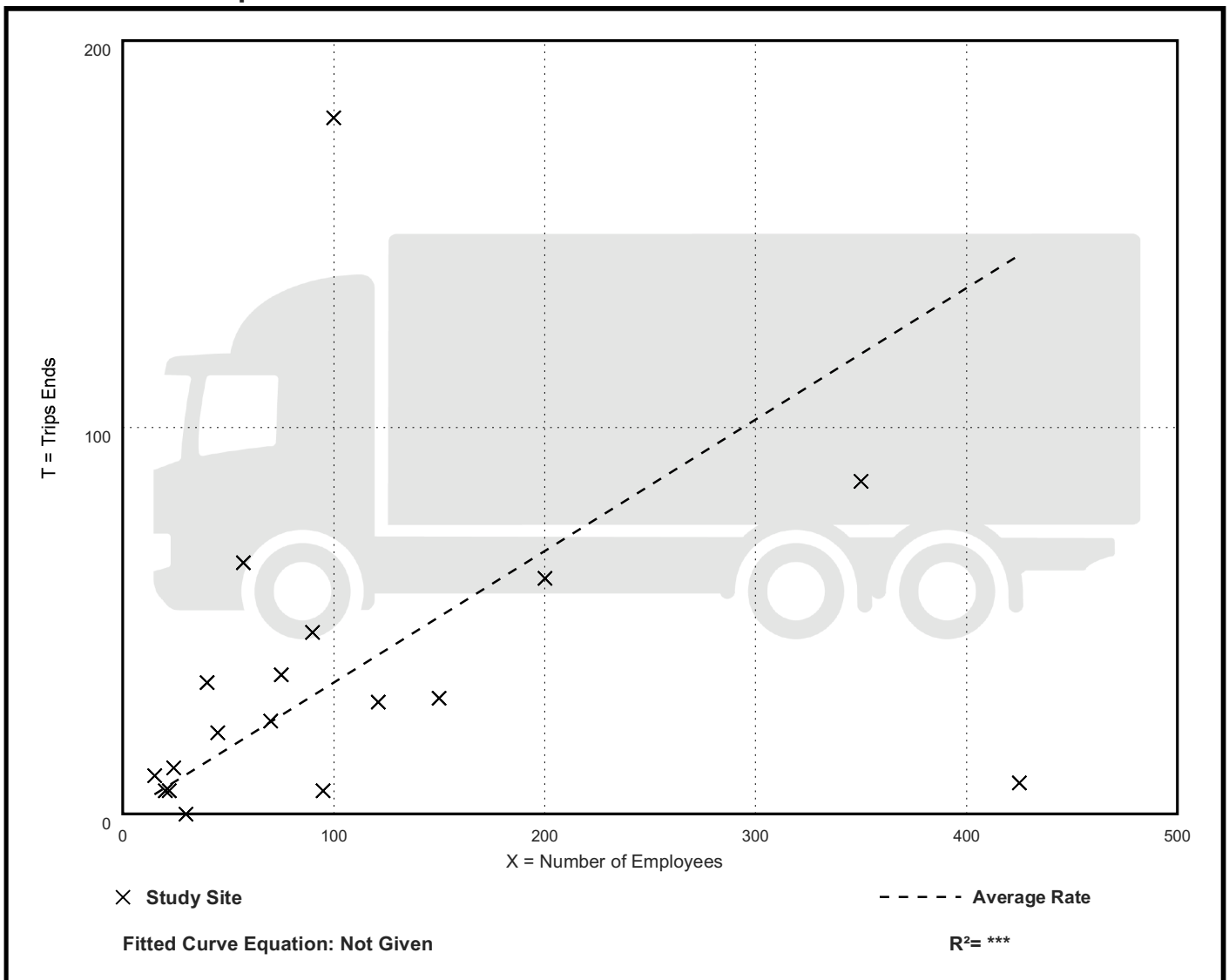
Avg. Num. of Employees: 107

Directional Distribution: 50% entering, 50% exiting

Truck Trip Generation per Employee

Average Rate	Range of Rates	Standard Deviation
0.34	0.00 - 1.80	0.43

Data Plot and Equation



Manufacturing (140)

Truck Trip Ends vs: Employees

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: 18

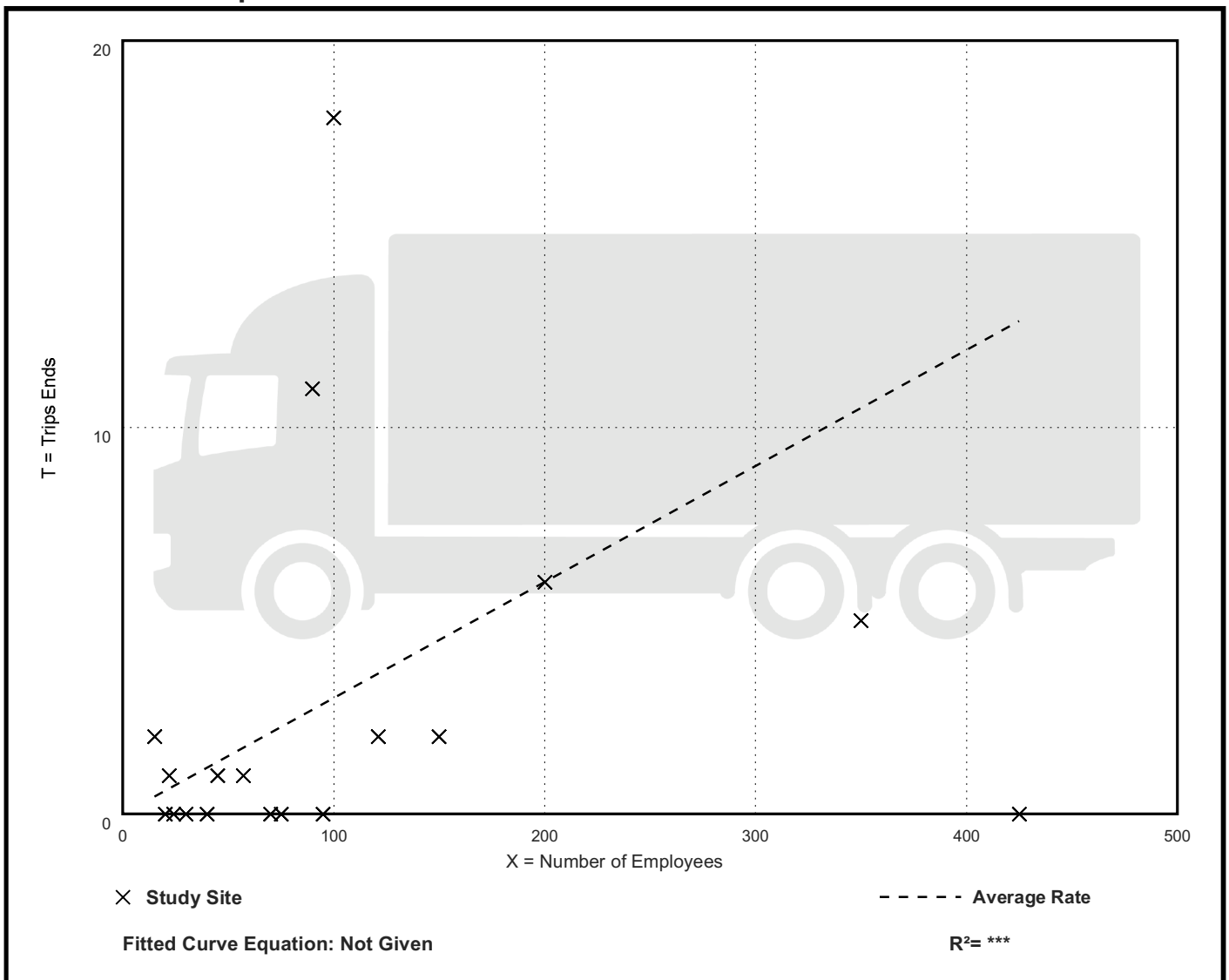
Avg. Num. of Employees: 107

Directional Distribution: 59% entering, 41% exiting

Truck Trip Generation per Employee

Average Rate	Range of Rates	Standard Deviation
0.03	0.00 - 0.18	0.05

Data Plot and Equation



Manufacturing (140)

Truck Trip Ends vs: Employees

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: 17

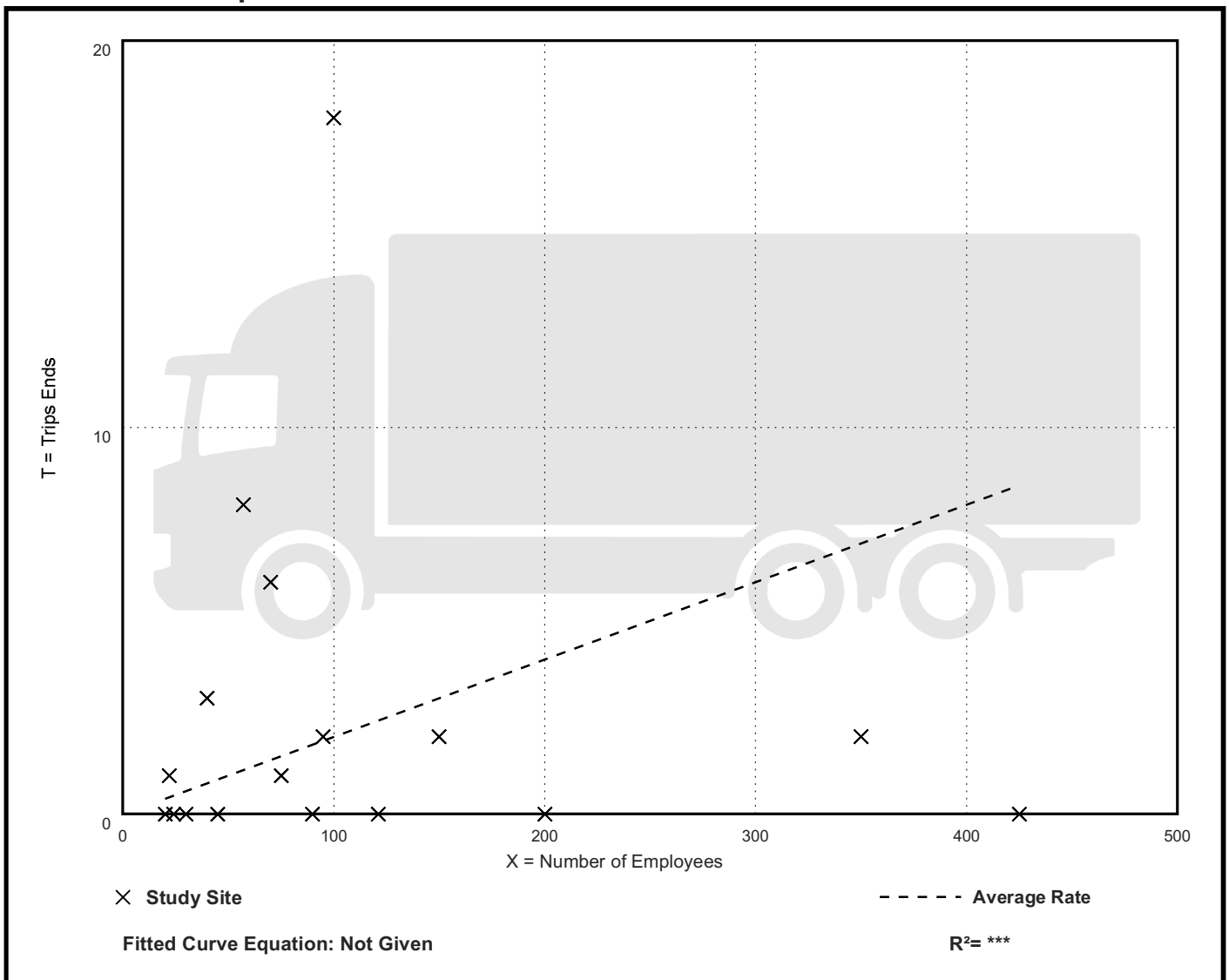
Avg. Num. of Employees: 113

Directional Distribution: 37% entering, 63% exiting

Truck Trip Generation per Employee

Average Rate	Range of Rates	Standard Deviation
0.02	0.00 - 0.18	0.05

Data Plot and Equation



Manufacturing (140)

Truck Trip Ends vs: Employees

On a: Weekday,

AM Peak Hour of Generator

Setting/Location: General Urban/Suburban

Number of Studies: 18

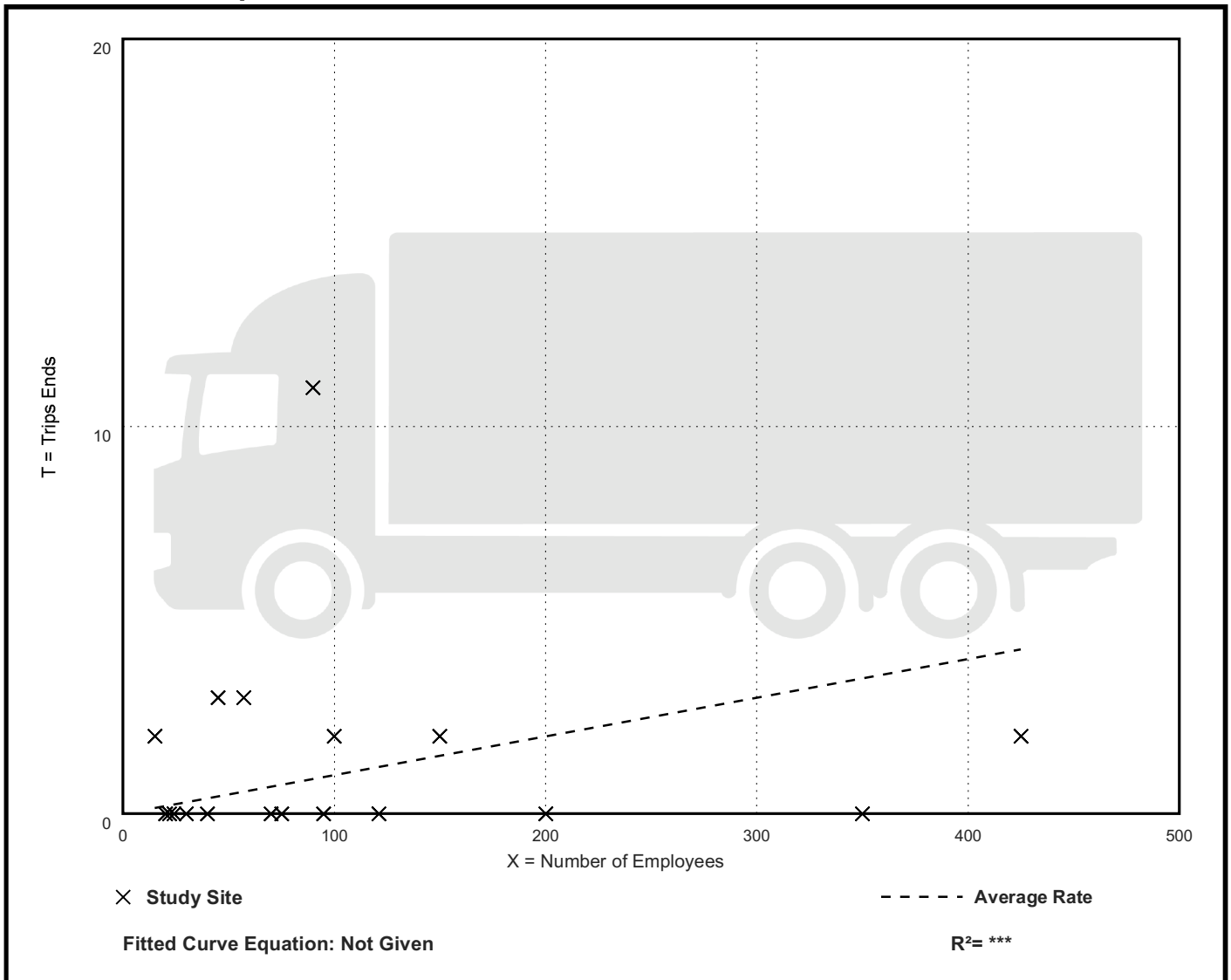
Avg. Num. of Employees: 107

Directional Distribution: 44% entering, 56% exiting

Truck Trip Generation per Employee

Average Rate	Range of Rates	Standard Deviation
0.01	0.00 - 0.13	0.03

Data Plot and Equation



Manufacturing (140)

Truck Trip Ends vs: Employees

On a: Weekday,

PM Peak Hour of Generator

Setting/Location: General Urban/Suburban

Number of Studies: 18

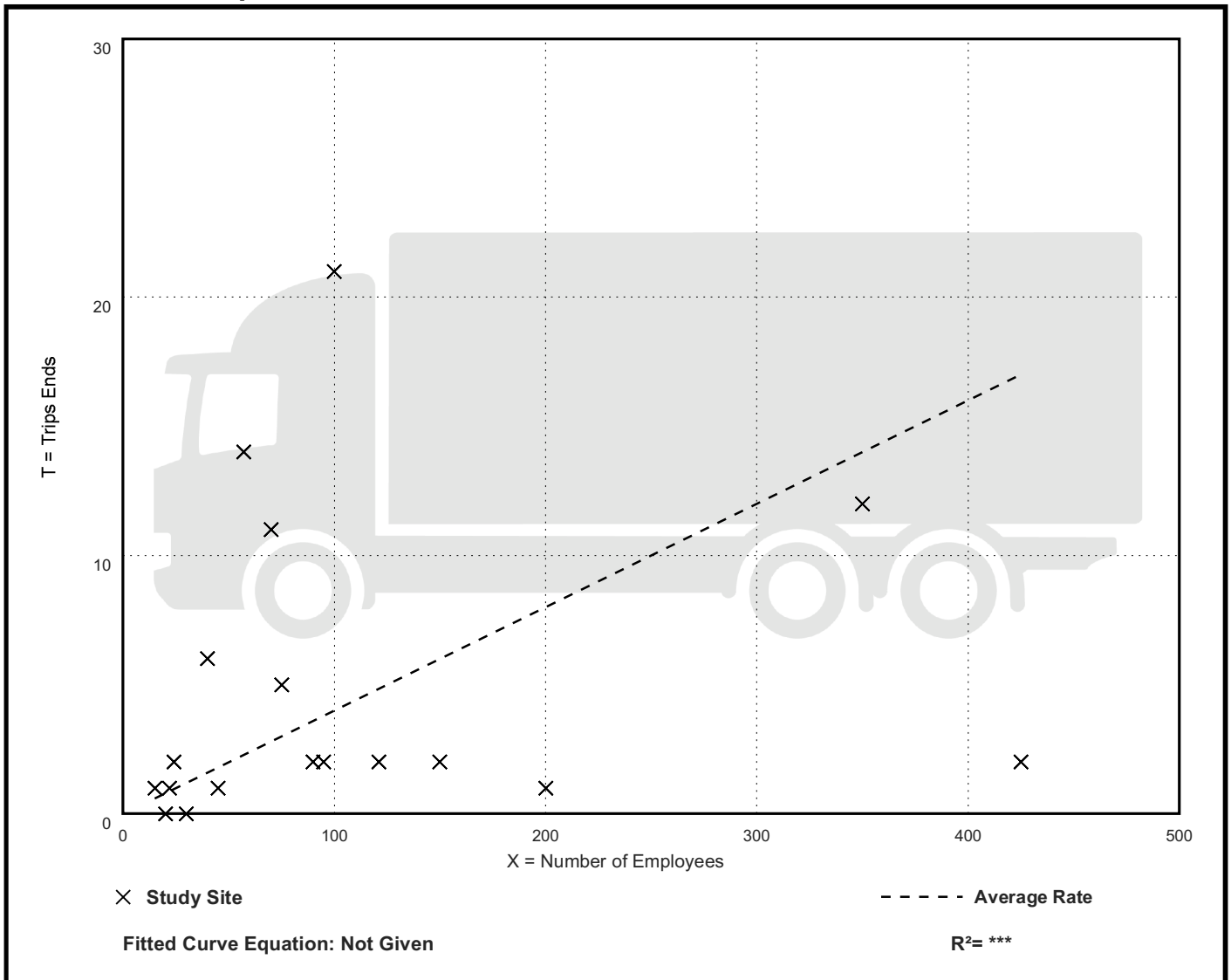
Avg. Num. of Employees: 107

Directional Distribution: 45% entering, 55% exiting

Truck Trip Generation per Employee

Average Rate	Range of Rates	Standard Deviation
0.04	0.00 - 0.25	0.07

Data Plot and Equation



Manufacturing (140)

Truck Trip Ends vs: Acres

On a: Weekday

Setting/Location: General Urban/Suburban

Number of Studies: 17

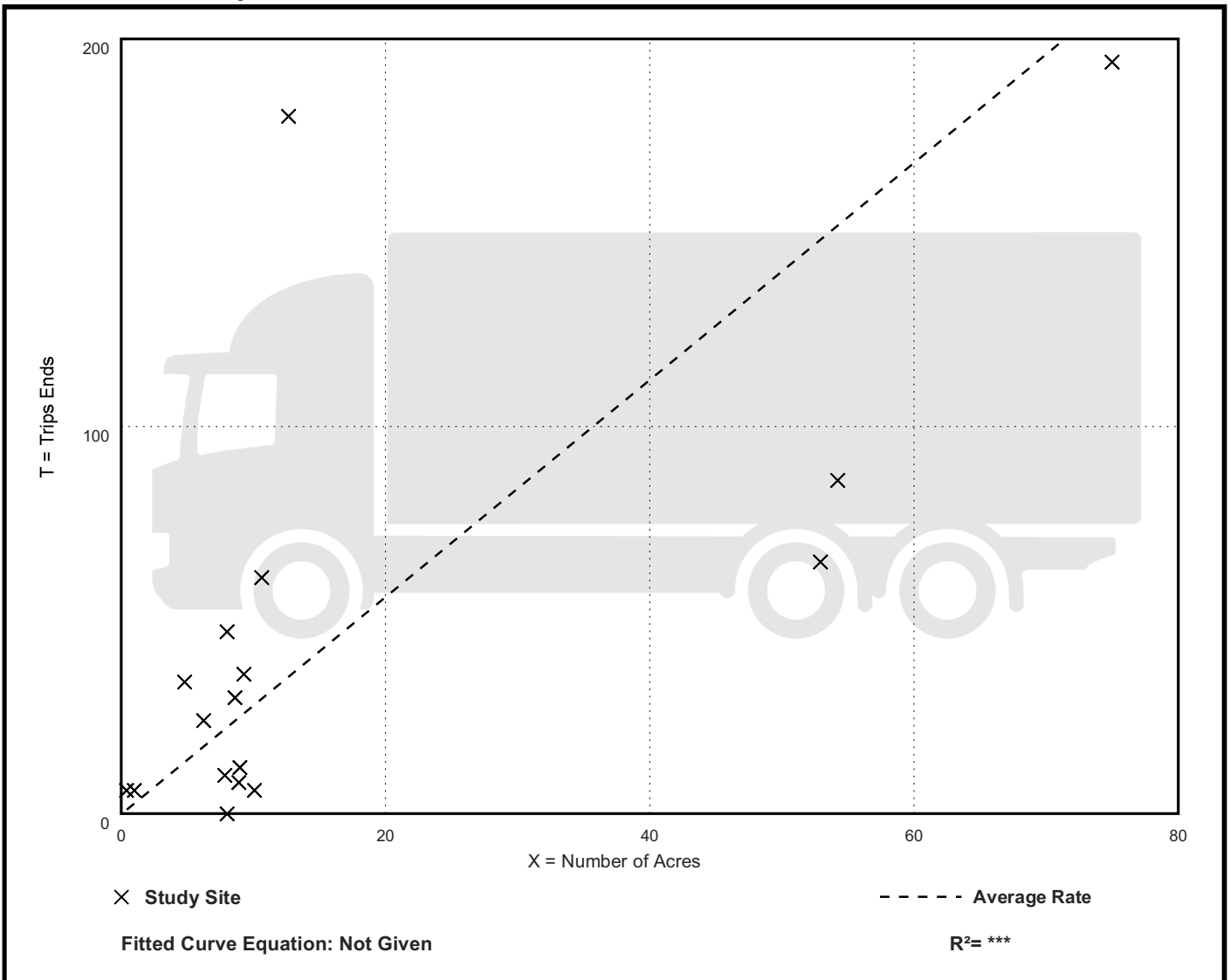
Avg. Num. of Acres: 17

Directional Distribution: 50% entering, 50% exiting

Truck Trip Generation per Acre

Average Rate	Range of Rates	Standard Deviation
2.80	0.00 - 15.00	2.98

Data Plot and Equation



Manufacturing (140)

Truck Trip Ends vs: Acres

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: 17

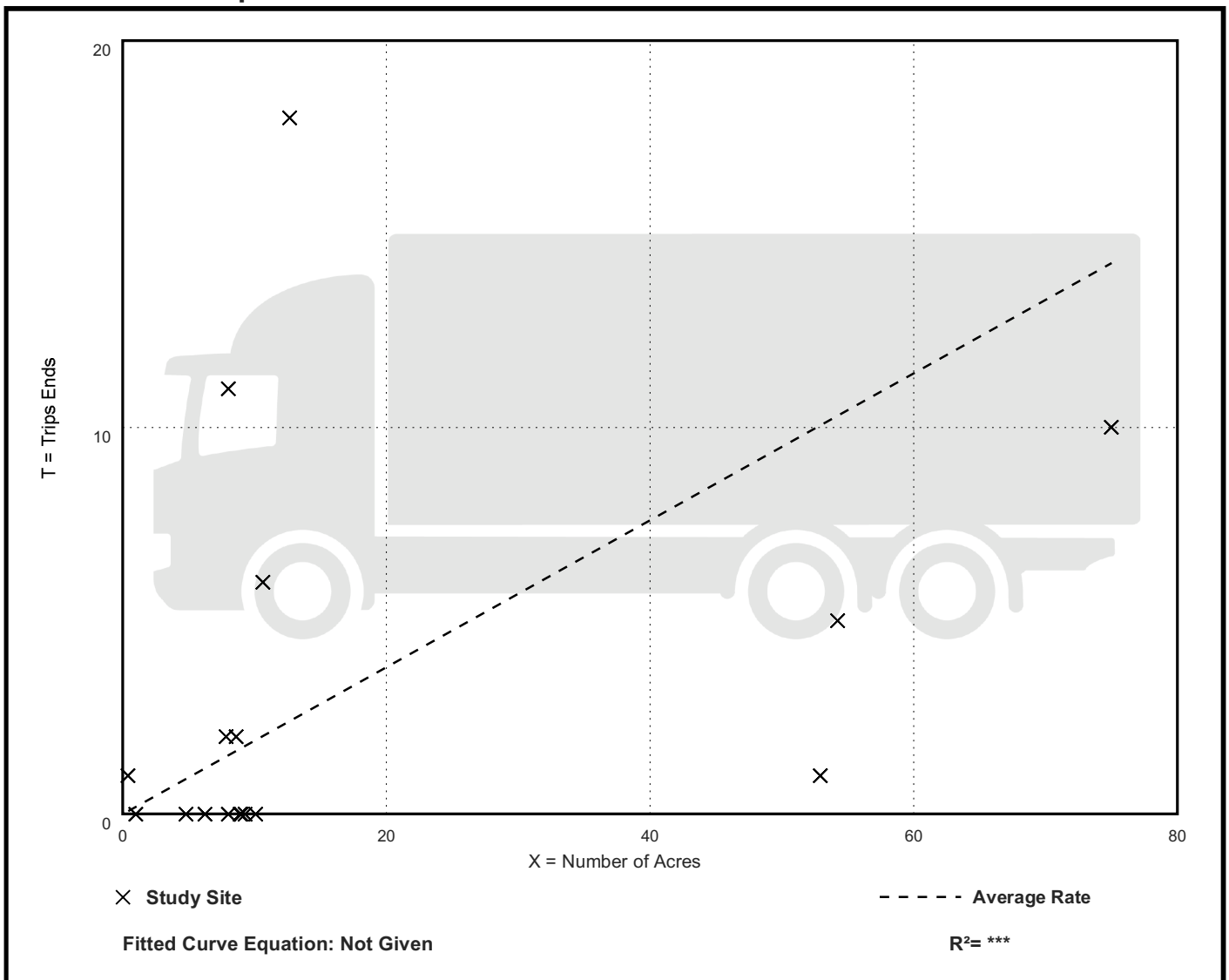
Avg. Num. of Acres: 17

Directional Distribution: 55% entering, 45% exiting

Truck Trip Generation per Acre

Average Rate	Range of Rates	Standard Deviation
0.19	0.00 - 2.50	0.38

Data Plot and Equation



Manufacturing (140)

Truck Trip Ends vs: Acres

On a: Weekday,

Peak Hour of Adjacent Street Traffic,

One Hour Between 4 and 6 p.m.

Setting/Location: General Urban/Suburban

Number of Studies: 16

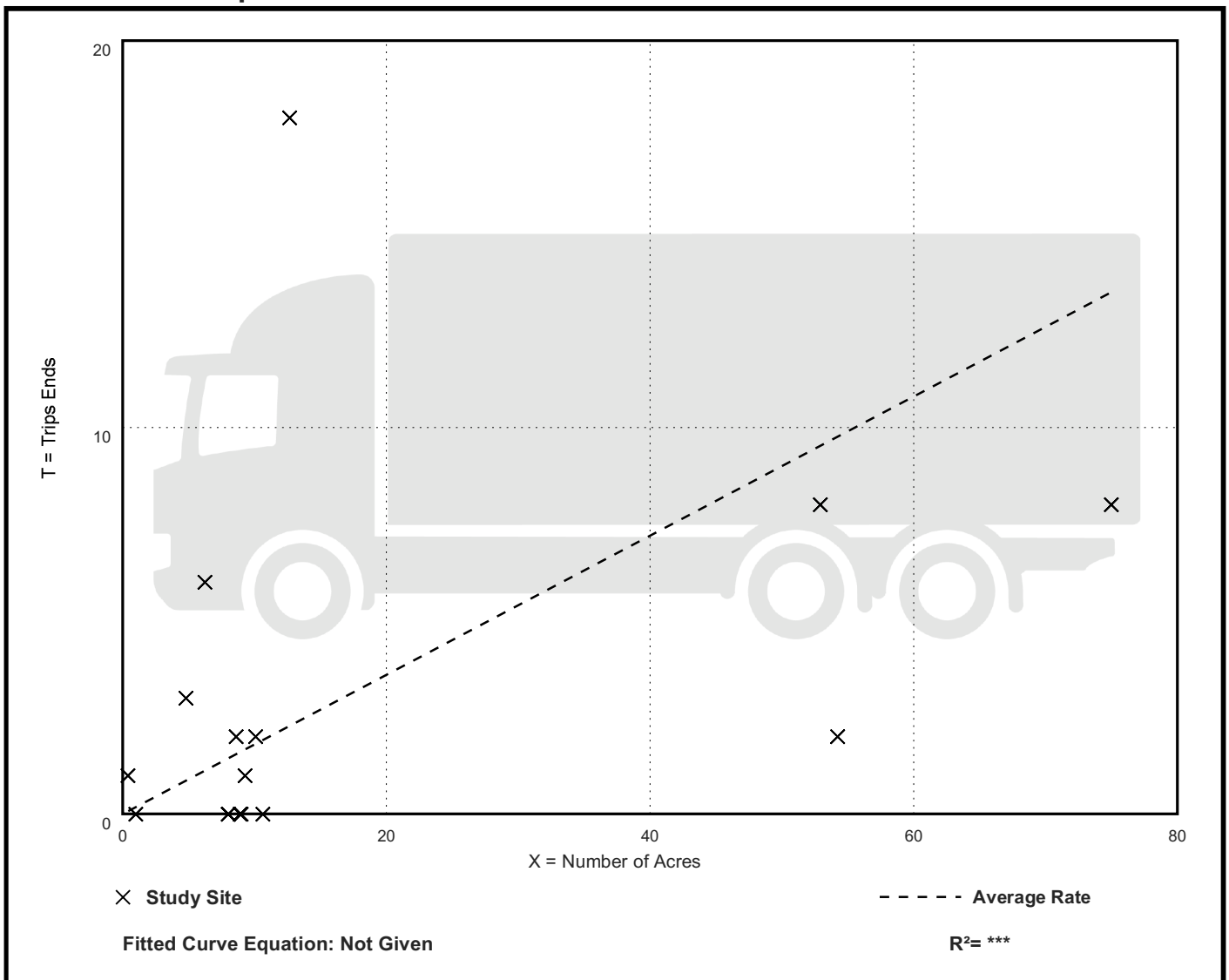
Avg. Num. of Acres: 17

Directional Distribution: 41% entering, 59% exiting

Truck Trip Generation per Acre

Average Rate	Range of Rates	Standard Deviation
0.18	0.00 - 2.50	0.34

Data Plot and Equation



Manufacturing (140)

Truck Trip Ends vs: Acres

On a: **Weekday,**

AM Peak Hour of Generator

Setting/Location: General Urban/Suburban

Number of Studies: 17

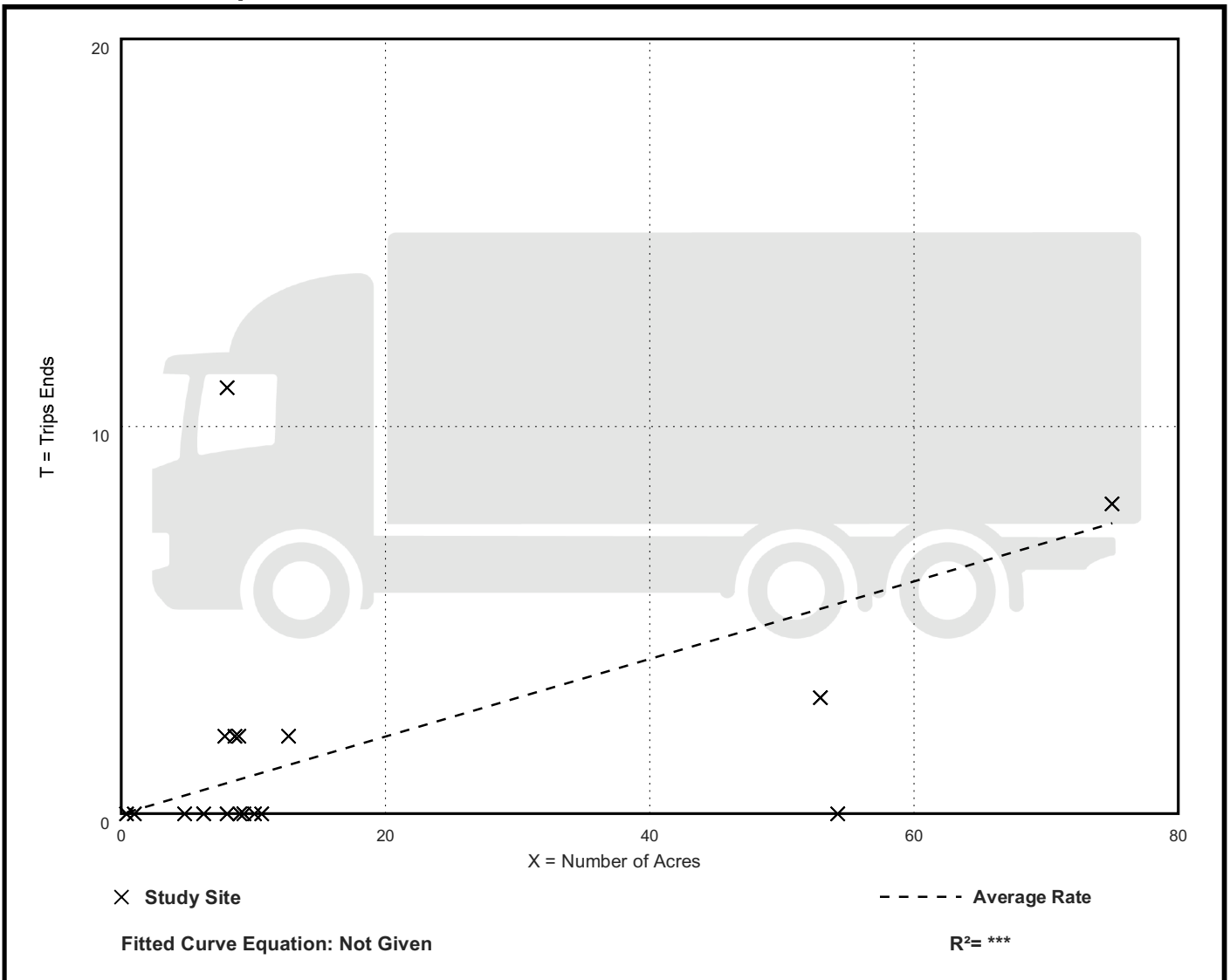
Avg. Num. of Acres: 17

Directional Distribution: 43% entering, 57% exiting

Truck Trip Generation per Acre

Average Rate	Range of Rates	Standard Deviation
0.10	0.00 - 1.38	0.23

Data Plot and Equation



Manufacturing (140)

Truck Trip Ends vs: Acres

On a: Weekday,

PM Peak Hour of Generator

Setting/Location: General Urban/Suburban

Number of Studies: 17

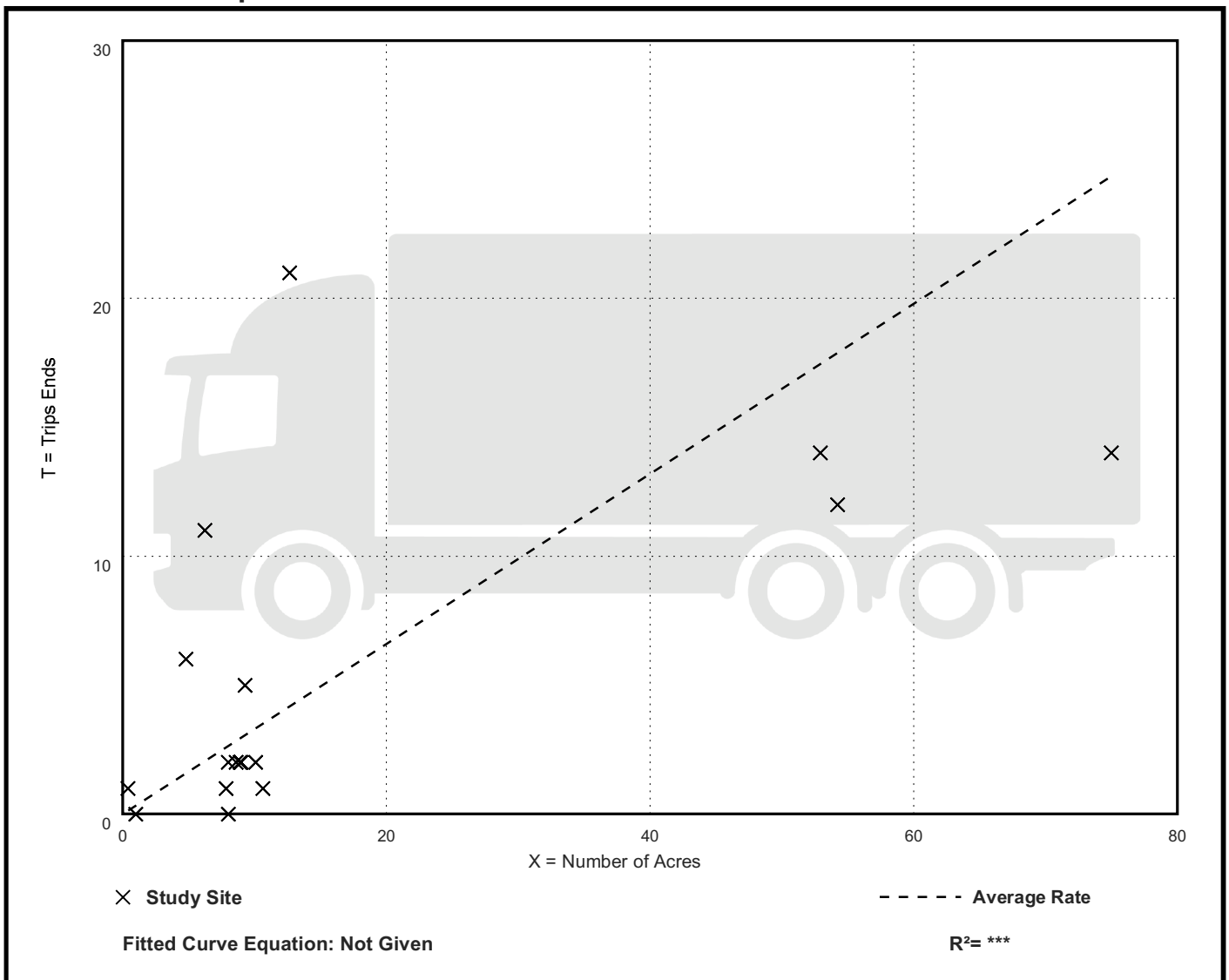
Avg. Num. of Acres: 17

Directional Distribution: 43% entering, 57% exiting

Truck Trip Generation per Acre

Average Rate	Range of Rates	Standard Deviation
0.33	0.00 - 2.50	0.41

Data Plot and Equation



Land Use: 150

Warehousing

Description

A warehouse is primarily devoted to the storage of materials, but it may also include office and maintenance areas. High-cube transload and short-term storage warehouse (Land Use 154), high-cube fulfillment center warehouse (Land Use 155), high-cube parcel hub warehouse (Land Use 156), and high-cube cold storage warehouse (Land Use 157) are related uses.

Additional Data

The technical appendices provide supporting information on time-of-day distributions for this land use. The appendices can be accessed through either the ITETripGen web app or the trip generation resource page on the ITE website (<https://www.ite.org/technical-resources/topics/trip-and-parking-generation/>).

The sites were surveyed in the 1980s, the 1990s, the 2000s, and the 2010s in California, Connecticut, Minnesota, New Jersey, New York, Ohio, Oregon, Pennsylvania, and Texas.

Source Numbers

184, 331, 406, 411, 443, 579, 583, 596, 598, 611, 619, 642, 752, 869, 875, 876, 914, 940, 1050

Warehousing (150)

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

Setting/Location: General Urban/Suburban

Number of Studies: 31

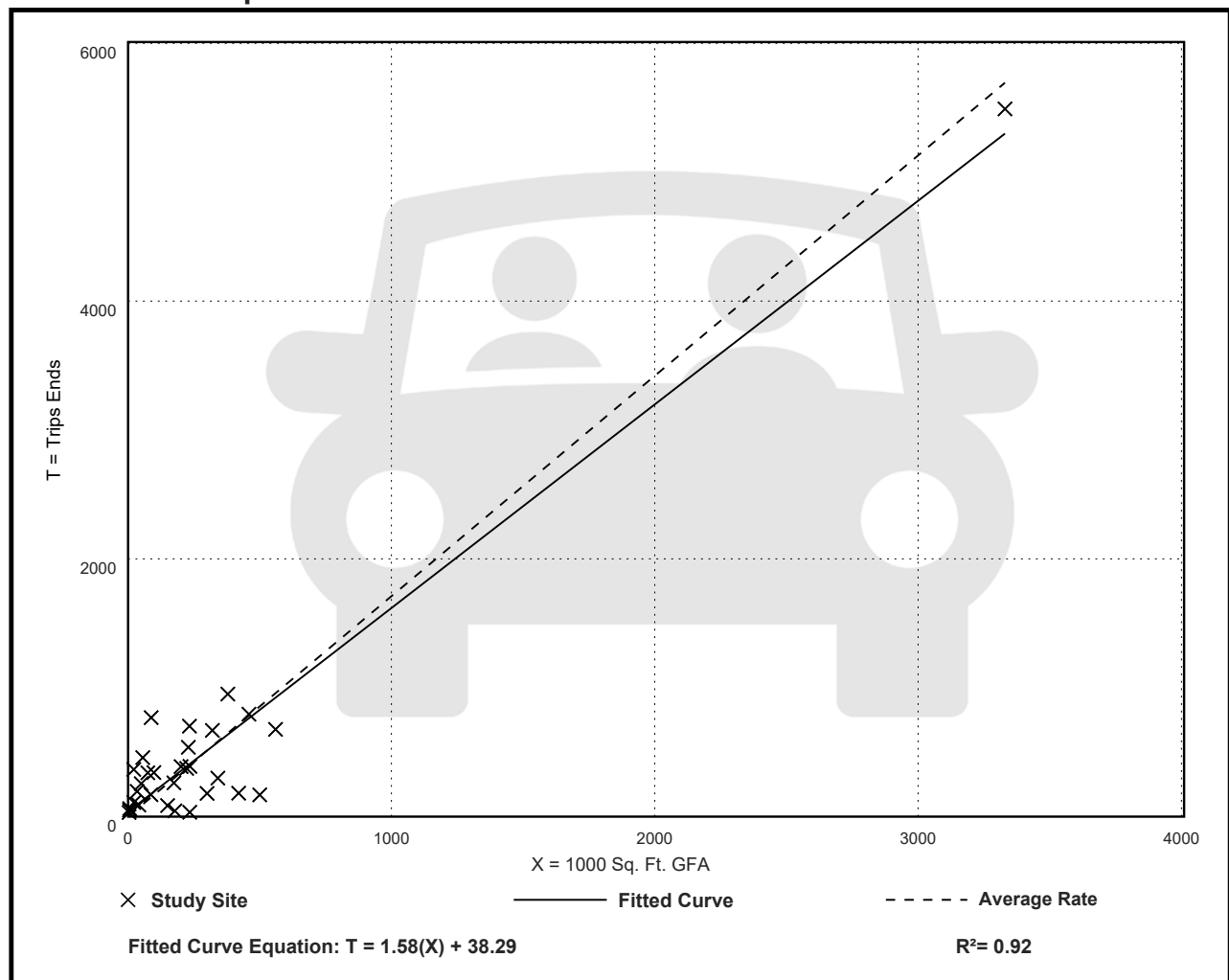
Avg. 1000 Sq. Ft. GFA: 292

Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
1.71	0.15 - 16.93	1.48

Data Plot and Equation



Warehousing (150)

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: 36

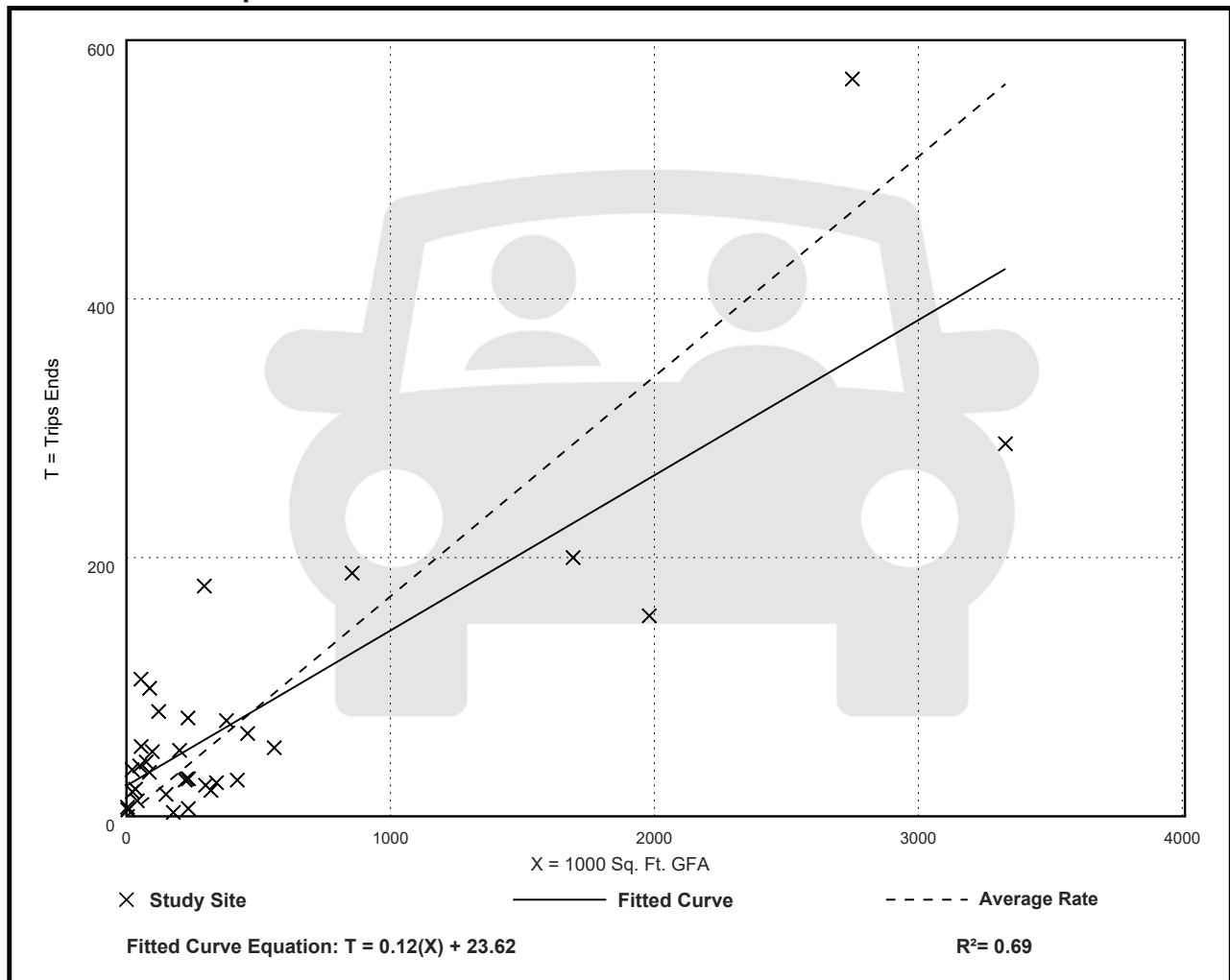
Avg. 1000 Sq. Ft. GFA: 448

Directional Distribution: 77% entering, 23% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
0.17	0.02 - 1.93	0.19

Data Plot and Equation



Warehousing (150)

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: 49

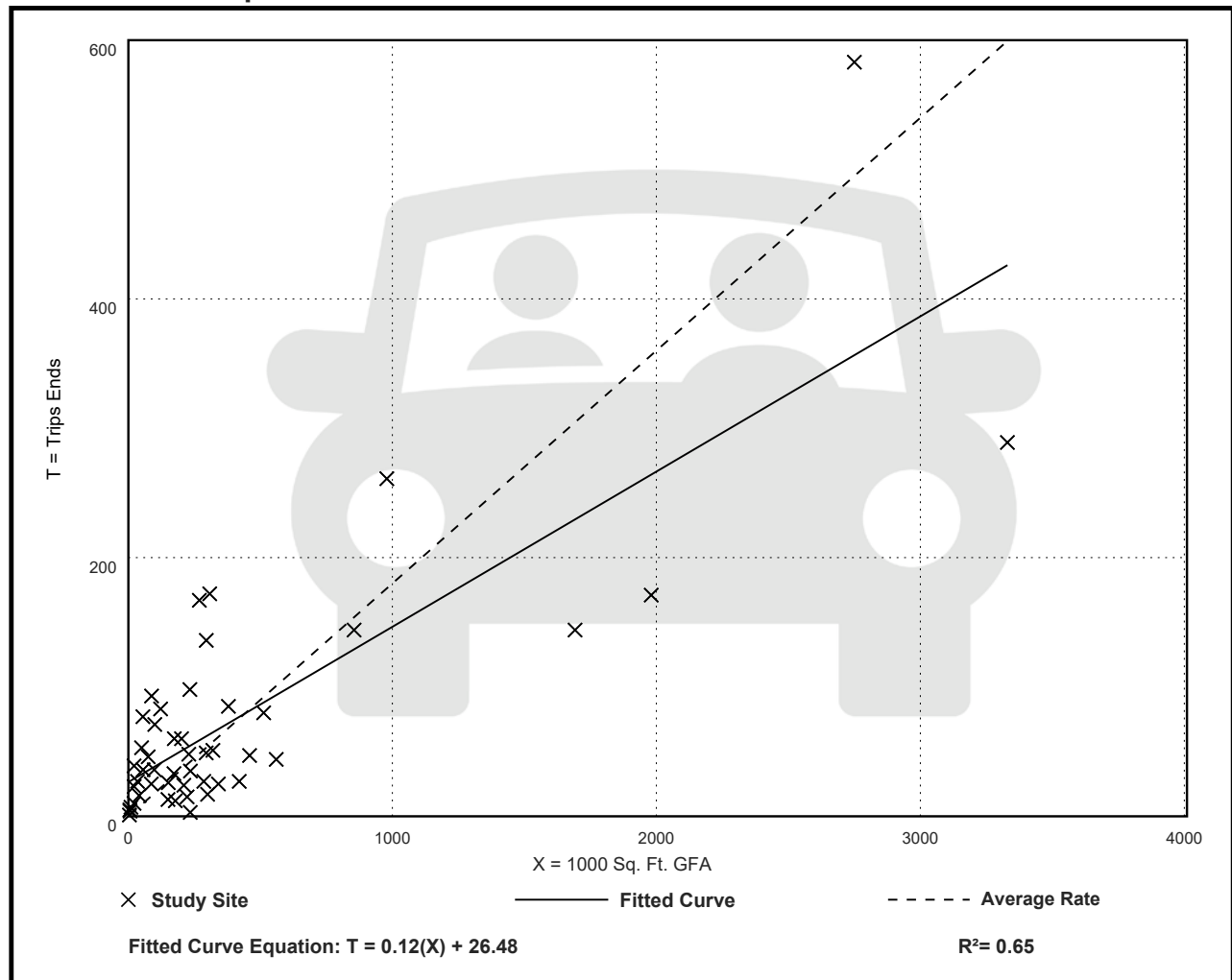
Avg. 1000 Sq. Ft. GFA: 400

Directional Distribution: 28% entering, 72% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
0.18	0.01 - 1.80	0.18

Data Plot and Equation



Warehousing (150)

Vehicle Trip Ends vs: 1000 Sq. Ft. GFA

On a: Weekday,

AM Peak Hour of Generator

Setting/Location: General Urban/Suburban

Number of Studies: 25

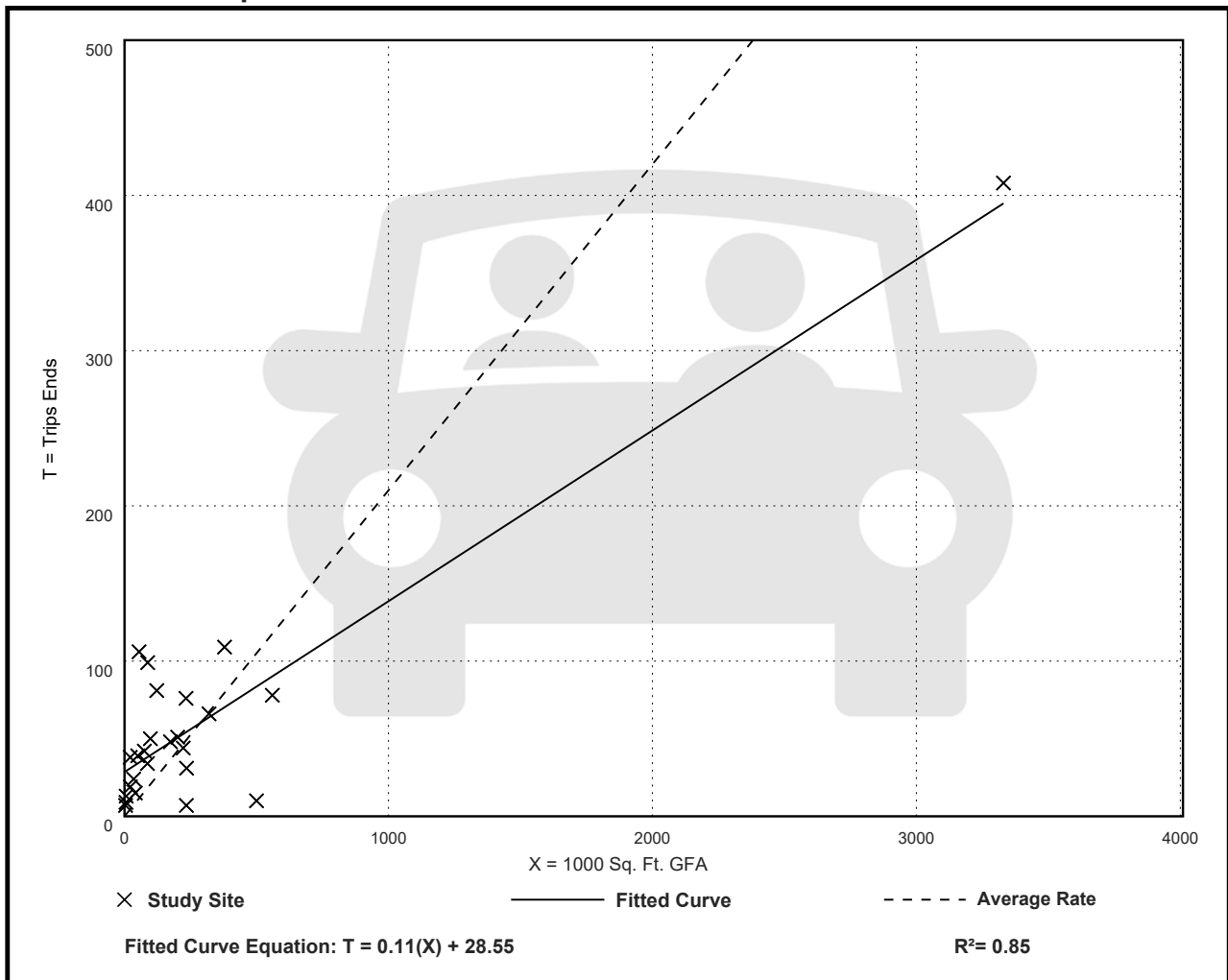
Avg. 1000 Sq. Ft. GFA: 284

Directional Distribution: 66% entering, 34% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
0.21	0.02 - 2.08	0.26

Data Plot and Equation



Warehousing (150)

Vehicle Trip Ends vs: 1000 Sq. Ft. GFA

On a: Weekday,

PM Peak Hour of Generator

Setting/Location: General Urban/Suburban

Number of Studies: 27

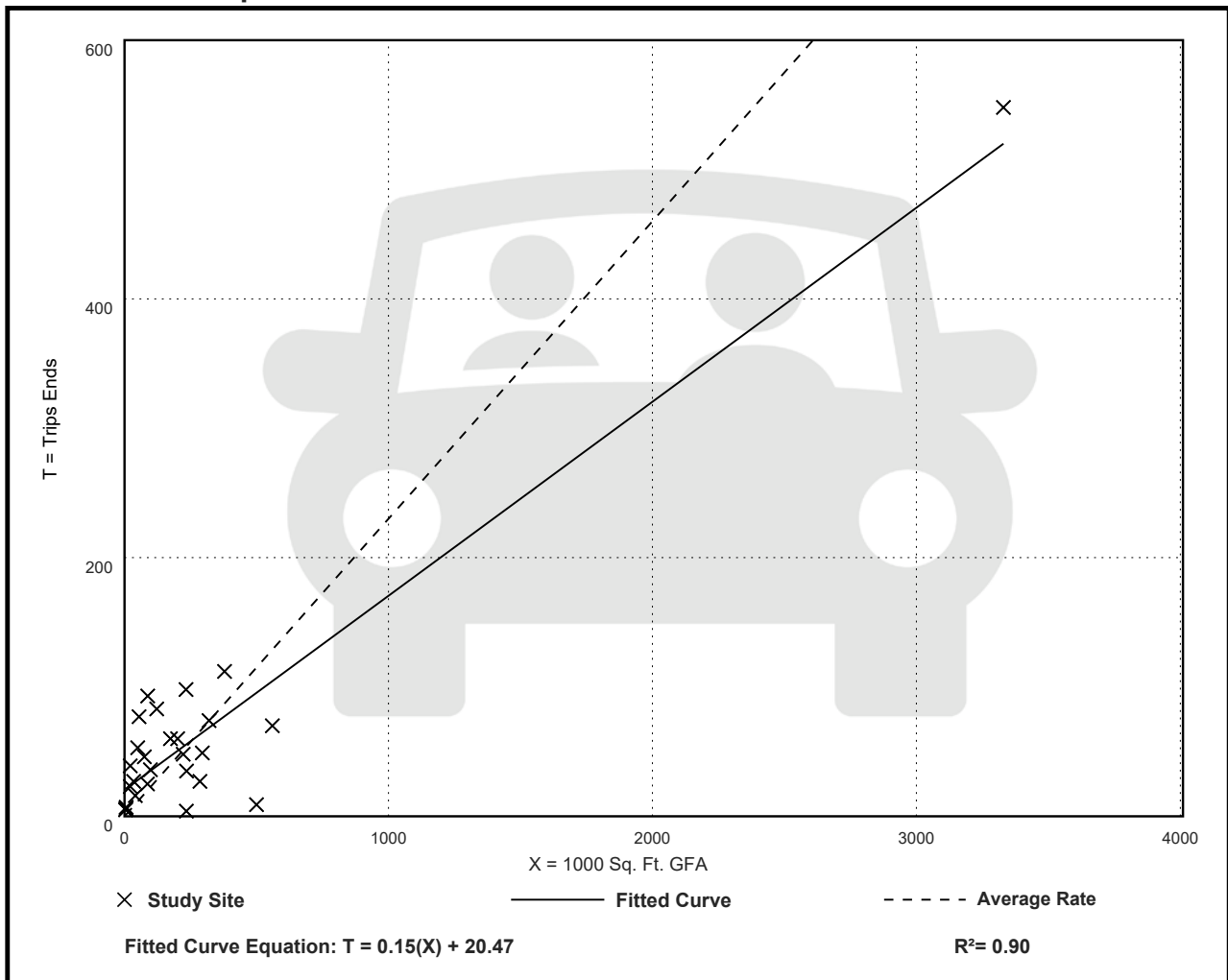
Avg. 1000 Sq. Ft. GFA: 284

Directional Distribution: 24% entering, 76% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
0.23	0.02 - 1.80	0.23

Data Plot and Equation



Warehousing (150)

Vehicle Trip Ends vs: 1000 Sq. Ft. GFA

On a: Saturday

Setting/Location: General Urban/Suburban

Number of Studies: 3

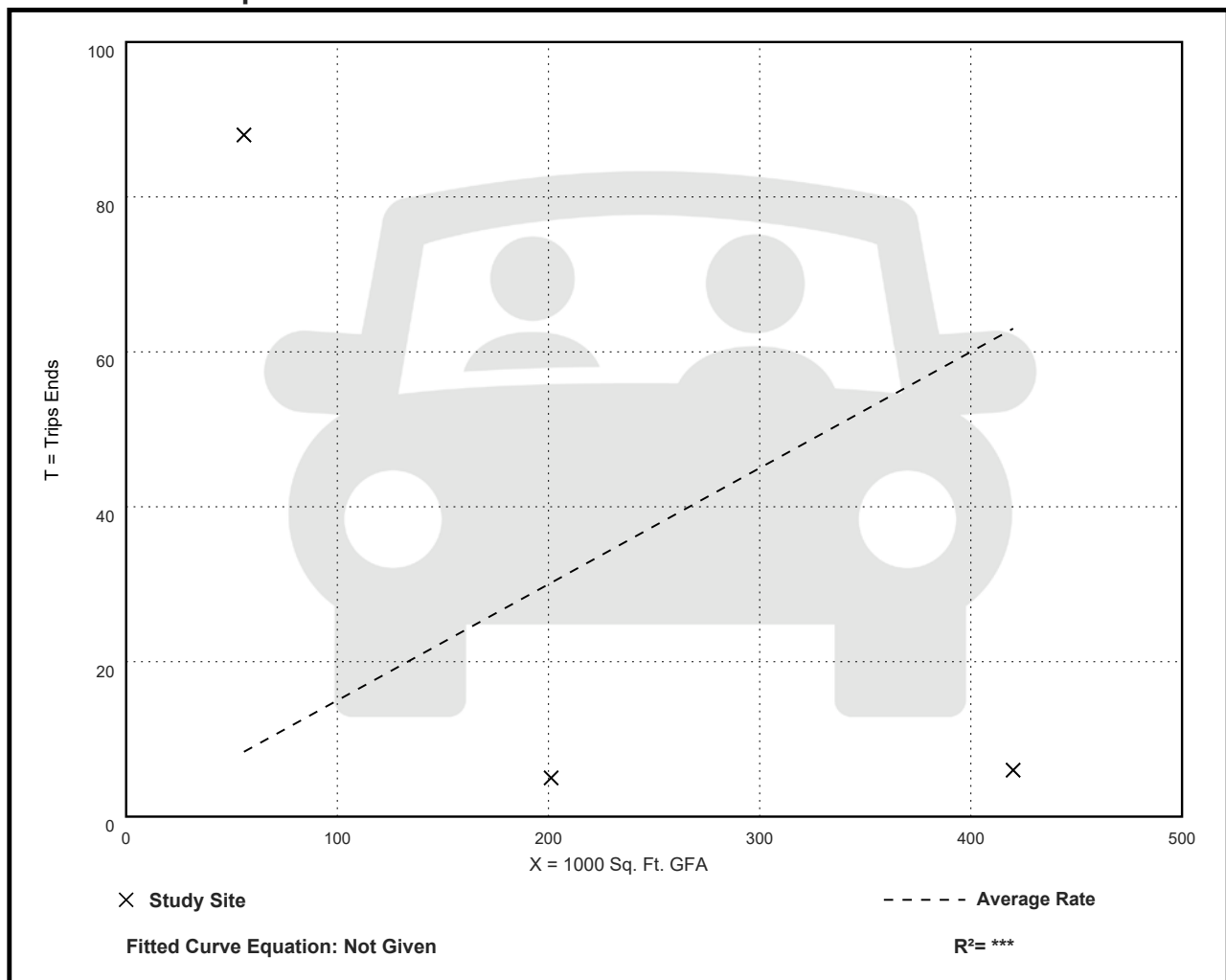
Avg. 1000 Sq. Ft. GFA: 226

Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
0.15	0.01 - 1.58	0.53

Data Plot and Equation



Warehousing (150)

Vehicle Trip Ends vs: 1000 Sq. Ft. GFA

On a: Saturday, Peak Hour of Generator

Setting/Location: General Urban/Suburban

Number of Studies: 2

Avg. 1000 Sq. Ft. GFA: 129

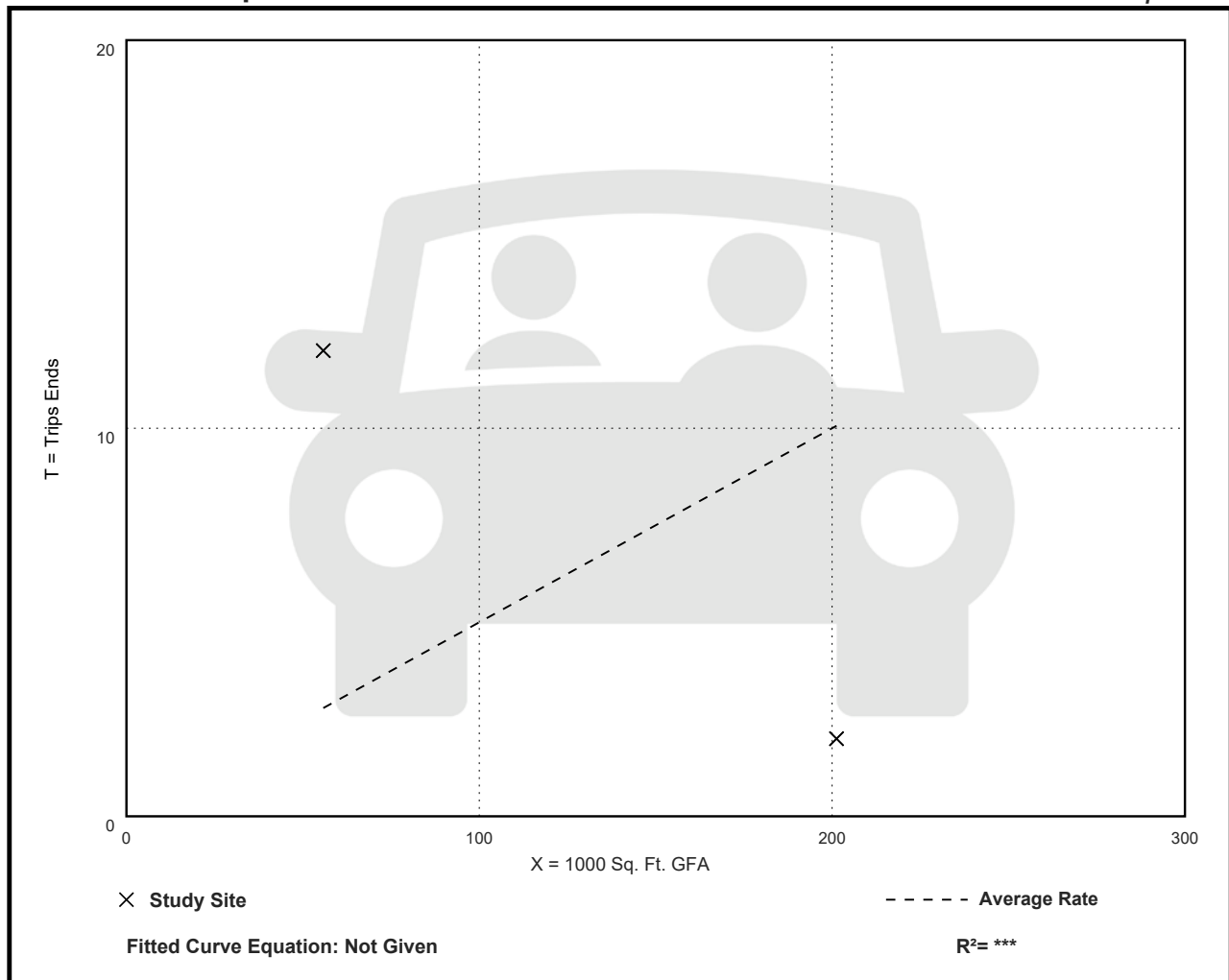
Directional Distribution: 64% entering, 36% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
0.05	0.01 - 0.22	***

Data Plot and Equation

Caution – Small Sample Size



Warehousing (150)

Vehicle Trip Ends vs: 1000 Sq. Ft. GFA

On a: Sunday

Setting/Location: General Urban/Suburban

Number of Studies: 3

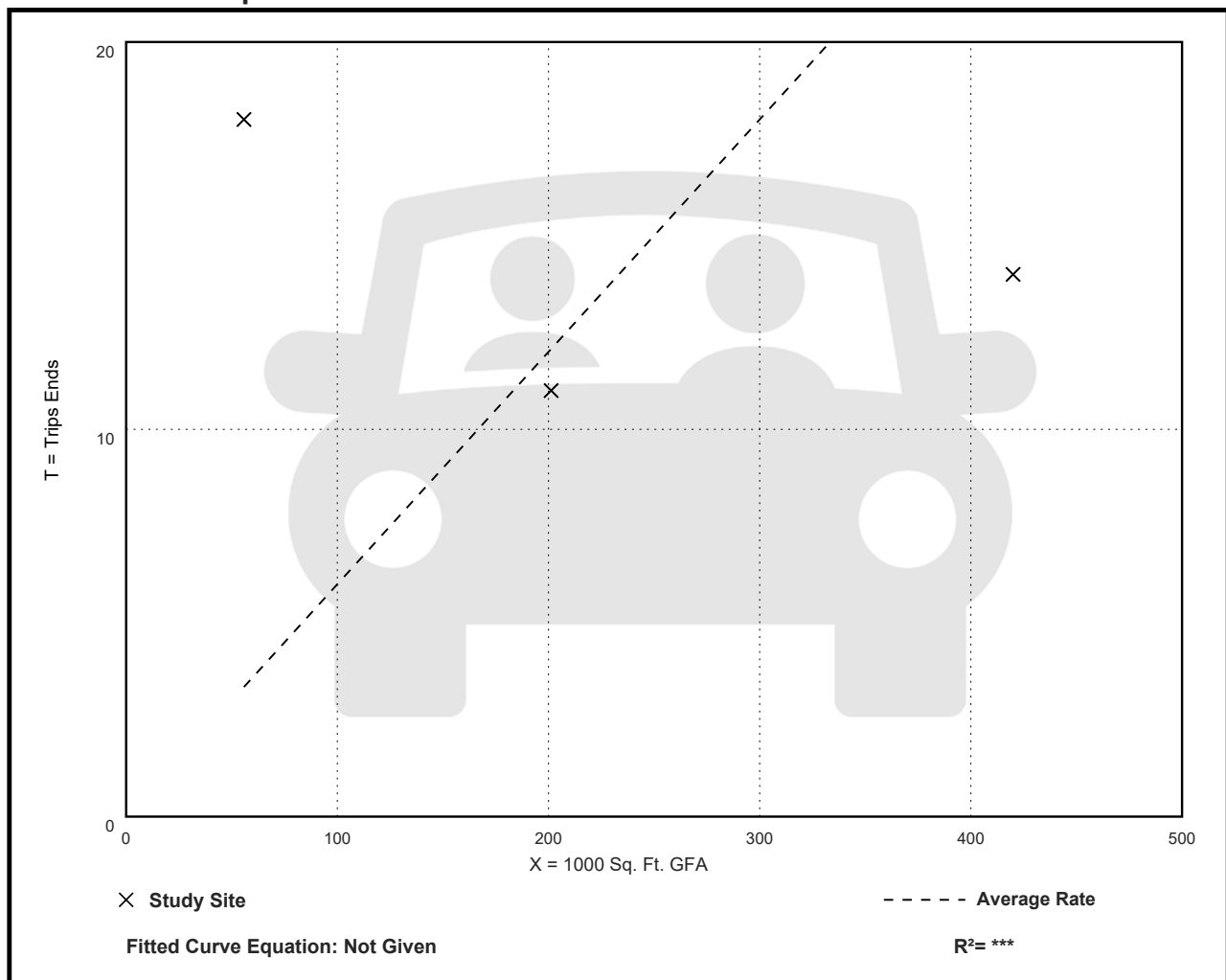
Avg. 1000 Sq. Ft. GFA: 226

Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
0.06	0.03 - 0.32	0.10

Data Plot and Equation



Warehousing (150)

Vehicle Trip Ends vs: 1000 Sq. Ft. GFA

On a: Sunday, Peak Hour of Generator

Setting/Location: General Urban/Suburban

Number of Studies: 2

Avg. 1000 Sq. Ft. GFA: 129

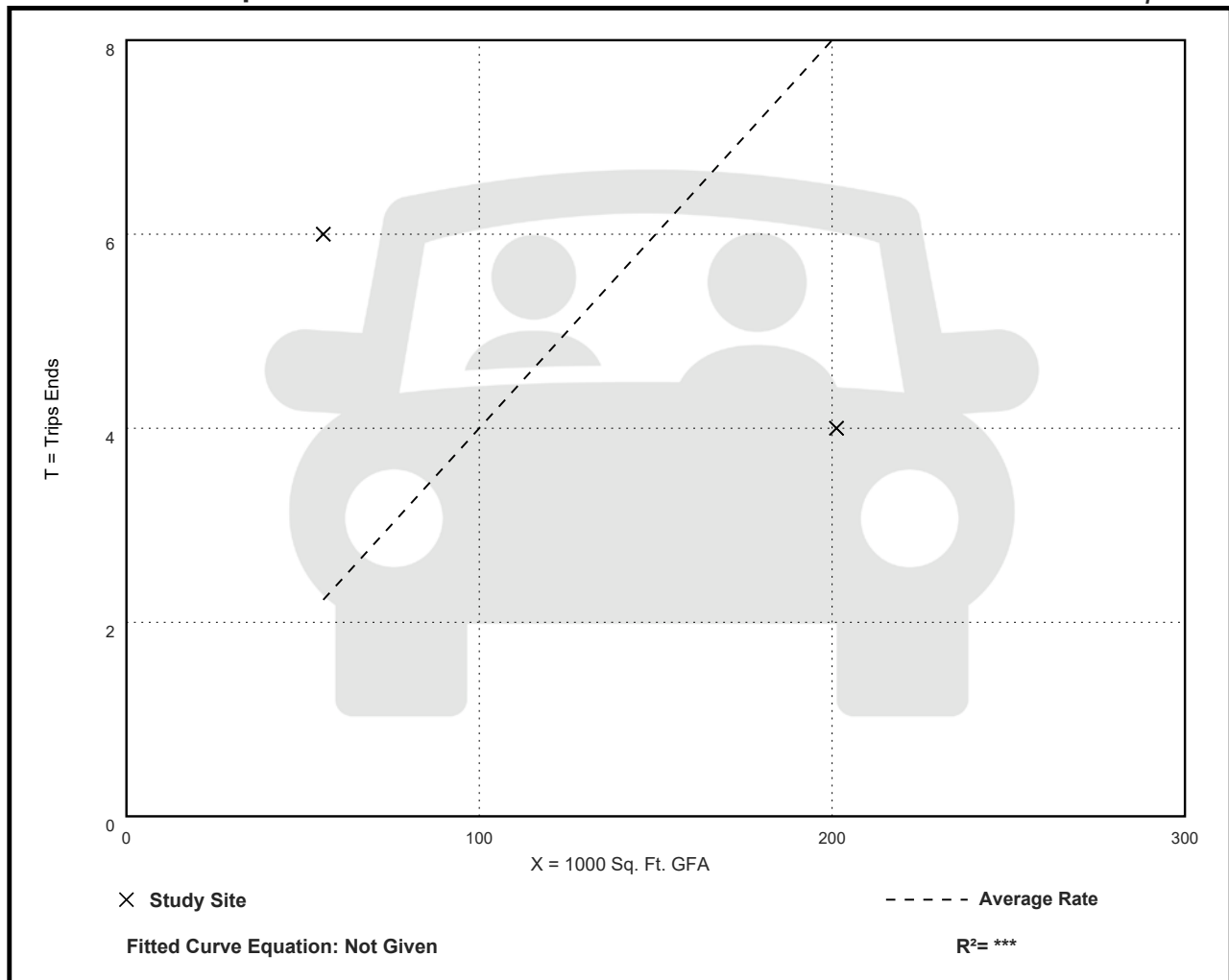
Directional Distribution: 52% entering, 48% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
0.04	0.02 - 0.11	***

Data Plot and Equation

Caution – Small Sample Size



Warehousing (150)

Vehicle Trip Ends vs: Employees
On a: Weekday

Setting/Location: General Urban/Suburban

Number of Studies: 14

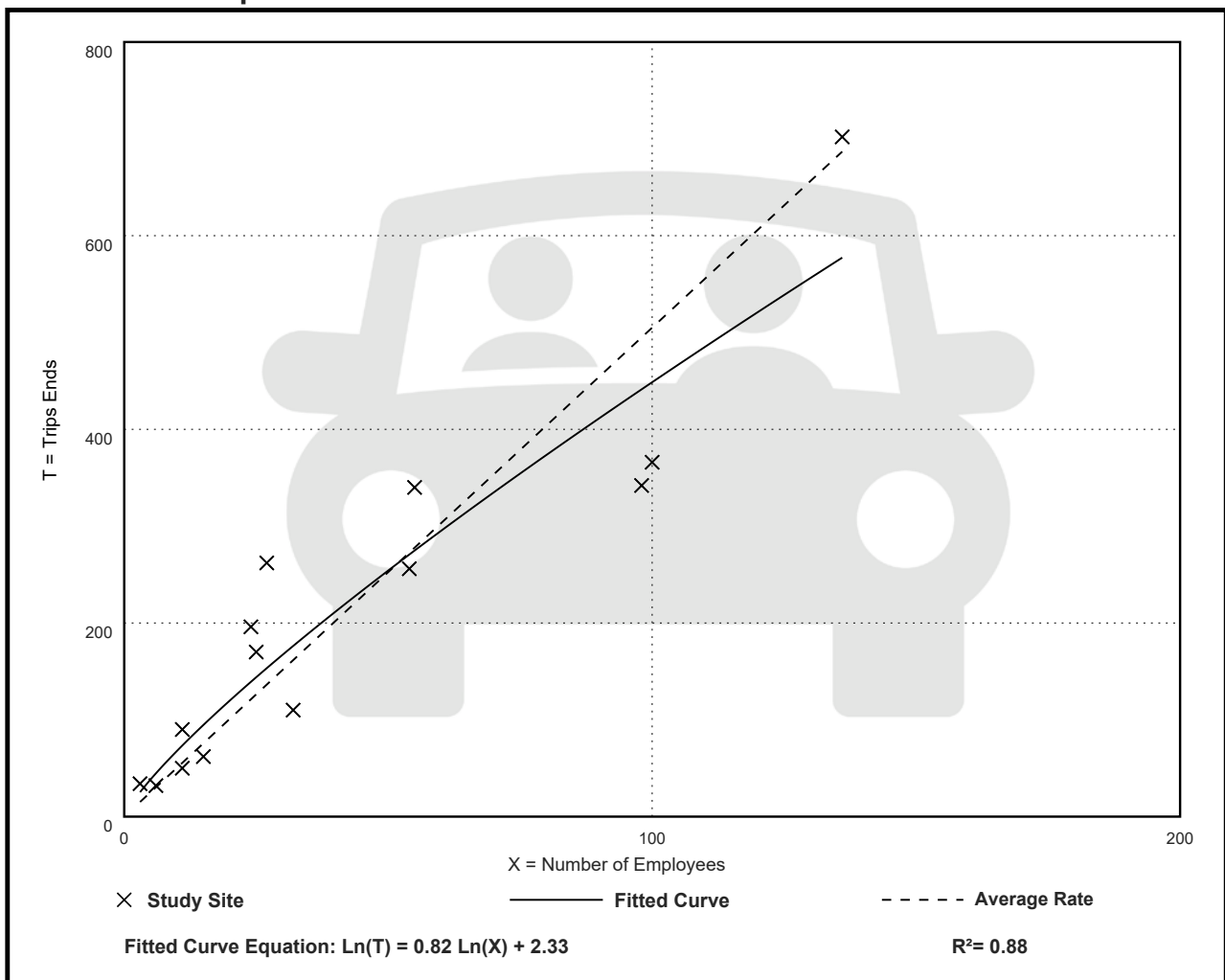
Avg. Num. of Employees: 43

Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per Employee

Average Rate	Range of Rates	Standard Deviation
5.05	3.44 - 11.33	1.77

Data Plot and Equation



Warehousing (150)

Vehicle Trip Ends vs: Employees

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: 14

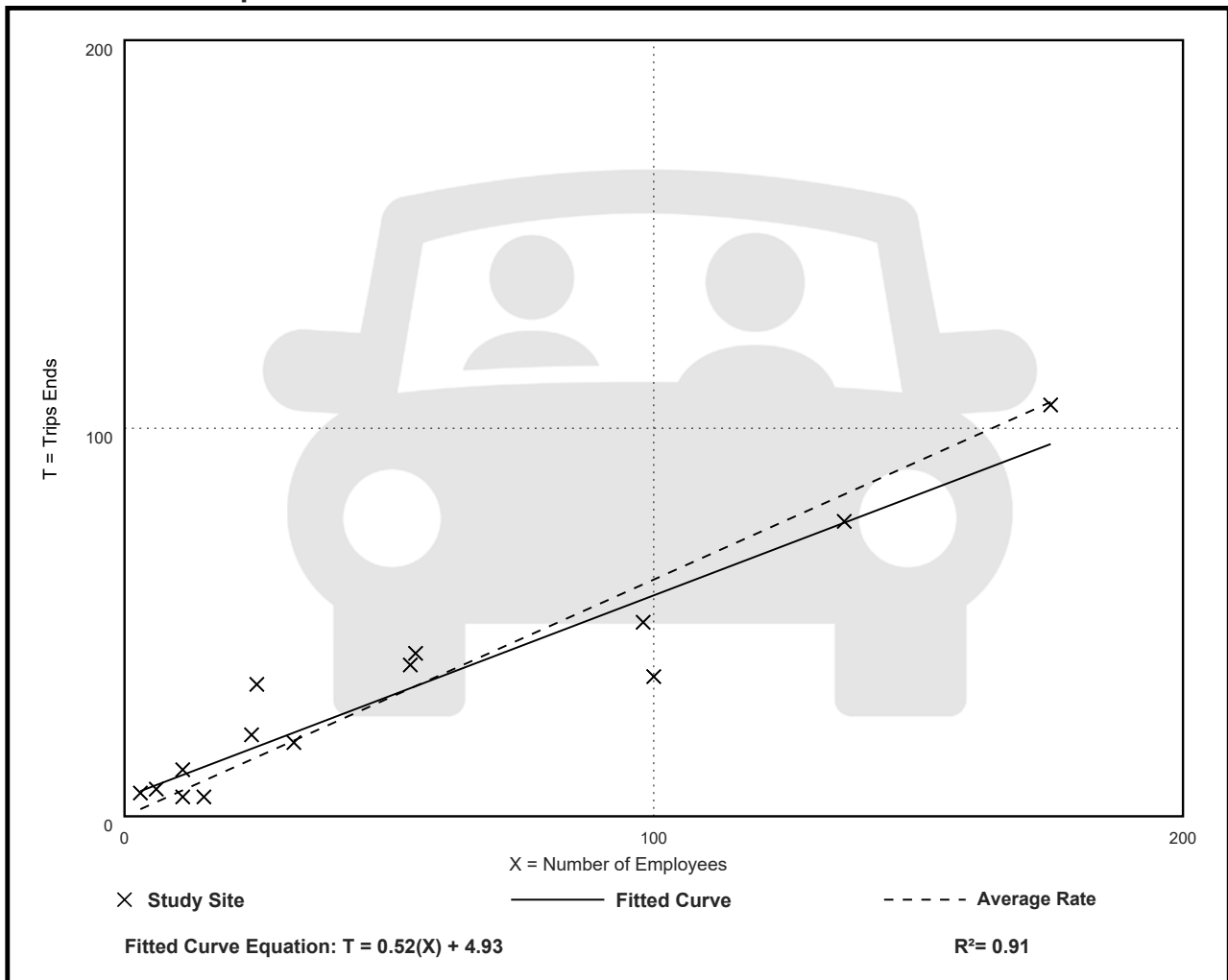
Avg. Num. of Employees: 53

Directional Distribution: 72% entering, 28% exiting

Vehicle Trip Generation per Employee

Average Rate	Range of Rates	Standard Deviation
0.61	0.33 - 2.00	0.23

Data Plot and Equation



Warehousing (150)

Vehicle Trip Ends vs: Employees

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: 15

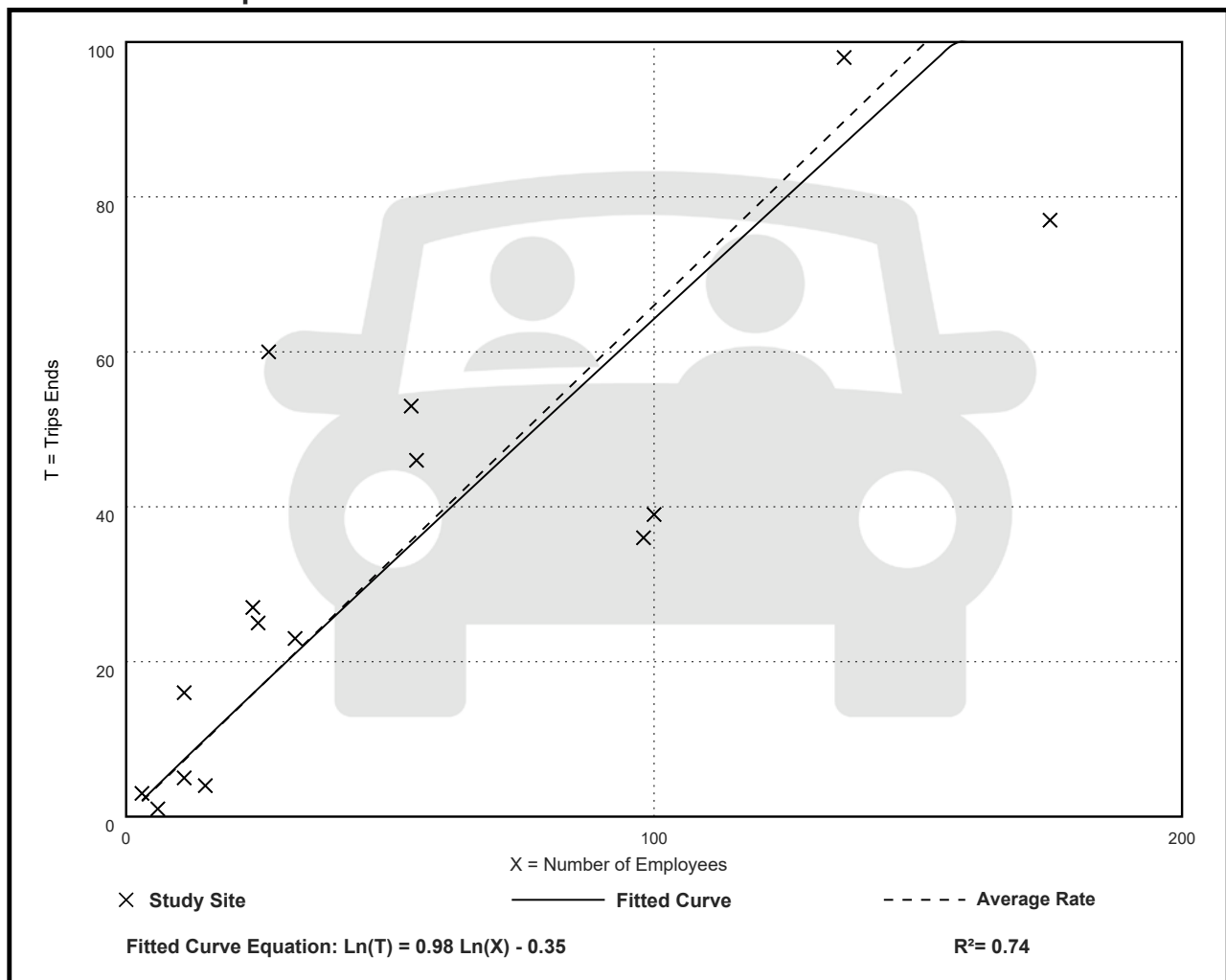
Avg. Num. of Employees: 51

Directional Distribution: 36% entering, 64% exiting

Vehicle Trip Generation per Employee

Average Rate	Range of Rates	Standard Deviation
0.66	0.17 - 2.22	0.40

Data Plot and Equation



Warehousing (150)

Vehicle Trip Ends vs: Employees

On a: Weekday,

AM Peak Hour of Generator

Setting/Location: General Urban/Suburban

Number of Studies: 15

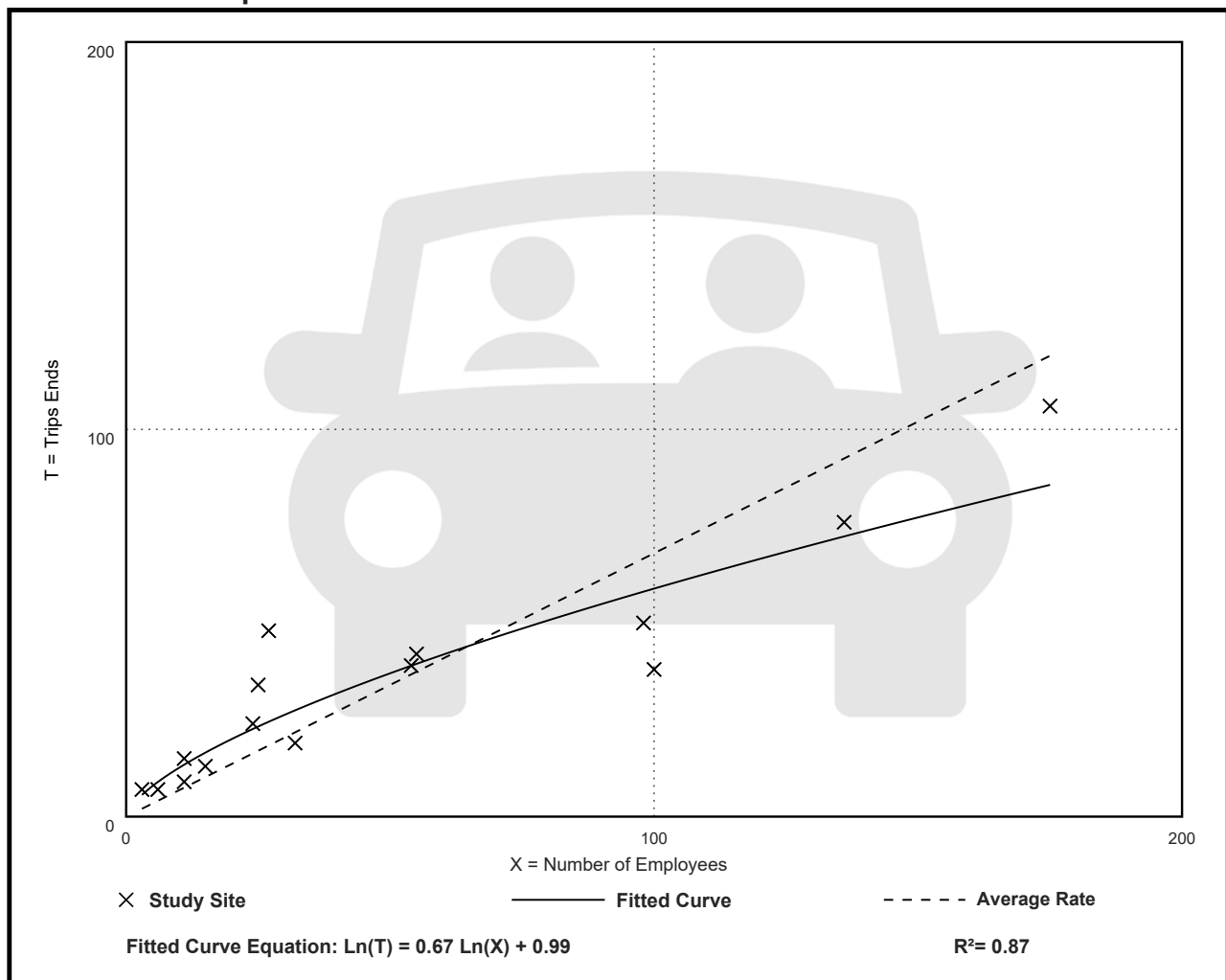
Avg. Num. of Employees: 51

Directional Distribution: 53% entering, 47% exiting

Vehicle Trip Generation per Employee

Average Rate	Range of Rates	Standard Deviation
0.68	0.38 - 2.33	0.33

Data Plot and Equation



Warehousing (150)

Vehicle Trip Ends vs: Employees

On a: Weekday,

PM Peak Hour of Generator

Setting/Location: General Urban/Suburban

Number of Studies: 15

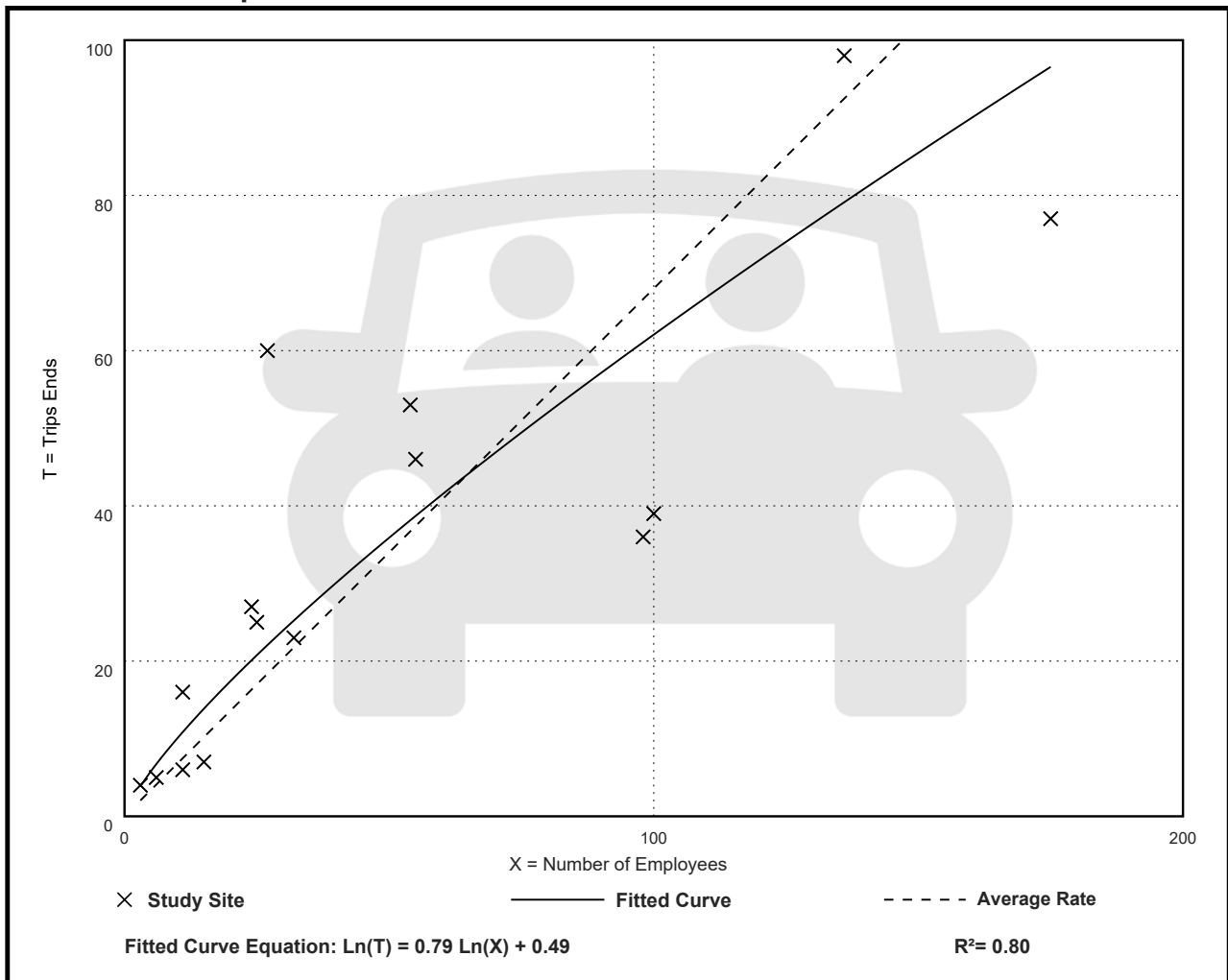
Avg. Num. of Employees: 51

Directional Distribution: 28% entering, 72% exiting

Vehicle Trip Generation per Employee

Average Rate	Range of Rates	Standard Deviation
0.68	0.37 - 2.22	0.40

Data Plot and Equation



Warehousing (150)

Truck Trip Ends vs: 1000 Sq. Ft. GFA

On a: Weekday

Setting/Location: General Urban/Suburban

Number of Studies: 12

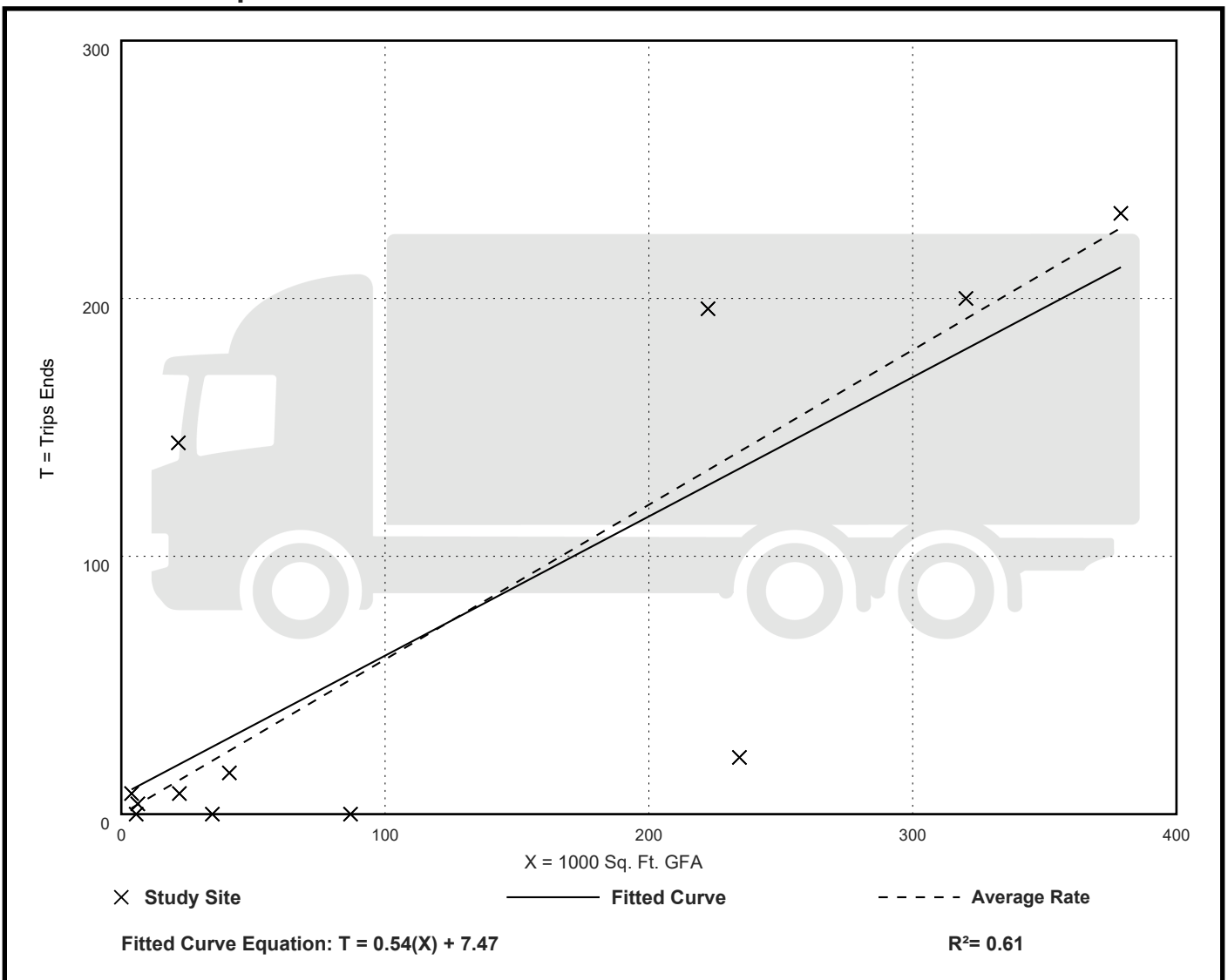
Avg. 1000 Sq. Ft. GFA: 115

Directional Distribution: 50% entering, 50% exiting

Truck Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
0.60	0.00 - 6.66	0.86

Data Plot and Equation



Warehousing (150)

Truck 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: 21

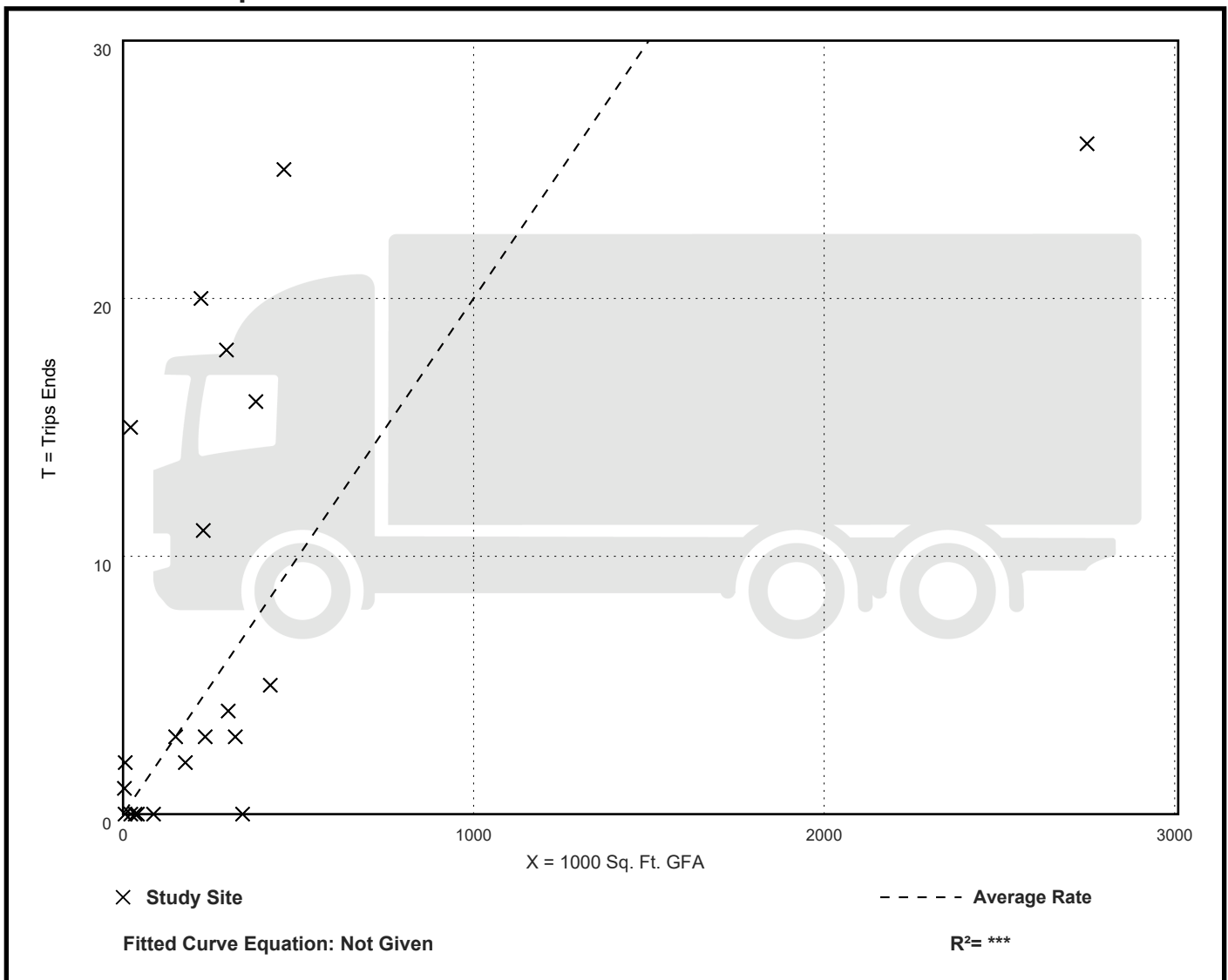
Avg. 1000 Sq. Ft. GFA: 309

Directional Distribution: 52% entering, 48% exiting

Truck Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
0.02	0.00 - 0.69	0.05

Data Plot and Equation



Warehousing (150)

Truck 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: 23

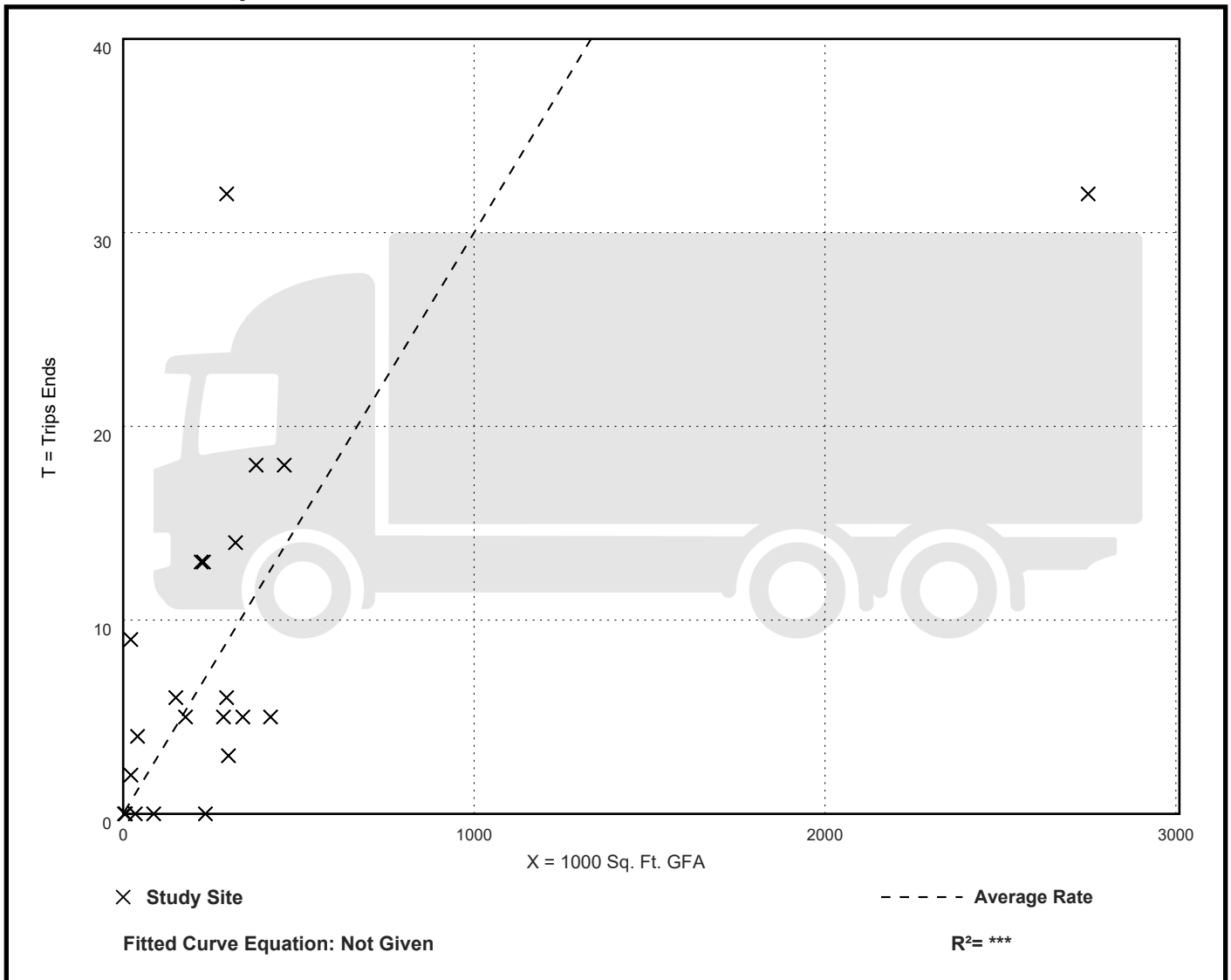
Avg. 1000 Sq. Ft. GFA: 308

Directional Distribution: 52% entering, 48% exiting

Truck Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
0.03	0.00 - 0.42	0.03

Data Plot and Equation



Warehousing (150)

Truck Trip Ends vs: 1000 Sq. Ft. GFA

On a: Weekday,
AM Peak Hour of Generator

Setting/Location: General Urban/Suburban

Number of Studies: 12

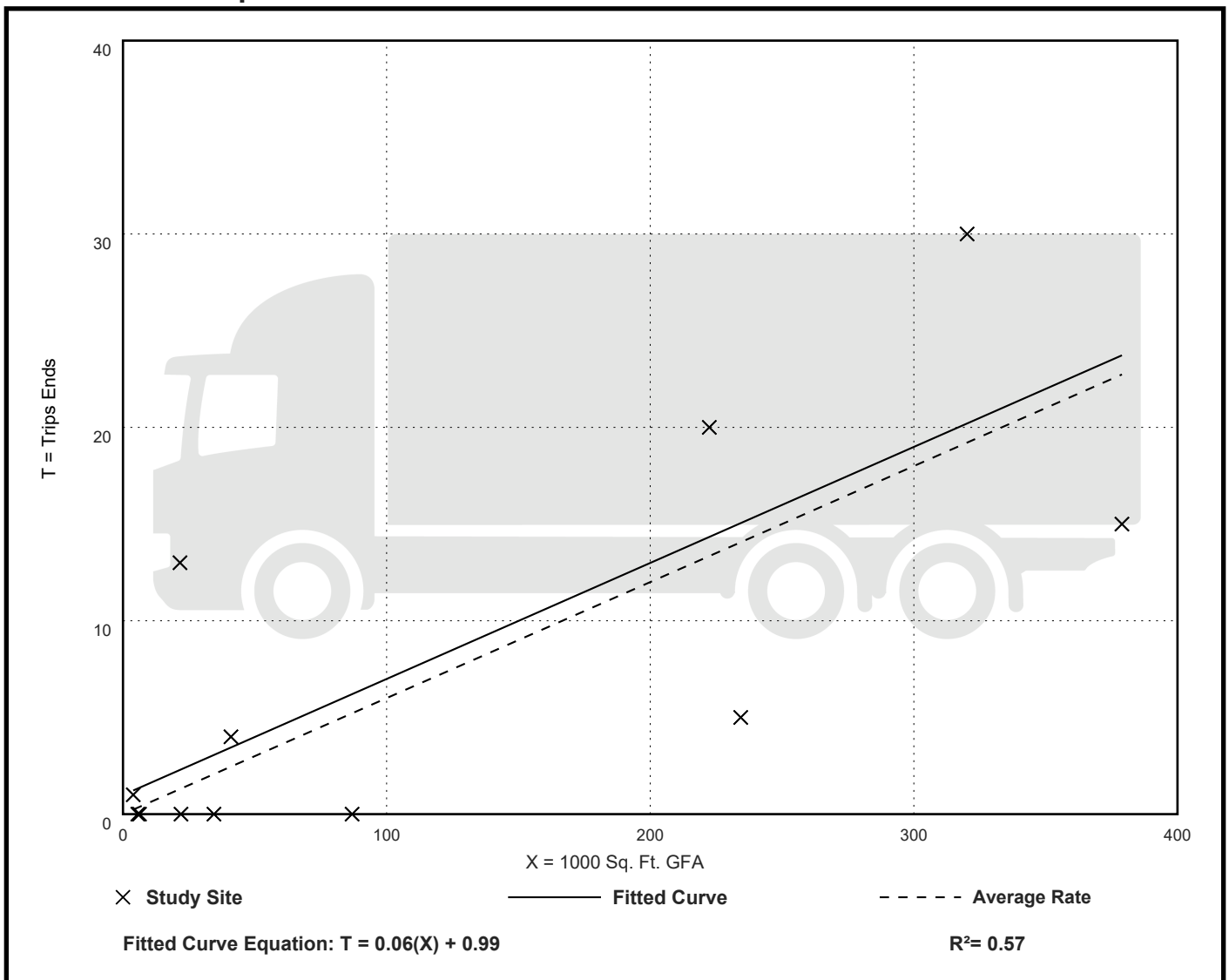
Avg. 1000 Sq. Ft. GFA: 115

Directional Distribution: 35% entering, 65% exiting

Truck Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
0.06	0.00 - 0.60	0.08

Data Plot and Equation



Warehousing (150)

Truck Trip Ends vs: 1000 Sq. Ft. GFA

On a: Weekday,
PM Peak Hour of Generator

Setting/Location: General Urban/Suburban

Number of Studies: 12

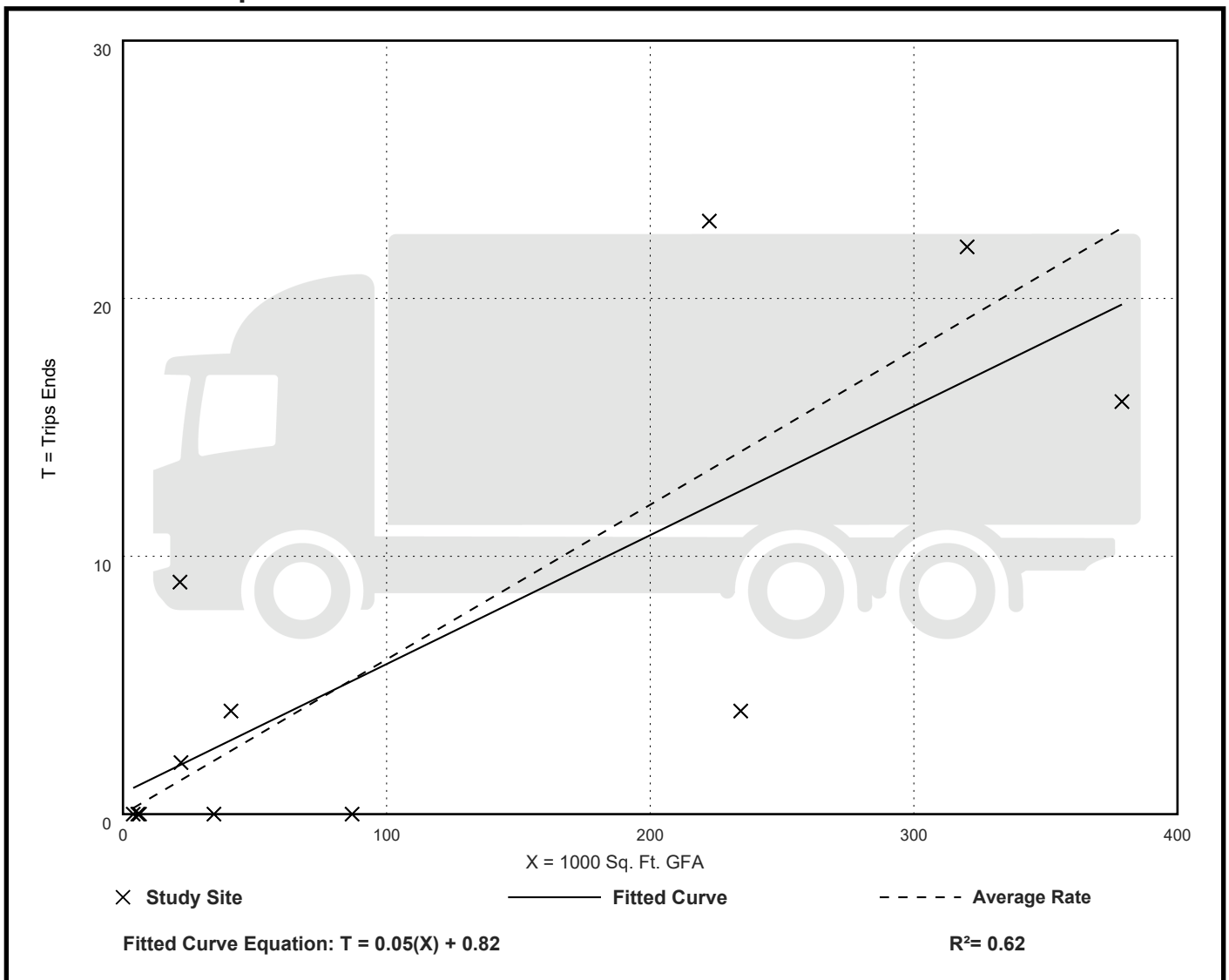
Avg. 1000 Sq. Ft. GFA: 115

Directional Distribution: 53% entering, 47% exiting

Truck Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
0.06	0.00 - 0.42	0.06

Data Plot and Equation



Warehousing (150)

Truck Trip Ends vs: Employees
On a: Weekday

Setting/Location: General Urban/Suburban

Number of Studies: 9

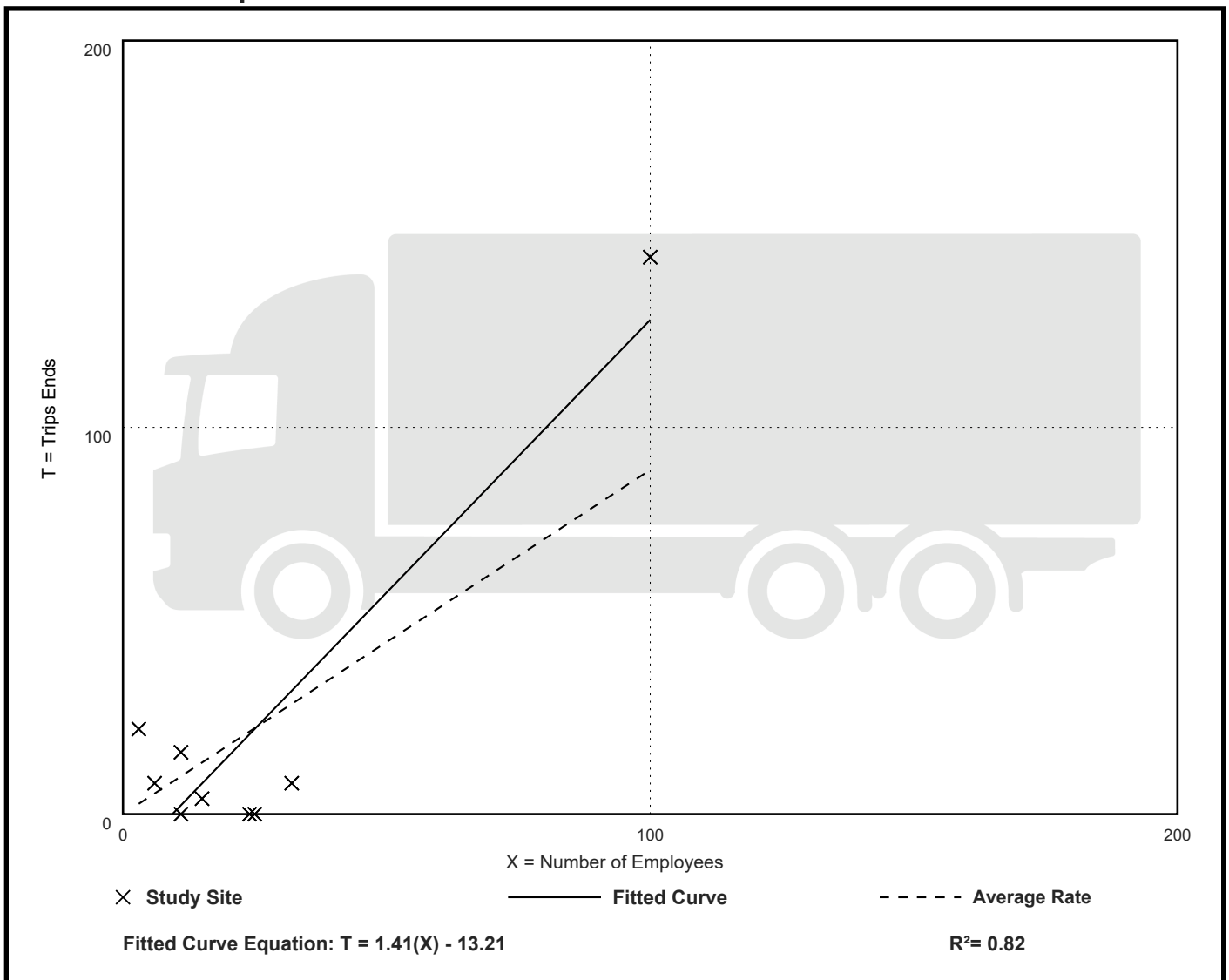
Avg. Num. of Employees: 25

Directional Distribution: 50% entering, 50% exiting

Truck Trip Generation per Employee

Average Rate	Range of Rates	Standard Deviation
0.89	0.00 - 7.33	1.06

Data Plot and Equation



Warehousing (150)

Truck Trip Ends vs: Employees

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: 9

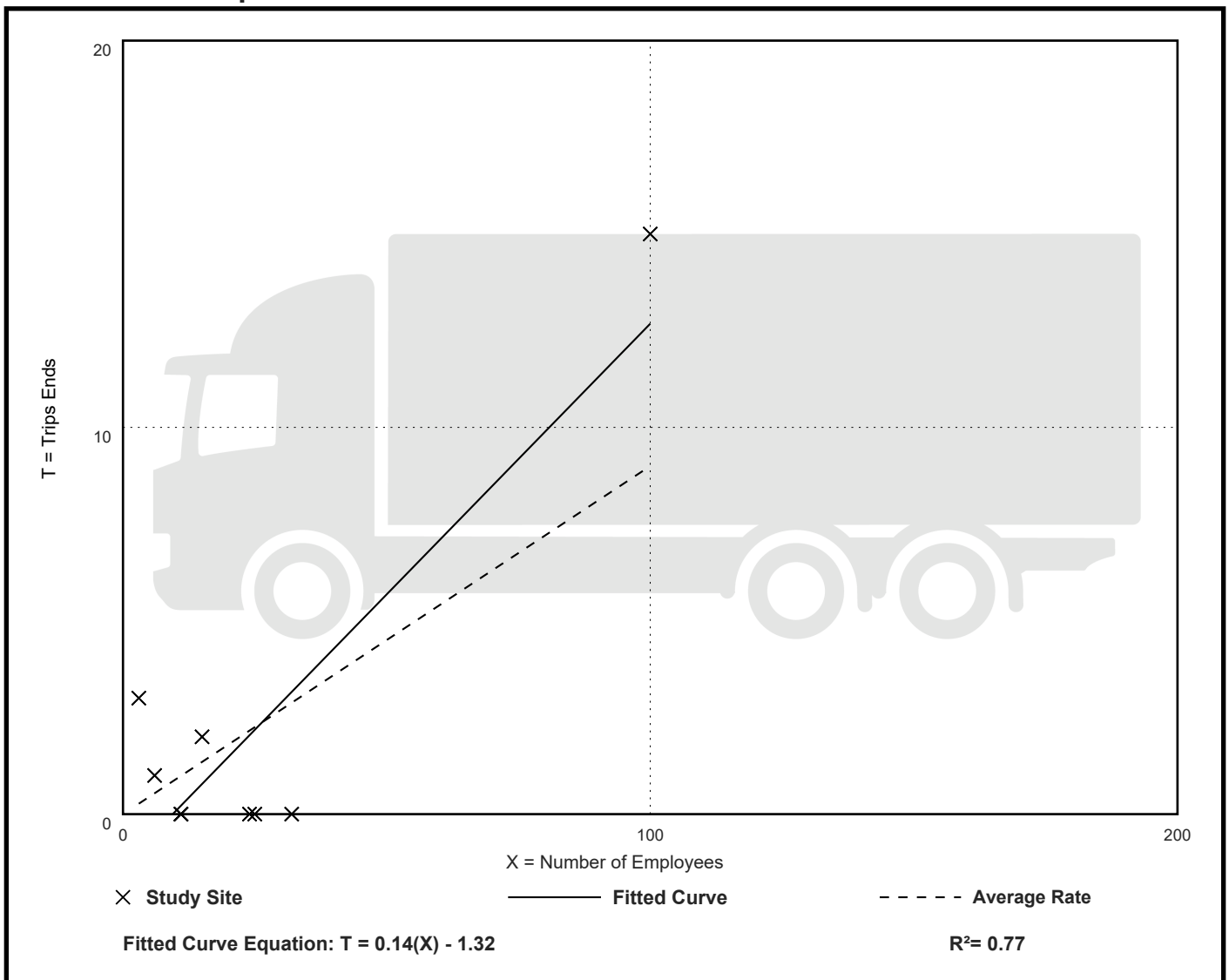
Avg. Num. of Employees: 25

Directional Distribution: 33% entering, 67% exiting

Truck Trip Generation per Employee

Average Rate	Range of Rates	Standard Deviation
0.09	0.00 - 1.00	0.14

Data Plot and Equation



Warehousing (150)

Truck Trip Ends vs: Employees

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: 9

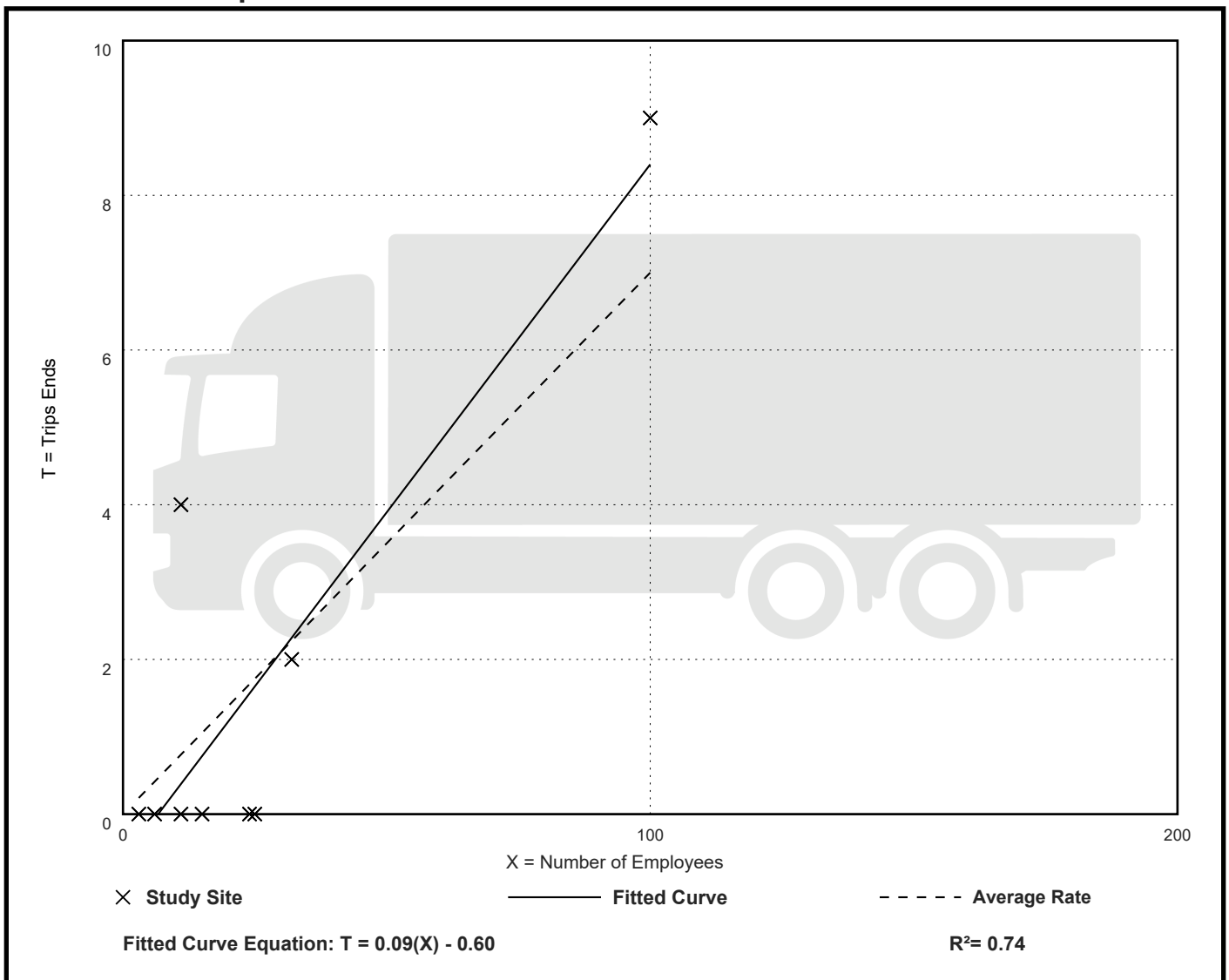
Avg. Num. of Employees: 25

Directional Distribution: 53% entering, 47% exiting

Truck Trip Generation per Employee

Average Rate	Range of Rates	Standard Deviation
0.07	0.00 - 0.36	0.08

Data Plot and Equation



Warehousing (150)

Truck Trip Ends vs: Employees

On a: Weekday,

AM Peak Hour of Generator

Setting/Location: General Urban/Suburban

Number of Studies: 9

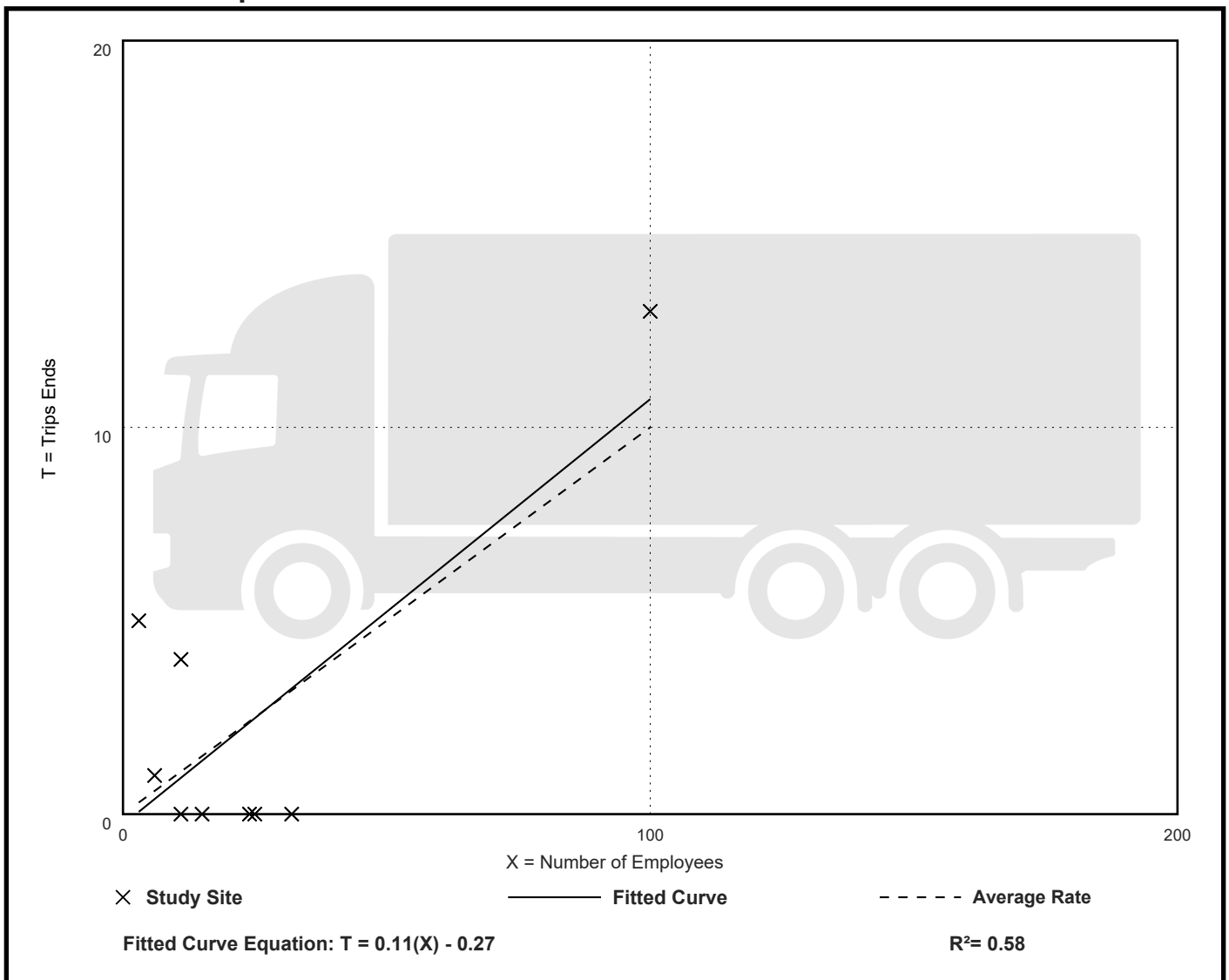
Avg. Num. of Employees: 25

Directional Distribution: 35% entering, 65% exiting

Truck Trip Generation per Employee

Average Rate	Range of Rates	Standard Deviation
0.10	0.00 - 1.67	0.21

Data Plot and Equation



Warehousing (150)

Truck Trip Ends vs: Employees

On a: Weekday,
PM Peak Hour of Generator

Setting/Location: General Urban/Suburban

Number of Studies: 9

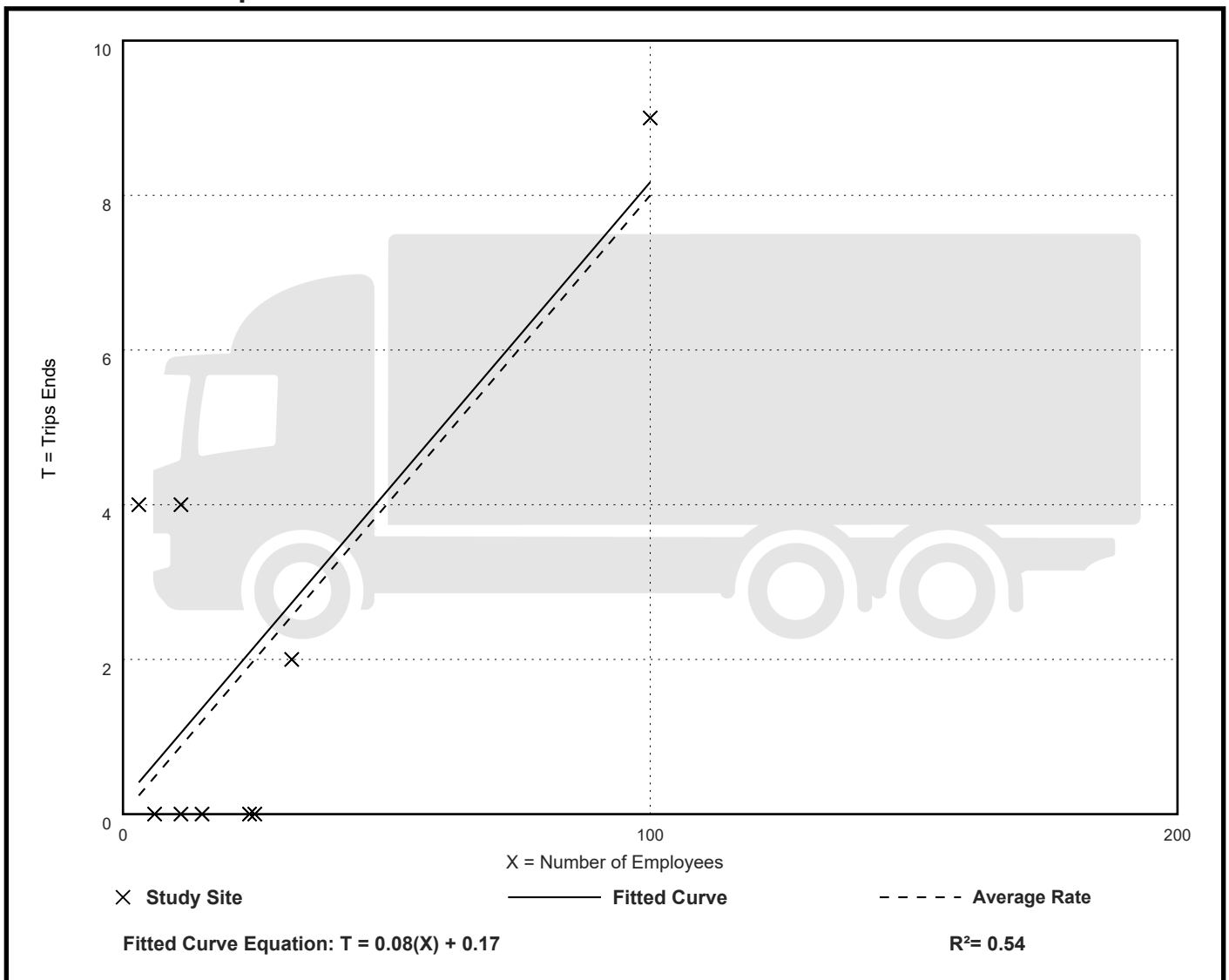
Avg. Num. of Employees: 25

Directional Distribution: 53% entering, 47% exiting

Truck Trip Generation per Employee

Average Rate	Range of Rates	Standard Deviation
0.08	0.00 - 1.33	0.17

Data Plot and Equation



Land Use: 154

High-Cube Transload and Short-Term Storage Warehouse

Description

A high-cube warehouse (HCW) is a building that typically has at least 200,000 gross square feet of floor area, has a ceiling height of 24 feet or more, and is used primarily for the storage and/or consolidation of manufactured goods (and to a lesser extent, raw materials) prior to their distribution to retail locations or other warehouses. A typical HCW has a high level of on-site automation and logistics management. The automation and logistics enable highly-efficient processing of goods through the HCW. A high-cube warehouse can be free-standing or located in an industrial park.

The HCWs included in this land use include transload and short-term storage facilities. A transload facility has the primary function of consolidation and distribution of pallet loads (or larger) for manufacturers, wholesalers, or retailers. A transload facility typically has little storage duration, high throughput, and its operations are high efficiency. A short-term HCW is a distribution facility often with custom/special features built into the structure for the movement of large volumes of freight with only short-term storage of products.

Some limited assembly and repackaging may occur within the facility.

A high-cube warehouse may contain a mezzanine. In a HCW setting, a mezzanine is a free-standing, semi-permanent structure that is commonly supported by structural steel columns and that is lined with racks or shelves. The gross floor area (GFA) values for the study sites in the database for this land use do NOT include the floor area of the mezzanine. The GFA values represent only the permanent ground-floor square footage.

The amount of office/employee welfare space that is provided within a HCW can be highly variable but is typically an insignificant portion of the overall building square footage. Within the trip generation database, common values are between 3,000 and 5,000 square feet for a Cold Storage HCW and between 5,000 and 10,000 square feet for Transload, Fulfillment Center, and Parcel Hub HCW (all of which are less than one percent of total GFA for a site). Therefore, for the trip generation data plots, any office space that is part of the normal operation of the warehouse is included in the total GFA.

Warehousing (Land Use 150), high-cube fulfillment center warehouse (Land Use 155), high-cube parcel hub warehouse (Land Use 156), and high-cube cold storage warehouse (Land Use 157) are related land uses.

The number of dock doors at a HCW is a potential independent variable. Future data submissions should include that information.

Additional Data

The High-Cube Warehouse/Distribution Center-related land uses underwent specialized consideration through a commissioned study titled “High-Cube Warehouse Vehicle Trip Generation Analysis,” published in October 2016. The results of this study are posted on the ITE website at <http://library.ite.org/pub/a3e6679a-e3a8-bf38-7f29-2961becdd498>.

The technical appendices provide supporting information on time-of-day distributions for this land use. The appendices can be accessed through either the ITETripGen web app or the trip generation resource page on the ITE website (<https://www.ite.org/technical-resources/topics/trip-and-parking-generation/>).

The sites were surveyed in the 1980s, the 2000s, and the 2010s in Alberta (CAN), California, Florida, Michigan, New Jersey, Texas, and Washington.

Source Numbers

331, 605, 619, 642, 645, 649, 739, 750, 752, 903, 904, 941, 942, 943, 969

High-Cube Transload and Short-Term Storage Warehouse (154)

Vehicle Trip Ends vs: 1000 Sq. Ft. GFA

On a: Weekday

Setting/Location: General Urban/Suburban

Number of Studies: 91

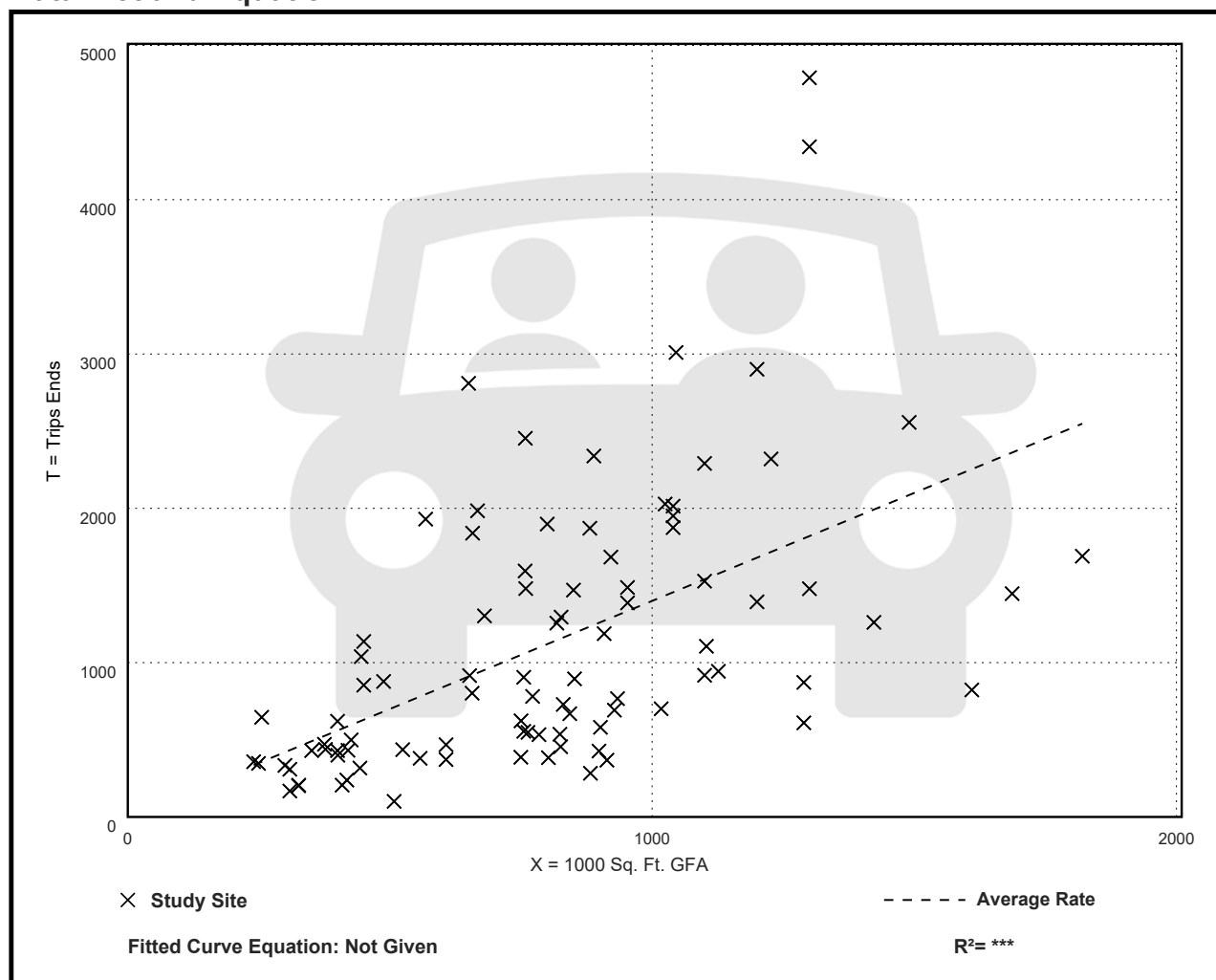
Avg. 1000 Sq. Ft. GFA: 798

Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
1.40	0.20 - 4.32	0.86

Data Plot and Equation



High-Cube Transload and Short-Term Storage Warehouse (154)

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: 102

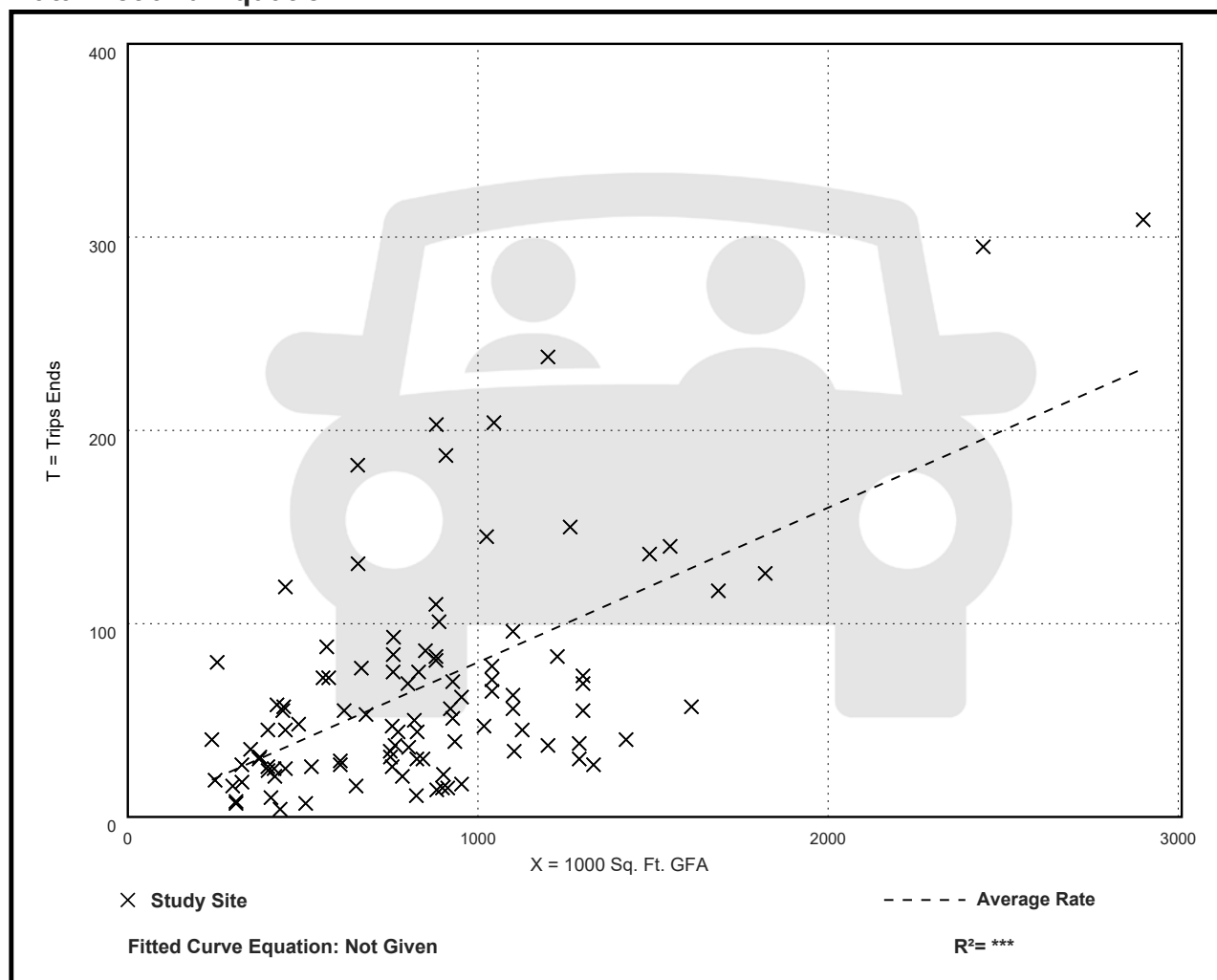
Avg. 1000 Sq. Ft. GFA: 846

Directional Distribution: 77% entering, 23% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
0.08	0.01 - 0.31	0.05

Data Plot and Equation



High-Cube Transload and Short-Term Storage Warehouse (154)

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: 103

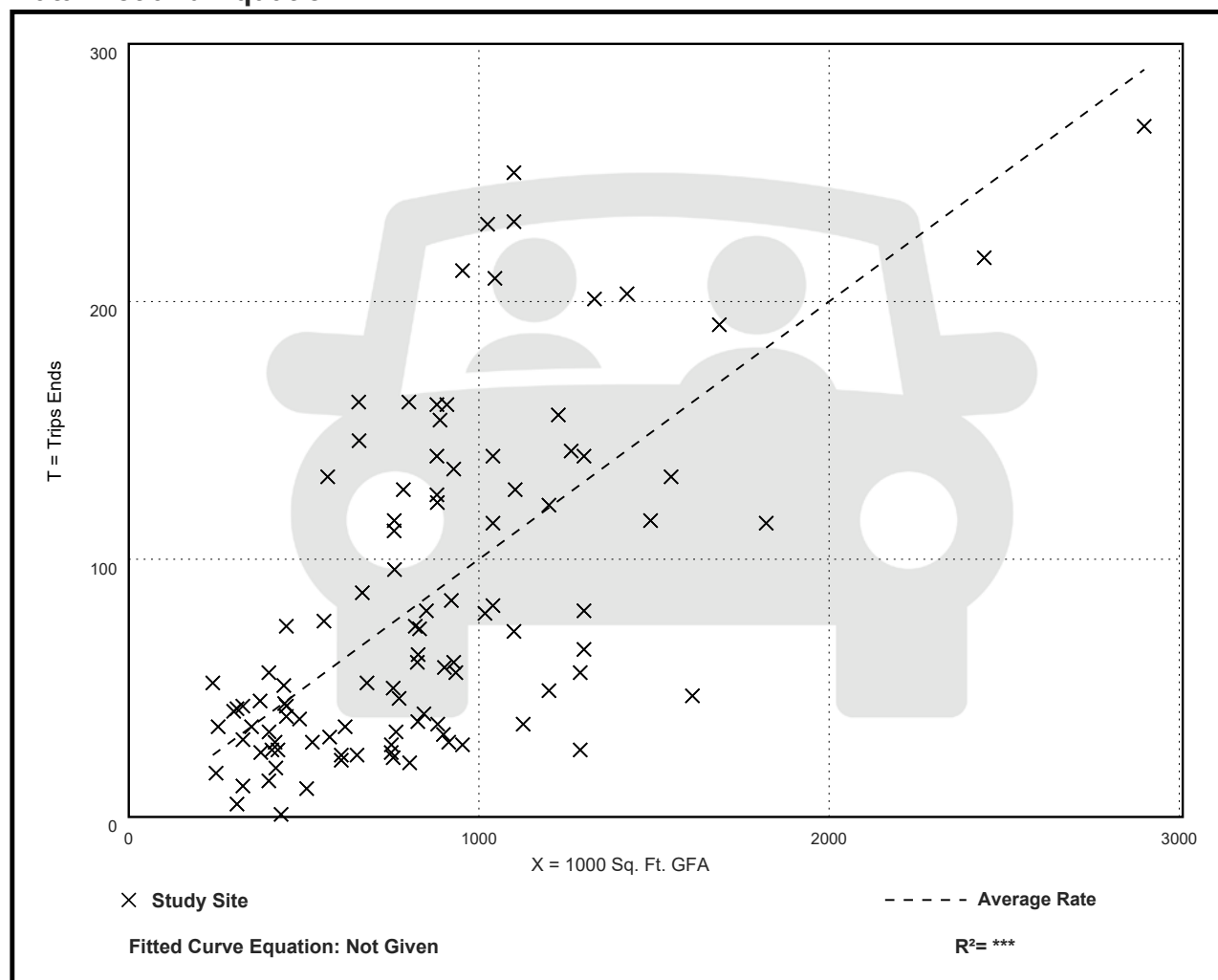
Avg. 1000 Sq. Ft. GFA: 840

Directional Distribution: 28% entering, 72% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
0.10	0.00 - 0.25	0.06

Data Plot and Equation



High-Cube Transload and Short-Term Storage Warehouse (154)

Vehicle Trip Ends vs: 1000 Sq. Ft. GFA

On a: Weekday,

AM Peak Hour of Generator

Setting/Location: General Urban/Suburban

Number of Studies: 31

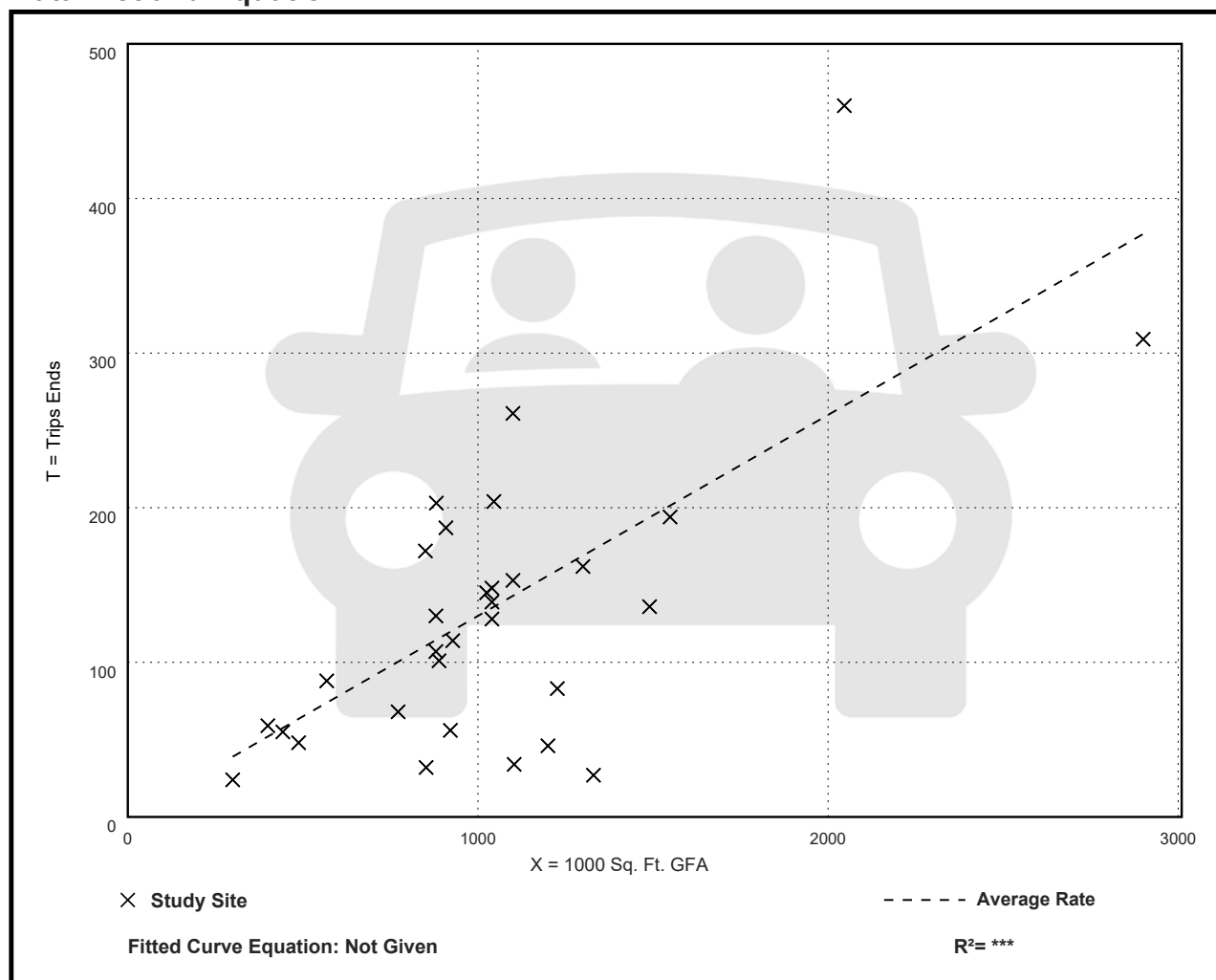
Avg. 1000 Sq. Ft. GFA: 1048

Directional Distribution: 78% entering, 22% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
0.13	0.02 - 0.24	0.06

Data Plot and Equation



High-Cube Transload and Short-Term Storage Warehouse (154)

Vehicle Trip Ends vs: 1000 Sq. Ft. GFA

On a: Weekday,

PM Peak Hour of Generator

Setting/Location: General Urban/Suburban

Number of Studies: 34

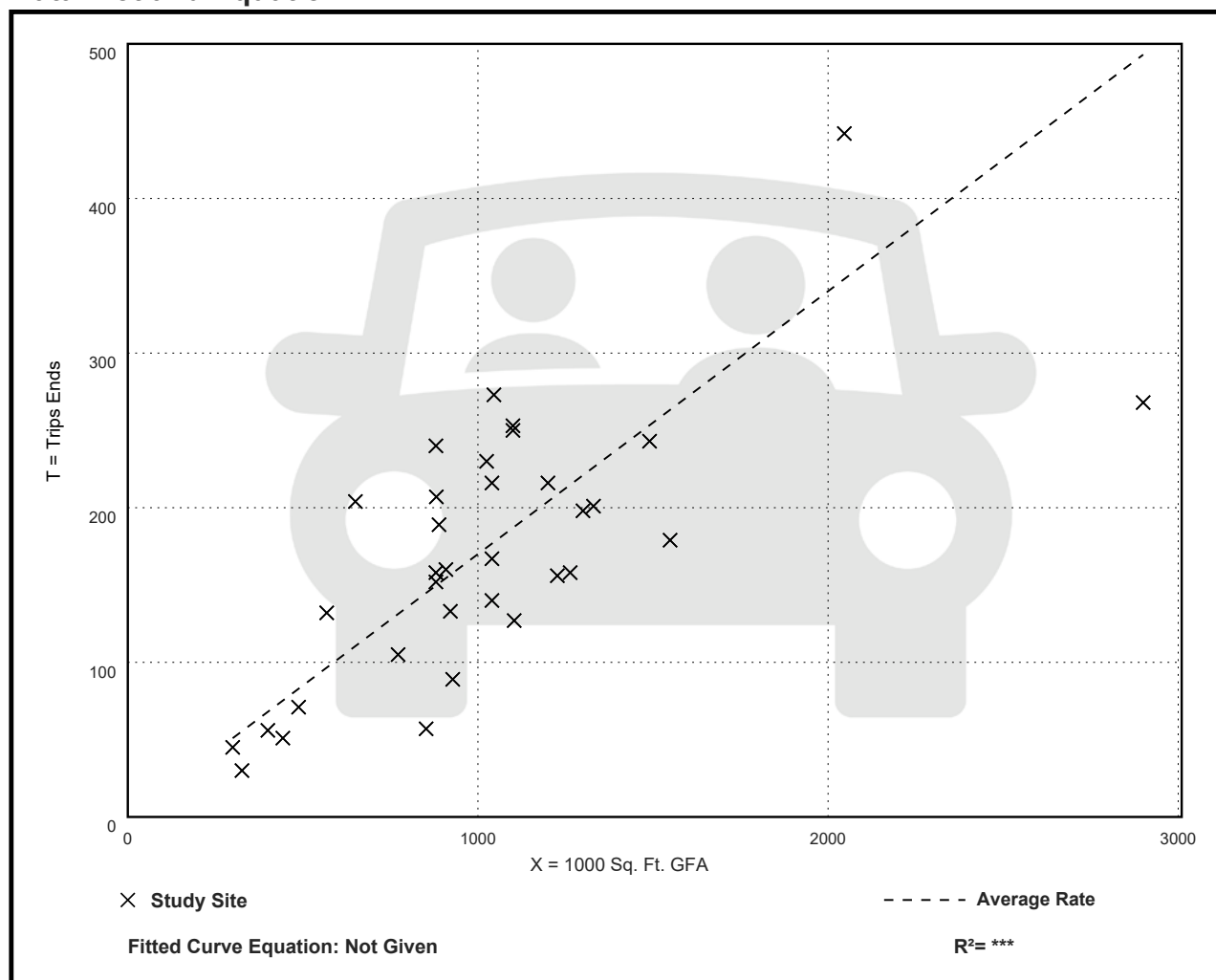
Avg. 1000 Sq. Ft. GFA: 1023

Directional Distribution: 34% entering, 66% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
0.17	0.07 - 0.31	0.06

Data Plot and Equation



High-Cube Transload and Short-Term Storage Warehouse (154)

Vehicle Trip Ends vs: 1000 Sq. Ft. GFA

On a: Saturday

Setting/Location: General Urban/Suburban

Number of Studies: 10

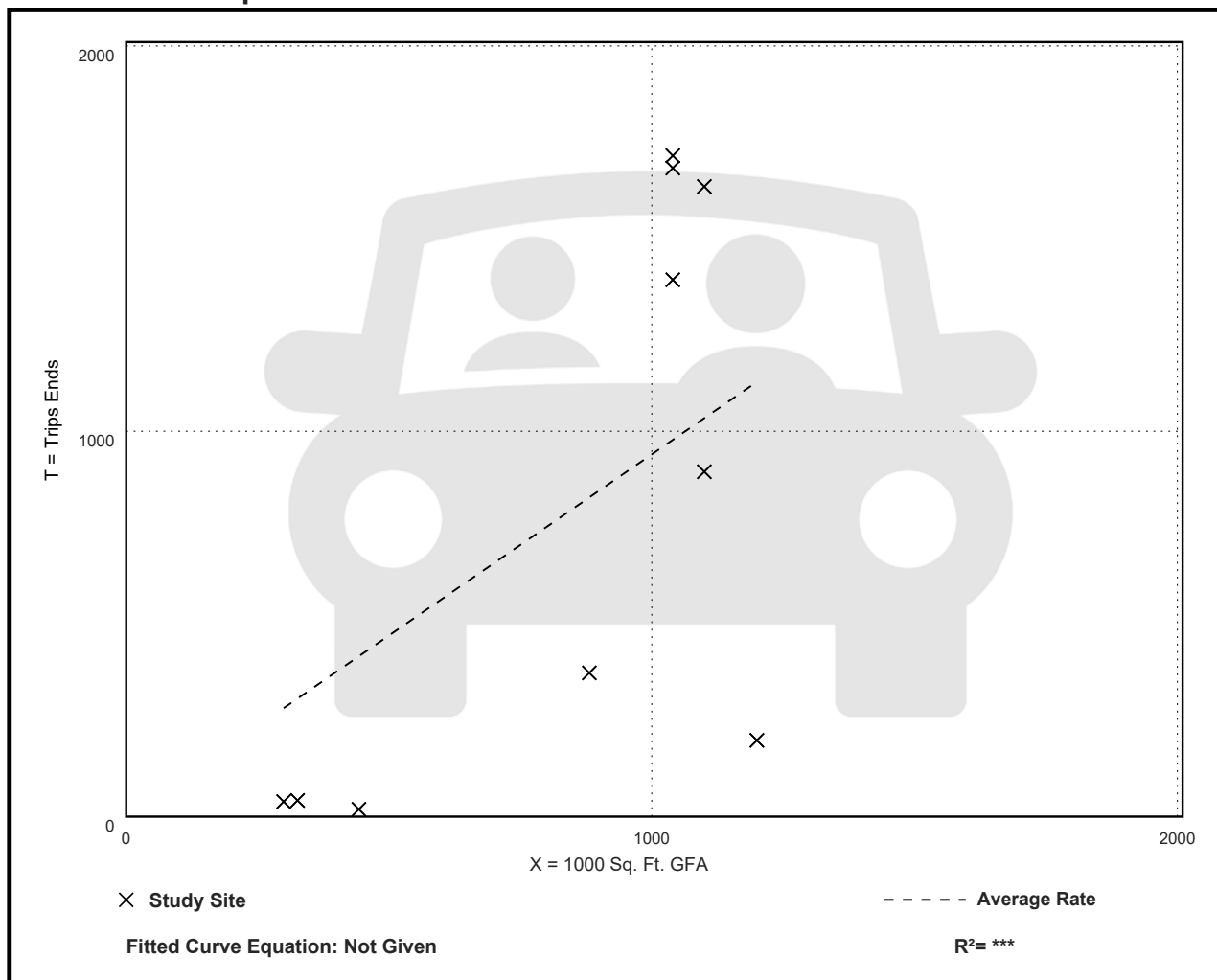
Avg. 1000 Sq. Ft. GFA: 847

Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
0.94	0.04 - 1.65	0.65

Data Plot and Equation



High-Cube Transload and Short-Term Storage Warehouse (154)

Vehicle Trip Ends vs: 1000 Sq. Ft. GFA

On a: Saturday, Peak Hour of Generator

Setting/Location: General Urban/Suburban

Number of Studies: 9

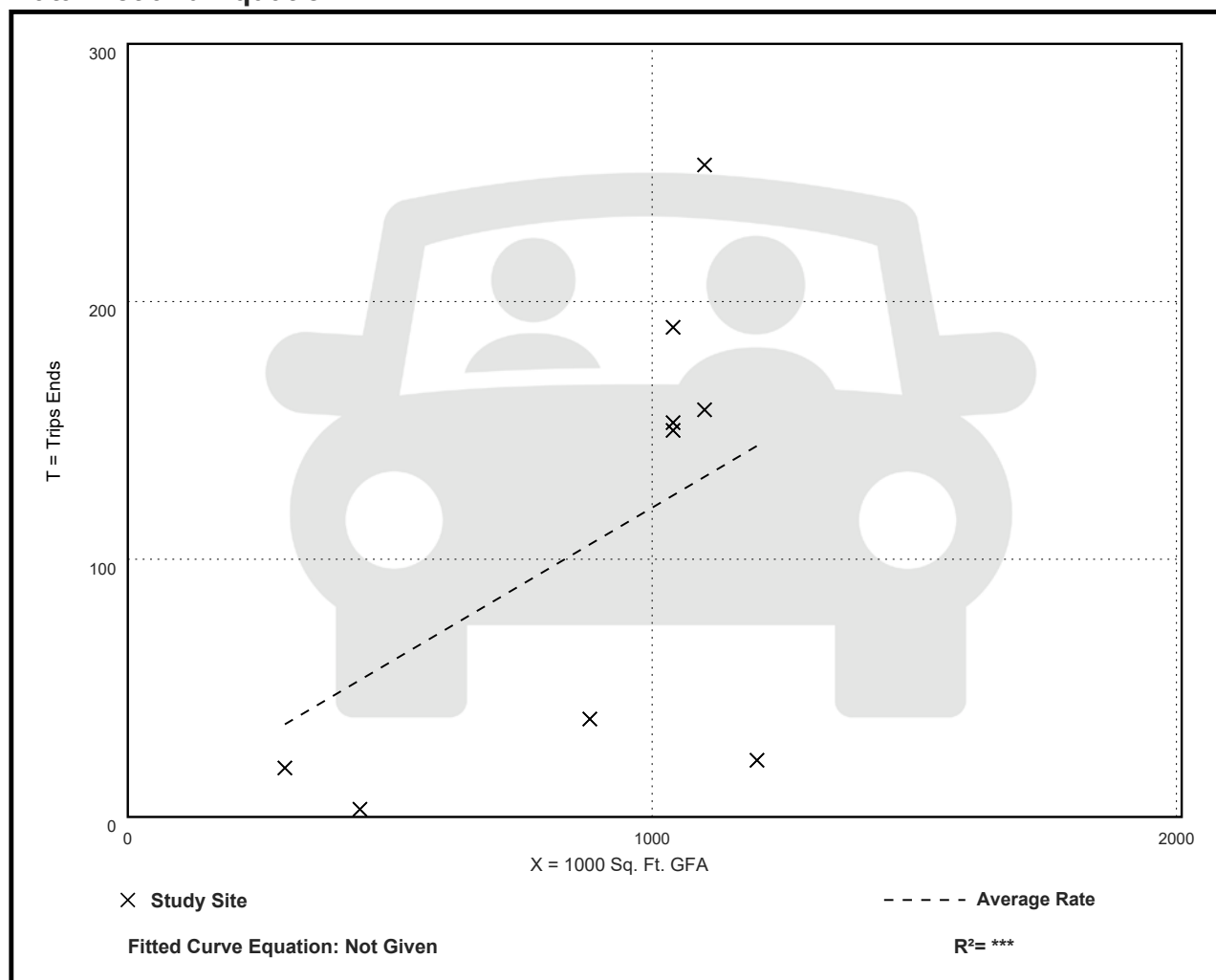
Avg. 1000 Sq. Ft. GFA: 905

Directional Distribution: Not Available

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
0.12	0.01 - 0.23	0.08

Data Plot and Equation



High-Cube Transload and Short-Term Storage Warehouse (154)

Vehicle Trip Ends vs: 1000 Sq. Ft. GFA

On a: Sunday

Setting/Location: General Urban/Suburban

Number of Studies: 10

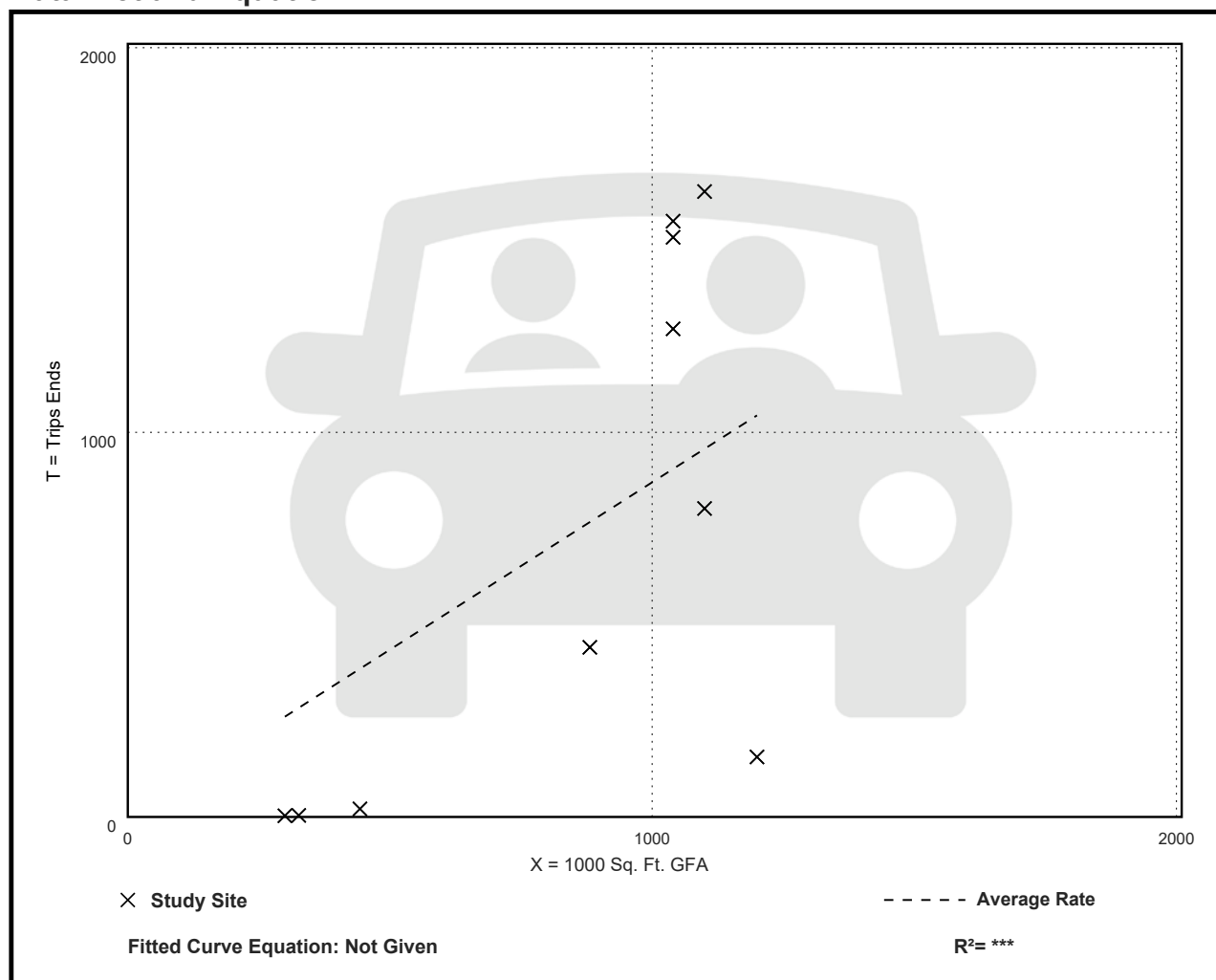
Avg. 1000 Sq. Ft. GFA: 847

Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
0.87	0.01 - 1.49	0.61

Data Plot and Equation



High-Cube Transload and Short-Term Storage Warehouse (154)

Vehicle Trip Ends vs: 1000 Sq. Ft. GFA

On a: Sunday, Peak Hour of Generator

Setting/Location: General Urban/Suburban

Number of Studies: 9

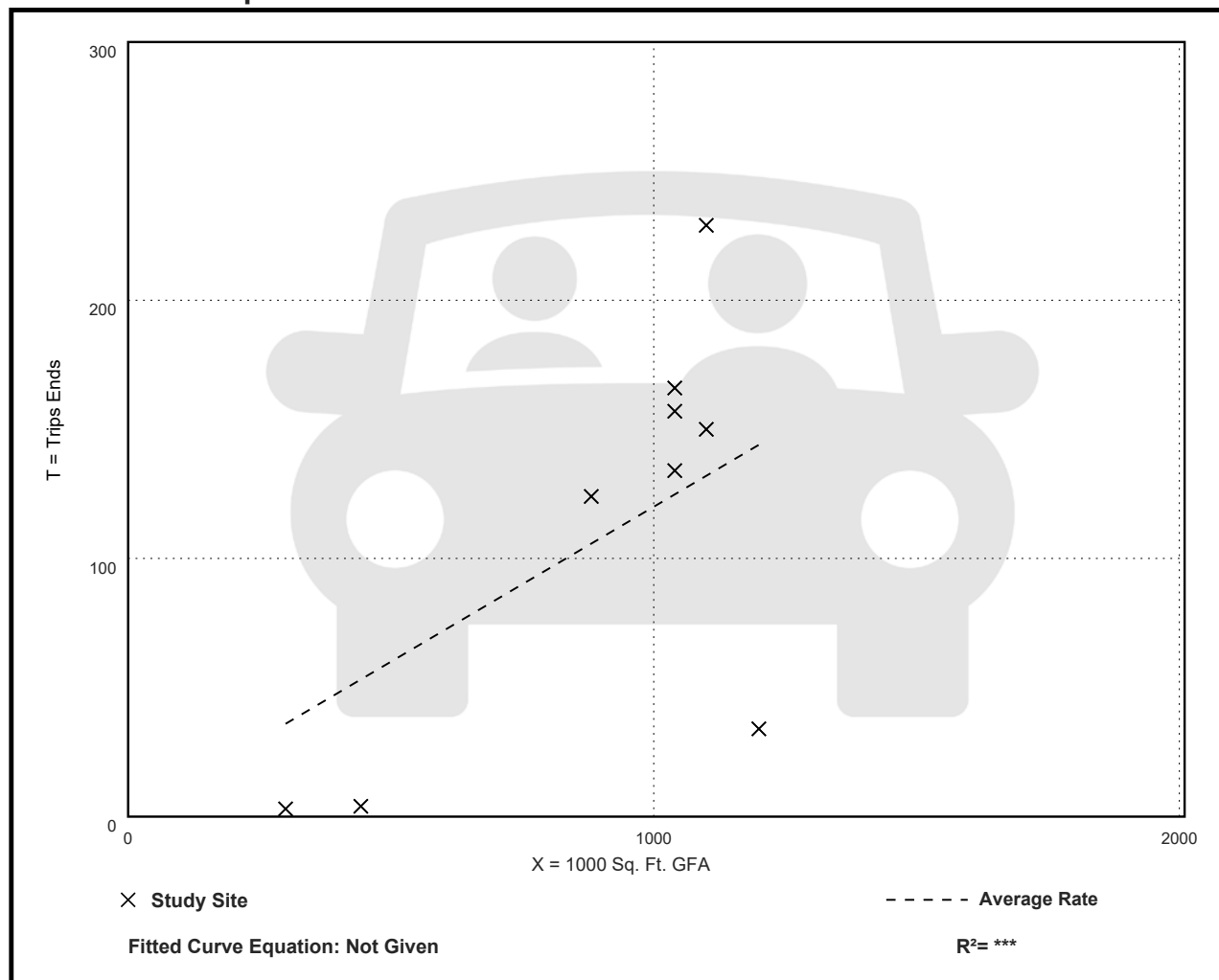
Avg. 1000 Sq. Ft. GFA: 905

Directional Distribution: Not Available

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
0.12	0.01 - 0.21	0.07

Data Plot and Equation



High-Cube Transload and Short-Term Storage Warehouse (154)

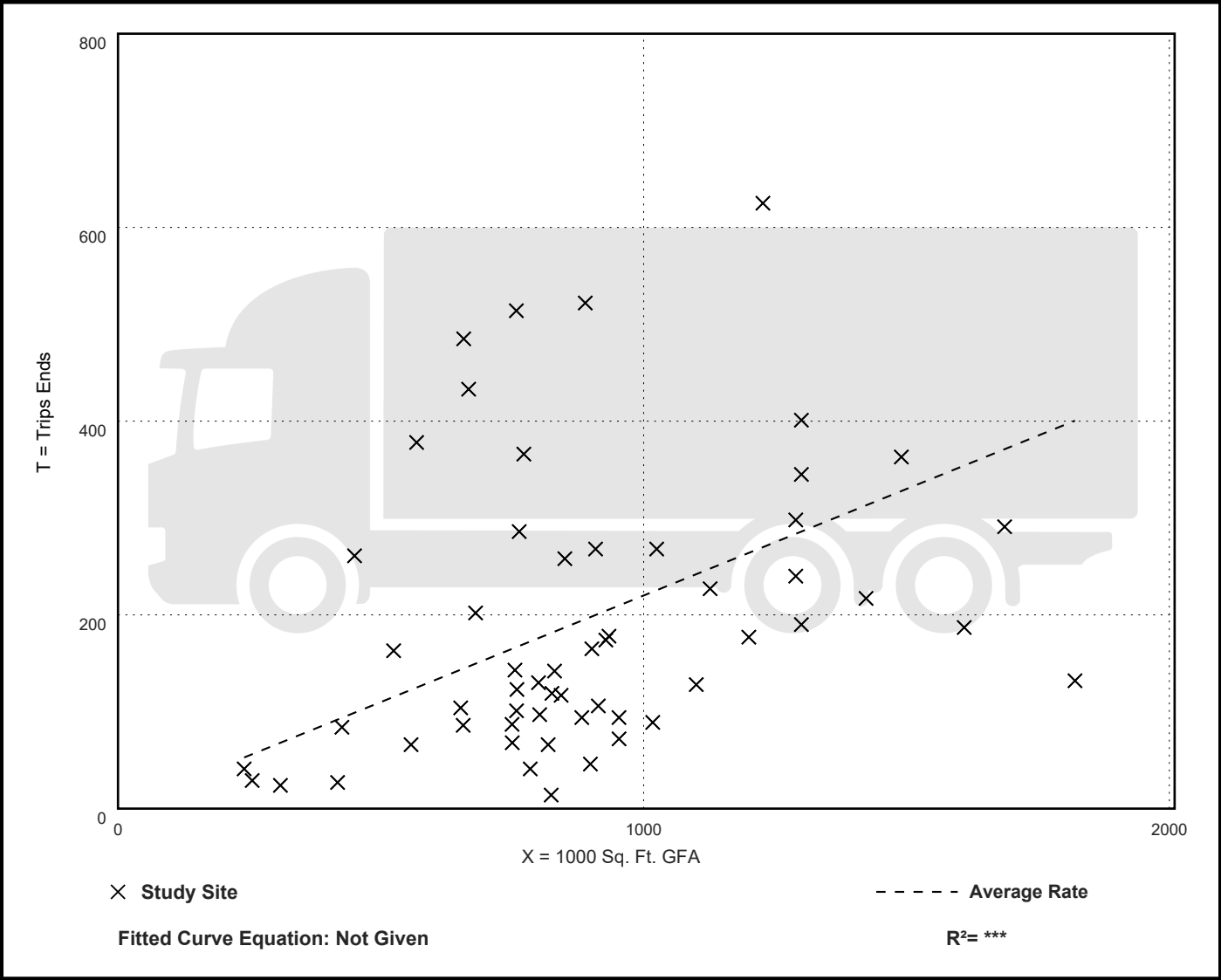
Truck Trip Ends vs: 1000 Sq. Ft. GFA
On a: Weekday

Setting/Location: General Urban/Suburban
Number of Studies: 57
Avg. 1000 Sq. Ft. GFA: 892
Directional Distribution: 50% entering, 50% exiting

Truck Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
0.22	0.02 - 0.74	0.16

Data Plot and Equation



High-Cube Transload and Short-Term Storage Warehouse (154)

Truck 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: 90

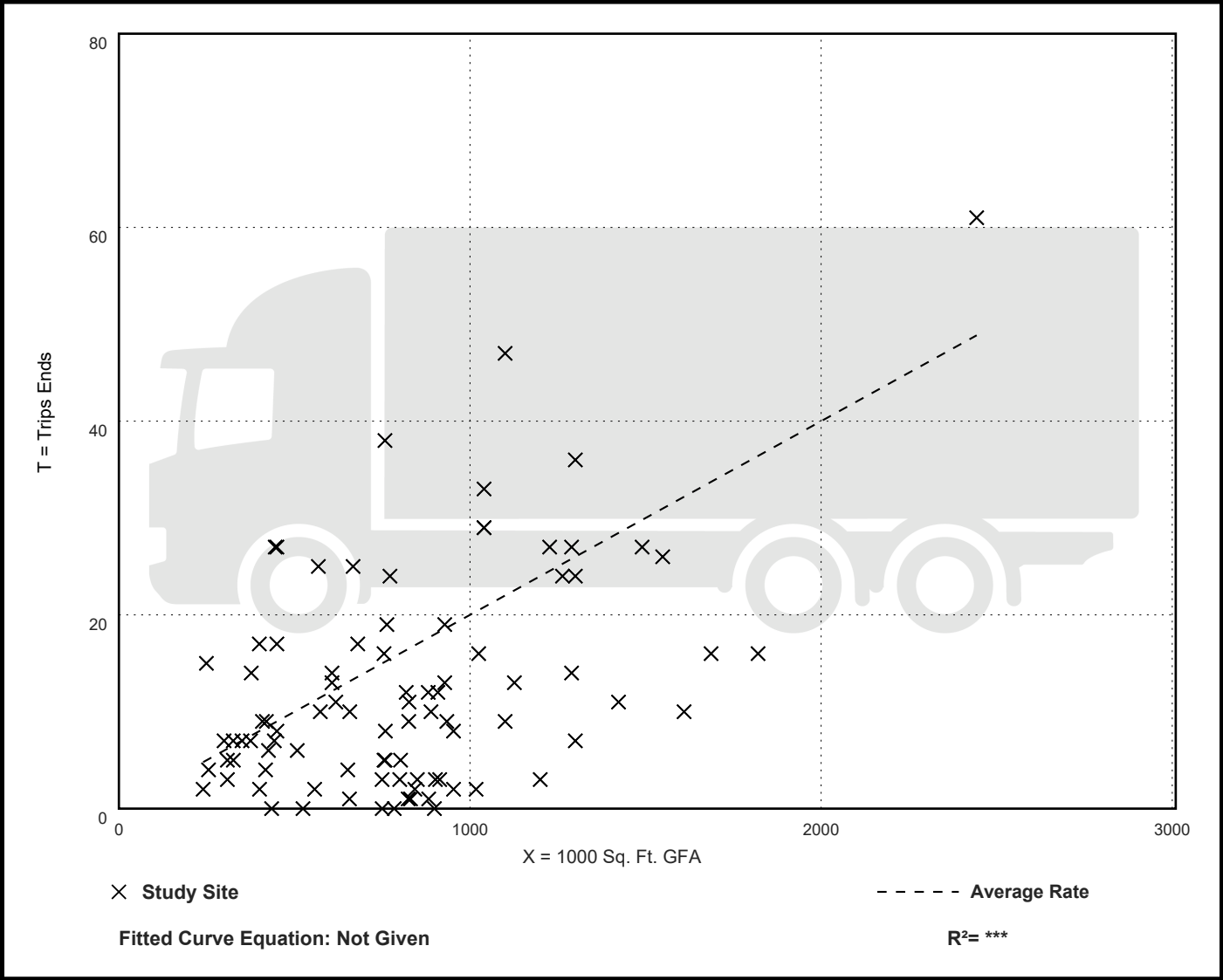
Avg. 1000 Sq. Ft. GFA: 812

Directional Distribution: 49% entering, 51% exiting

Truck Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
0.02	0.00 - 0.06	0.01

Data Plot and Equation



High-Cube Transload and Short-Term Storage Warehouse (154)

Truck 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: 91

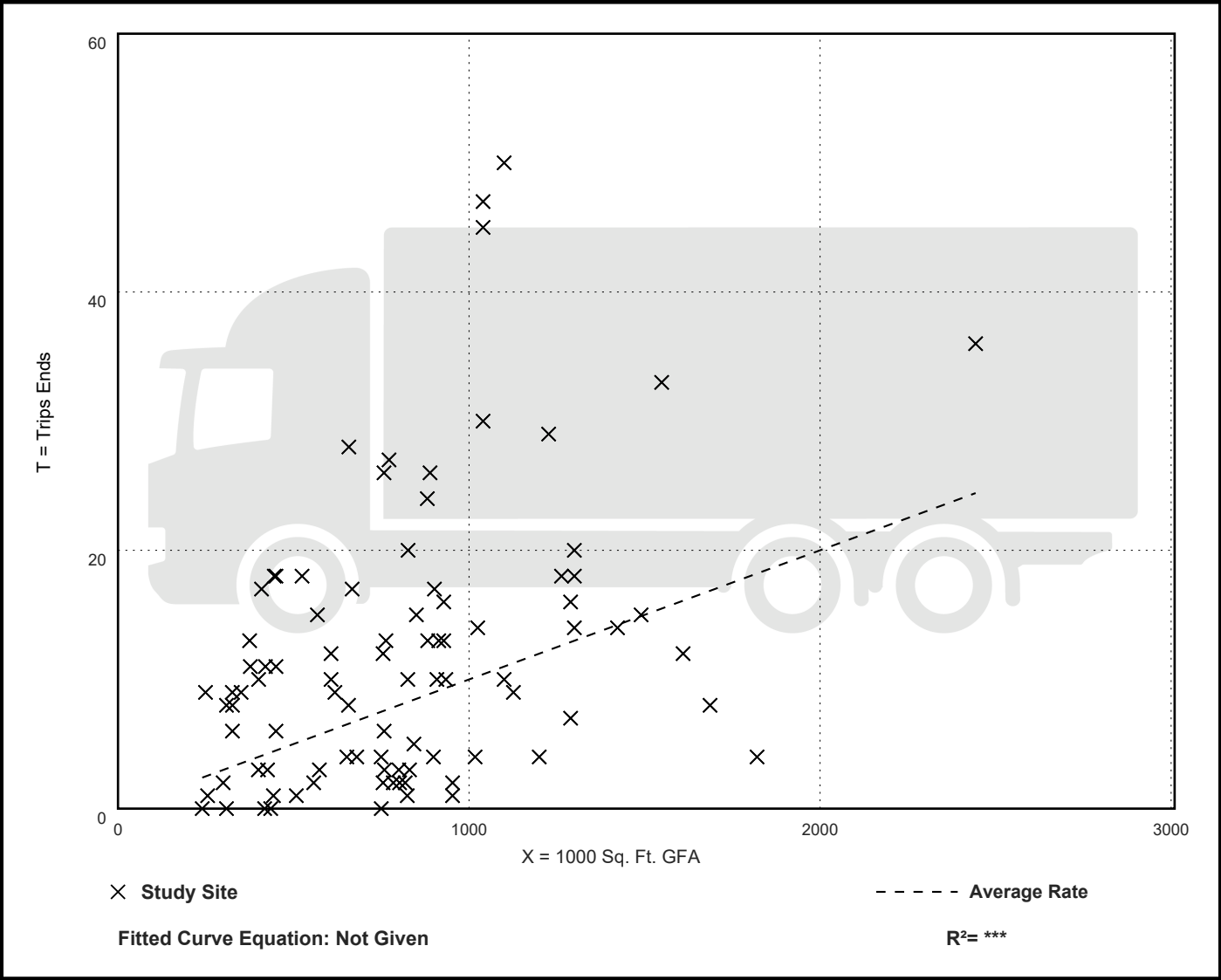
Avg. 1000 Sq. Ft. GFA: 807

Directional Distribution: 47% entering, 53% exiting

Truck Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
0.01	0.00 - 0.05	0.01

Data Plot and Equation



High-Cube Transload and Short-Term Storage Warehouse (154)

Truck Trip Ends vs: 1000 Sq. Ft. GFA

On a: Weekday,
AM Peak Hour of Generator

Setting/Location: General Urban/Suburban

Number of Studies: 12

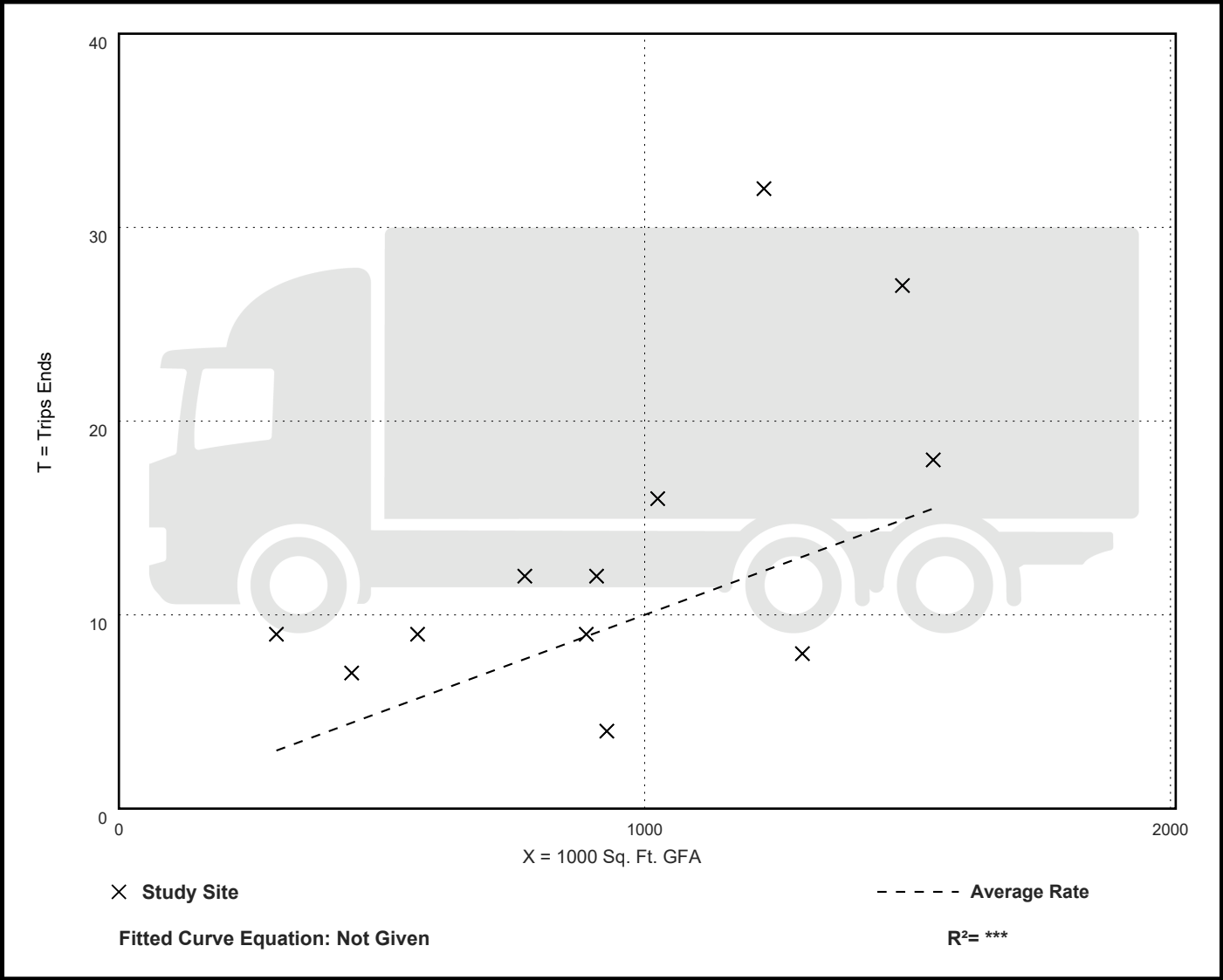
Avg. 1000 Sq. Ft. GFA: 950

Directional Distribution: 56% entering, 44% exiting

Truck Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
0.01	0.00 - 0.03	0.01

Data Plot and Equation



High-Cube Transload and Short-Term Storage Warehouse (154)

Truck Trip Ends vs: 1000 Sq. Ft. GFA

On a: Weekday,
PM Peak Hour of Generator

Setting/Location: General Urban/Suburban

Number of Studies: 13

Avg. 1000 Sq. Ft. GFA: 974

Directional Distribution: 55% entering, 45% exiting

Truck Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
0.02	0.00 - 0.04	0.01

Data Plot and Equation

