



West Virginia Department of Transportation Research Project #125

**TRIP GENERATION RATES,  
PEAKING CHARACTERISTICS, AND  
VEHICLE MIX CHARACTERISTICS OF  
SPECIAL WEST VIRGINIA GENERATORS**

**EXECUTIVE SUMMARY**

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## EXECUTIVE SUMMARY

### Introduction

Review of the trip generation literature indicated that for a number of land uses, published trip rates are not appropriate for application in West Virginia. Similarly, there are a number of so-called special generators, which are either unique to West Virginia (i.e., regional jails) or have assumed increased importance in the state's economy (e.g., poultry-related and timber processing facilities), for which no published rates are available. Due to the long period of time since certain rates were determined (e.g., residential subdivisions, schools, and shopping centers were examined in 1974) specifically for West Virginia, it was necessary to provide updated rates for these land uses.

The overall goal of this project was to determine trip generation rates, peaking characteristics, and vehicle mix characteristics of the following special West Virginia generators:

- Superstores
- Shopping centers
- Residential subdivisions
- Mobile home parks
- Consolidated elementary, middle, and high schools
- Light industry/industrial parks
- Comprehensive medical centers
- Regional jails
- Poultry-related facilities
- Timber processing plants

### **Project Objectives**

To accomplish this goal, several specific objectives were identified, namely:

1. To review literature from previous studies on trip generation
2. To determine a project methodology
3. To identify and collect traffic and socio-economic variable data at special generators
4. To calculate trip generation statistics for typical time periods including:
  - Average Trip Rate
  - Standard Deviation
  - Linear and logarithmic regression equations
  - Coefficient of Determination
5. To convey results in a format that can be used by WVDOT engineers and planners and is compatible with the ITE database.

### **Highlights of Results**

Table 1 presents a summary of the key quantitative results of the study. Further details and peak hour information are provided in the full report.

#### **Residential Land Uses**

- Many of the subdivisions studied were smaller than the smallest subdivision currently in ITE's (1997) data base. Rates for this study were lower than ITE's (1997) for the weekday peak periods and the weekend periods. The weekday trip rate was higher than ITE's (1997) average rate.

Table 1. Summary of Key Quantitative Results of Study.

Land Use	SEV	Avg Weekday Rate	Valid Results?	Weekday Traffic Proj. Range	Weekday Regression Results	Weekday K	% Trucks
Residential Subdivisions	dwelling units	9.78	Y	+/- 268	Good	10%	Neg.
Mobile Home Parks	dwelling units	8.79	Y	+/- 503	Acceptable	9%	Neg.
Light Industrial Parks	acres	12.67	N	+/- 2032	Poor	13%	8%
Regional Jails	employees	3.59	Y	---	N.R.U.	11%	Neg.
	beds	1.38	Y	+/- 97	N.R.U.	11%	Neg.
Shopping Centers	employees	12.97	Y	---	N.R.U.	9%	Neg.
	1000 SF GLA	20.44	Y	+/-2,671	N.R.U.	9%	Neg.
Superstores	employees	24.93	Y	---	N.R.U.	8%	Neg.
	1000 SF GLA	55.47	Y	---	N.R.U.	8%	Neg.
Consolidated High Schools	employees	24.58	Y	---	Good	17-23%	Neg.
	students	1.97	Y	---	Good	17-23%	Neg.
	1000 SF GFA	13.90	Y	+/-1,005	Good	17-23%	Neg.
Consolidated Middle Schools	employees	16.68	Y	---	---	17-33%	Neg.
	students	1.71	Y	---	---	17-33%	Neg.
	1000 SF GFA	13.41	Y	---	---	17-33%	Neg.
Consolidated Elementary Schools	employees	25.50	Y	---	N.R.U.	21-25%	Neg.
	students	2.87	Y	---	Acceptable	21-25%	Neg.
	1000 SF GFA	24.72	Y	+/-665	N.R.U.	21-25%	Neg.
Poultry-Related Facilities	employees	2.08	Y	---	Good	14%	12.8%
	1000 SF GFA	8.94	Y	+/-597	Good	14%	12.8%
Timber Processing Facilities	employees	4.39	Y	---	N.R.U.	12%	12.2%
	1000 SF GFA	2.03	Y	---	N.R.U.	12%	12.2%

N.R.U. = not recommended for use

--- = not determined

Neg. = negligible

SEV = Socio-Economic Variable

- The mobile home parks studied exhibited trip rates that were much higher than ITE's (1997) rates. The mobile home parks studied bore more similarity to the residential subdivisions in this study than they did to the mobile home park data base in ITE (1997).

### **Industrial Parks**

- Good average trip rates for light industrial parks were not achieved because this land use was not homogenous from site to site. In general, the trip rates measured at the parks studied were much less than those contained in ITE (1997). The percentage of trucks at the "average" light industrial park was 8%, with 4.6% single unit trucks and 3.4% tractor-trailers.

### **Regional Jails**

- It is likely that visitation times will dictate peaking characteristics at regional jails.
- Truck traffic was negligible at the regional jails.
- Reliable average trip rates were generated for regional jails. However, these rates should not be used for prisons, since these facility types have significantly different characteristics and operations.

### **Shopping Centers**

- ITE (1997) rates for shopping centers are too high for West Virginia. It is recommended that ITE (1997) be used to select trip rates for shopping centers, but that lower than average rates be selected.
- ITE (1997) rates for superstores are too low for West Virginia. In general, superstores and shopping centers had similar trip rates.

### Consolidated Schools

- “Consolidation” did not have a significant effect on trip rates for schools. School setting (urban versus rural) had a larger effect on trip rates.
- Truck traffic at consolidated schools was determined to be negligible. School buses are the primary heavy vehicle that needs to be considered in design and operations. In designing access to new schools, the AASHTO BUS should be used as the design vehicle.
- For consolidated high schools, located in large, sparsely populated districts, that will not be used for significant community functions outside of normal school hours, the trip rate selected should be much less than the ITE (1997) average rate. However, for consolidated high schools that will be used for community functions as well as school functions, slightly higher than average rates should be selected. The extent to which rates should be increased or decreased should be determined on a case-by-case basis depending on local conditions.
- For consolidated elementary schools, the West Virginia trip rates were approximately double the ITE (1997) rates. Differences were attributed to school locations in combination with commuting patterns and job types. When there are professional-type jobs located in the vicinity of the school and parents can tailor their schedule to coordinate dropping off and picking up their children, then trip-chaining occurs. The rate chosen should account for the expected extent of trip-chaining.

### **Poultry-Related Facilities**

- Users of trip generation data for poultry-related facilities must be cognizant of the different types of poultry facilities (e.g., feed mill, hatchery, and processing plant) since each will have different amounts and types of trips associated with it.
- Poultry-related facilities generated a large number of trucks, both in terms of absolute numbers and percentages. Tractor-trailers constituted approximately two-thirds of the trucks, and thus should be used as the design vehicle.
- The production process employed by the poultry industry requires that large trucks, including tractor-trailers, be used on local roads. In the short-term, this raises geometric design concerns at sharp horizontal curves and intersections. In the longer term, it raises pavement maintenance issues since it is unlikely that these rural roads are designed for significant tractor-trailer traffic.
- Trip generation rates were not determined for the following poultry-related facilities: hatchery, egg plant, office headquarters, and vehicle maintenance facility.
- No seasonal variations in traffic characteristics are expected to exist for poultry-related facilities.

### **Timber Processing Facilities**

- Timber processing facilities encompass a wide range of possible activities. Therefore, when selecting rates, the average rate should be adjusted, on a case-by-case basis, to reflect actual conditions.
- For timber processing facilities, a slight seasonal peaking trend was detected as summer traffic was between 5 and 10 percent greater than average.



- At the “average” timber processing facility, trucks accounted for slightly more than 12% of the total traffic. Tractor-trailers accounted for nearly 75% of the trucks. Tractor-trailer log trucks and flatbed trucks were the most common trucks, accounting for nearly two-thirds of the truck traffic overall.

### **Comprehensive Medical Centers**

- Trip generation rates and other traffic characteristics of comprehensive medical centers could not be studied using conventional techniques. These sites typically had significant off-site parking and too many access points unsuitable for machine counting.

Table 2 provides a brief summary of the recommendations for rate selection for each land use. Additional details are provided in the full report.

Table 2. Brief Recommendation Regarding Trip Rate Selection by Land Use.

Land Use	Recommendation
Residential Subdivisions	Study results for weekday periods agree with ITE (1997); use ITE (1997) except for weekends
Mobile Home Parks	Use study results, ITE (1997) rates are too low
Light Industrial Parks	Project traffic for each business and aggregate. If not possible, use rates lower than those found in ITE.
Regional Jails	Use number of beds in traffic projections; visitation times may dictate peak hours. These rates are not applicable to prisons.
Shopping Centers	Use ITE (1997), but use a lower rate
Superstores	Use ITE (1997), but use a higher rate
Consolidated High Schools	Use study results, be cognizant of additional activities carried on at school. Use lower rates for more remotely located schools.
Consolidated Middle Schools	Use ITE (1997), use lower rates for more remotely located schools.
Consolidated Elementary Schools	Use study results with adjustments for the type of area.
Poultry-Related Facilities	Use study results, be cognizant of which specific facility types are included in the site
Timber Processing Facilities	Use study results, use rates from site(s) performing similar type of work