SOUNDCAST NETWORK ASSIGNMENT, TRUCKS, AND SUPPLEMENTALS

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INTRODUCTION

The three main components of SoundCast are:

- person trip demand in the **Daysim** activity-based model
- external, special generation, truck, and group quarters aggregate modeling
- assignment and skimming in **EMME**

DaySim is a modeling approach and software platform to ***simulate resident daily travel*** and activities on a typical weekday for the residents of a metropolitan region or state.

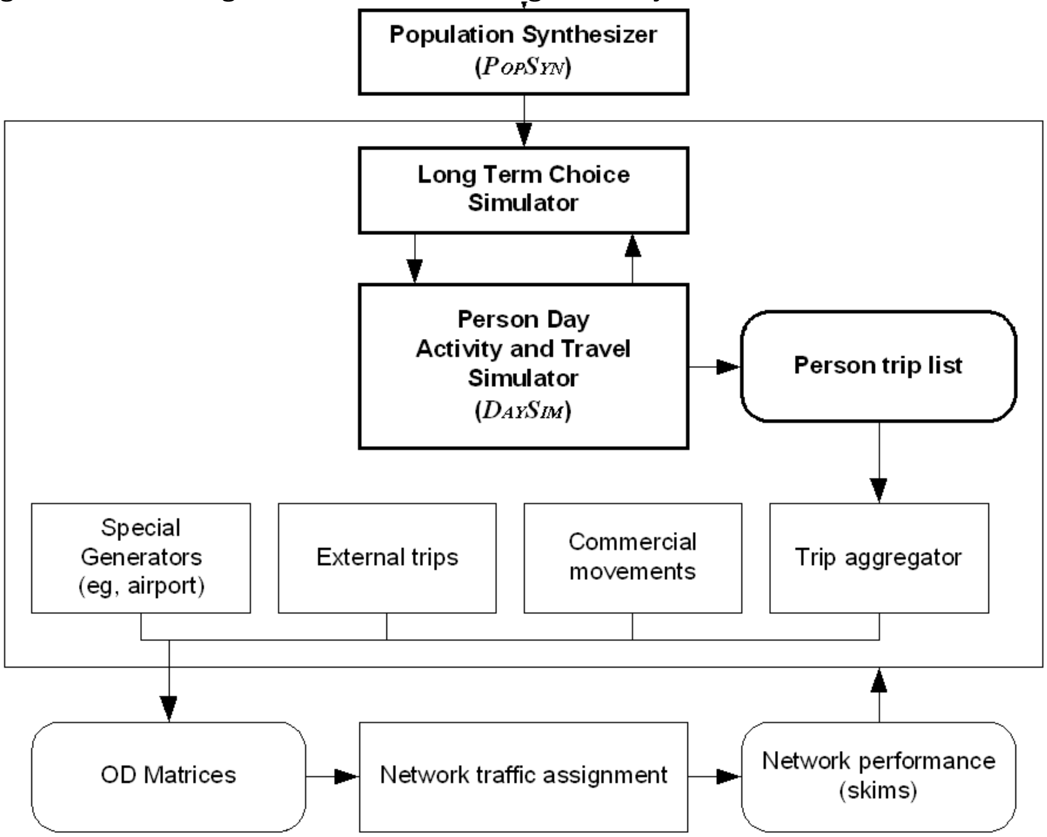
In essence, DaySim replaces the trip generation, trip distribution and mode choice steps of a 4-step model, while ***representing more aspects of travel behavior*** *(auto ownership, trip chaining, time of day scheduling, detailed market segmentation, etc.)*

Daysim ***integrates with EMME*** by generating resident trip matrices for assignment and uses the network skims from assignment for the next global iteration of DaySim.

The major inputs to SoundCast are transportation networks and modeled household and employment data from UrbanSim. In Daysim, The Population Synthesizer (PopSyn) creates a synthetic population, comprised of Census PUMS households, that is consistent with regional residential, employment and school enrollment forecasts. Long-term choices (work location, school location and auto ownership) are simulated for all members of the population. The Person Day Activity and Travel Simulator (DaySim) creates a one-day activity and travel schedule for each person in the population, including a list of their tours and the trips on each tour.

The trips predicted by DaySim are aggregated into EMME trip matrices and combined with predicted trips for special generators, external trips and commercial traffic into time- and mode-specific trip matrices. The EMME network traffic assignment models load the trips onto the network. Traffic assignment is iteratively equilibrated with the Long Term Choice Simulator, DaySim and the other demand models. The parcel level land use inputs come from UrbanSim.

Figure 1: PSRC Regional Travel Forecasting Model System



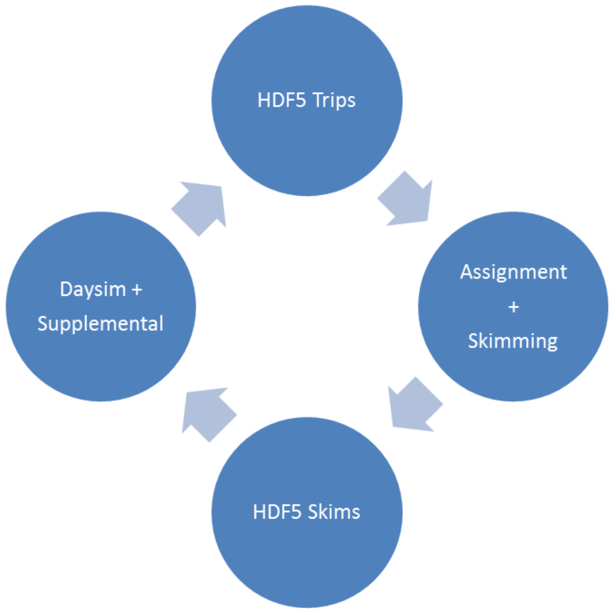
Network Assignment and Skimming

After all the daily trips for the region have been generated, SoundCast assign the trips to the network. The assignment results in a set of travel impedances which are skimmed from the network.

Skim and Trip Data Exchange

The skims are sent from the skimming process in EMME into Daysim; and the supplemental trips and the Daysim trips must be sent into the assignment, as shown in the figure below.

Figure 1. Data Exchanges



DaySim is configured to read skims that are stored in HDF5. The disaggregate trip-list based estimates of passenger travel demand produced by DaySim, as well estimates of demand produces by auxiliary models such as trucks and special generators, are inputs to EMME 's network assignment. In order to assign the demand generated by DaySim, the trip-list based demand are aggregated into matrices identified by time period, TAZ, mode and market segment.

Skims

Skims of network performance are produced by EMME, and are characterized by the time period, mode, and market segment. The skims are used to represent travel impedance when generating travel demand.

Table 2. Time Period Definitions

Mode	Time Period Name	Time Period Definition
Roadway	Early AM	5:00 am - 6:00 am
	AM Peak Hour 1	6:00 am - 7:00 am
	AM Peak Hour 2	7:00 am - 8:00 am
	AM Peak Hour 3	8:00 am - 9:00 am
	AM Peak Hour 4	9:00 am - 10:00 am
	Midday	10:00 am - 2:00 pm
	PM Peak Hour 1	2:00 pm - 3:00 pm

	PM Peak Hour 2	3:00 pm - 4:00 pm
	PM Peak Hour 3	4:00 pm - 5:00 pm
	PM Peak Hour 4	5:00 pm - 6:00 pm
	Evening	6:00 pm – 8:00 pm
	Overnight	8:00 pm - 5:00 am
Transit	AM	6:00 am - 9:00 am
	Midday	9:00 am - 3:00 pm
	PM	3:00 pm - 6:00 pm
	Evening	6:00 pm - 8:00 pm
	Night	8:00 pm - 6:00 am
Walk	Allday	6:00 am - 6:00 am
Bike	Allday	6:00 am - 6:00 am

Skim Attributes

For each of the time periods described in the preceding section, a set of modal-specific skim attributes is developed. As shown in the table below, twenty-one roadway attributes are skimmed. These are derived from the combinations of three primary attributes (time, distance, and cost) and market segments.

For the roadway modes, the basic time, distance and cost measures are skimmed for SOV, HOV 2 and HOV 3+. DaySim incorporates a nest under each auto occupancy mode of toll/no toll choices, and as a result it is necessary to develop separate skims that reflect the availability (or unavailability) of tolled facilities. This skimming approach does not include a distinction between so-called "value tolls" and other tolls that may be unavoidable.

In addition, DaySim has been enhanced to use distributed values of time rather than a single average value. In order to support these enhanced capabilities, the skims should reflect this VOT segmentation, a set of truck trip skims reflect different values of time assumptions for commercial vehicle travel .

Table 3. PSRC Model Skim Attributes

Mode	Segment	Skims
Roadway (x12 time periods)	General Purpose/SOV, No Toll, VOT 1	Time, distance & cost
	General Purpose/SOV, No Toll, VOT 2	Time, distance & cost
	General Purpose/SOV, No Toll, VOT 3	Time, distance & cost
	General Purpose/SOV, Toll, VOT 1	Time, distance & cost

	General Purpose/SOV, Toll, VOT 2	Time, distance & cost
	General Purpose/SOV, Toll, VOT 3	Time, distance & cost
	HOV 2, No Toll, VOT 1	Time, distance & cost
	HOV 2, No Toll, VOT 2	Time, distance & cost
	HOV 2, No Toll, VOT 3	Time, distance & cost
	HOV 2, Toll, VOT 1	Time, distance & cost
	HOV 2, Toll, VOT 2	Time, distance & cost
	HOV 2, Toll, VOT 3	Time, distance & cost
	HOV 3+, No Toll, VOT 1	Time, distance & cost
	HOV 3+, No Toll, VOT 2	Time, distance & cost
	HOV 3+, No Toll, VOT 3	Time, distance & cost
	HOV 3+, Toll, VOT 1	Time, distance & cost
	HOV 3+, Toll, VOT 2	Time, distance & cost
	HOV 3+, Toll, VOT 3	Time, distance & cost
	Light Truck	Time, distance & cost
	Medium Truck	Time, distance & cost
	Heavy Truck	Time, distance & cost
Transit (x5 time periods)	Generalized Transit	Transit in-vehicle time
	Generalized Transit	Initial wait time
	Generalized Transit	Total transfer time
	Generalized Transit	Average number of boardings
	Generalized Transit	Transit fare
	Generalized Transit	In-vehicle time on local bus
	Generalized Transit	In-vehicle time on premium bus
	Generalized Transit	In-vehicle time on commuter

		rail
	Generalized Transit	In-vehicle time on light rail
	Generalized Transit	In-vehicle time on ferry
Walk (x1 time period)	Walk	Walk distance
	Walk	Walk time
Bike (x1 time period)	Bike	Bike onroad distance
	Bike	Bike offroad distance
	Bike	Bike time

DaySim Trips to EMME

Demand is assigned using the same time periods and market segments described in the earlier discussion of skimming. For roadways, it is proposed that for each time period a total of 21 classes will be assigned.

Transit assignment uses a single transit mode, with the DaySim determining whether transit is accessed by driving, and the EMME pathbuilder determining the specific modes and routes to which transit demand is assigned.

Table 4. PSRC Model Assignment Segments

Mode	Segment
Roadway (x12 time periods)	General Purpose/SOV, No Toll, VOT 1
	General Purpose/SOV, No Toll, VOT 2
	General Purpose/SOV, No Toll, VOT 3
	General Purpose/SOV, Toll, VOT 1
	General Purpose/SOV, Toll, VOT 2
	General Purpose/SOV, Toll, VOT 3
	HOV 2, No Toll, VOT 1
	HOV 2, No Toll, VOT 2
	HOV 2, No Toll, VOT 3
	HOV 2, Toll, VOT 1
	HOV 2, Toll, VOT 2

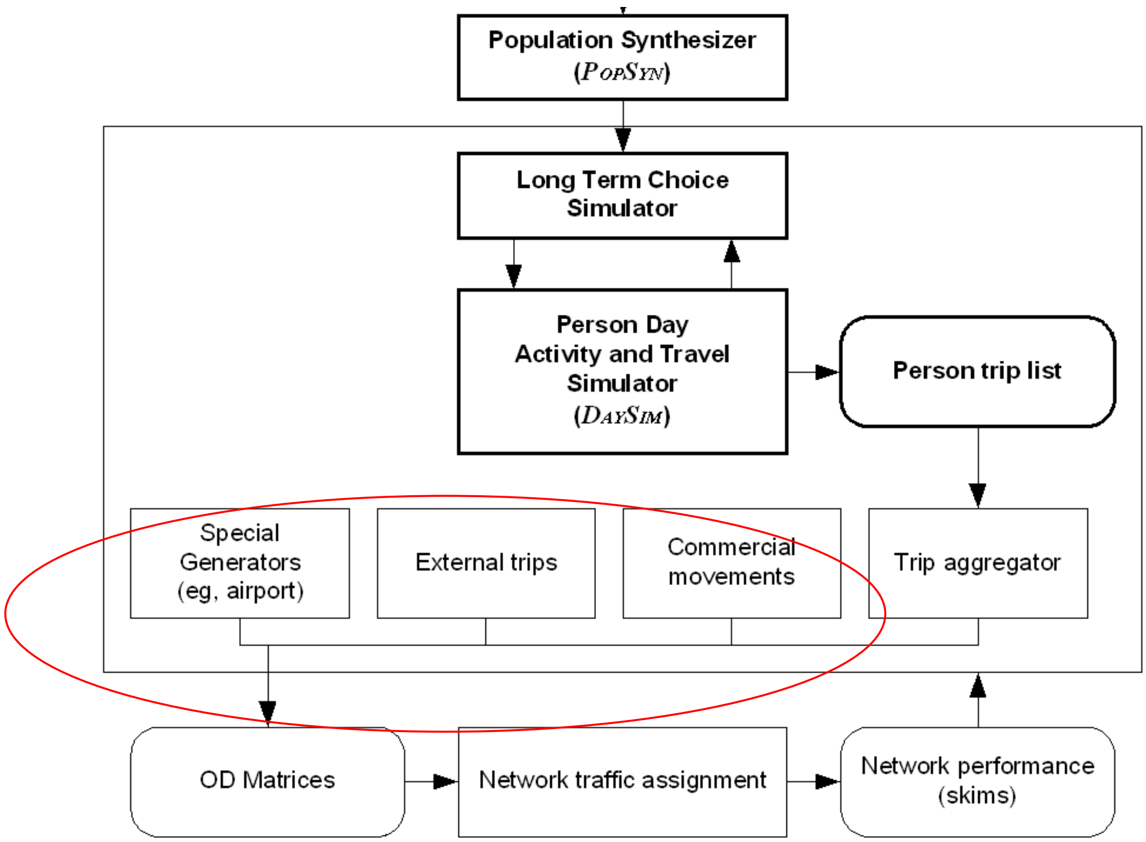
	HOV 2, Toll, VOT 3
	HOV 3+, No Toll, VOT 1
	HOV 3+, No Toll, VOT 2
	HOV 3+, No Toll, VOT 3
	HOV 3+, Toll, VOT 1
	HOV 3+, Toll, VOT 2
	HOV 3+, Toll, VOT 3
	Light Truck
	Medium Truck
	Heavy Truck
Transit (x5 time periods)	Generalized Transit

Supplemental Trip Modeling: External, Trucks, Special Generation, and Group Quarters

The following section depicts the supplemental trips that are added to the Daysim internal regular travel demand to build a full set of trips in assignment. The four types of trips, external, trucks, special generation, and group quarters are aggregated at the end of their processes, and then combined with Daysim trips. Cambridge Systematics designed PSRC's external trip modeling processes.

Each of the special model types have their own trip generation and trip distribution processes as traditionally performed in a four-step model. Then finally, they are factored by mode and time of day to match into the SoundCast assignment periods.

Figure 2. Supplemental Trips



External Modeling

External trips can be defined as three types of trips: 1) internal-external; 2) external-internal; and 3) external-external. Of these three types, the trip generation model estimates only the internal-external and external-internal trips

The external-external trip table is estimated from a separate source and added to the trip tables prior to trip assignment.

External trips were originally derived from an external survey conducted in 1970 that covered King, Pierce, and Snohomish county borders. These external trip tables have been updated over time, based on current traffic counts and cross-sound data.

Table 4. Internal-External and External-Internal Trips by Purpose

Trip Purpose	Trips
Home-Based Work	73,252
Home-Based College	4,137
Home-Based School	5,266
Home-Based Shop	37,760
Home-Based Other	103,678
Non-Home-Based (Total)	22,916
Total	**247,009**

External trips involve classifying external trips into three types of trips and two vehicle types, as follows:

- Internal-external trips by auto (I-E auto);
- External-internal trips by auto (E-I auto);
- External-external trips by auto (E-E auto);
- Internal-external trips by truck (I-E truck);
- External-internal trips by truck (E-I truck); and
- External-external trips by truck (E-E truck).

These classifications are made based on the origin and destination of trips traveling through external stations around the four-county region. Origins and destinations are defined based on whether they are inside or outside the region.

There are 18 external stations in the Puget Sound region. Through trips (classified as E-E trips) are those trips that begin and end outsid ethe region, but travel through the region at some point. These trips were originally created from an origin-destination survey conducted in 1961, and then updated in 1971 during a model update process. Since that time, the external trips have remained relatively constant, while the overall traffic at external stations has grown to match external station counts.

A through trip table is used to represent external-to-external trip interchange. Passenger through trips are those trips that begin and end outside the region, but travel through the region at some point. These trips were originally created from an origin-destination survey conducted in 1961, and then updated in 1971 during a model update process. Since that time, the external trips have remained relatively constant, while the overall traffic at external stations has grown.

SPECIAL GENERATORS

The use of special generators allows for the inclusion of trip activities that are difficult to replicate using general cross-classification or linear regression equations. The trips associated with these generators are established outside the four-step modeling process, but were evaluated using the *ITE Trip Generation Manual*. The PSRC model traditionally has included four special generators (Seattle Center, SoDo Sports Complex, SeaTac Airport, and Tacoma Dome). In addition, the FASTruck model generators for each of the major ports in the region (the Port of Seattle and the Port of Tacoma) and warehouse and distribution centers in the SR 167 corridor.

Table 5. Special Generators

Generator	Special Generation Trips	Daysim Regular Trips
Seattle Center	14,013	3,145
Exhibition Center	7,567	8,145
SeaTac Airport	101,838	15,941
Tacoma Dome	1,682	1,309

GROUP QUARTERS

Trip rates per student in college housing are derived from a university trip model developed for the University of Michigan. This is one of the few university trip models that are developed from household

survey data, including students. The results of this model indicate that there are 1.18 university trips per student on a daily basis. It is assumed that there is no work or school trips made by university trip students. Other trip purposes are assumed to be proportional to the regional average, but adjusted so that the total of non-university trip purposes matches the ITE trip generation rate for University Housing (ITE Code 550). The ITE total vehicle trip rate is 2.38 trips per student per day, converted to 3.14 person trips per student per day, using average regional auto occupancy of 1.32 persons per vehicle. The home-based college trips are held constant at 1.18 trips per student, so the total trip rate per person in college housing is 3.82 trips per person, compared to the regional average of 3.48 trips per person.

Proposed trip rates per person in military housing are derived from a special generator model developed for the MacDill Air Force Base inTampa Bay (Florida), and controlled to Institute of Transportation

Engineers (ITE) trip generation rates for military housing (ITE Code 501). Tampa Bay is one of the few military trip models that are developed by trip purpose. The ITE total vehicle trip rate is 1.78 trips per employee per day, converted to 2.35 person trips per employee per day, using average regional auto occupancy of 1.32 persons per vehicle. This is further converted to 2.97 person trips per unit per day, using a conversion factor of 1.27 employees to population rate in Fort Lewis. The results of this

model indicate that there are 2.97 trips per person from military housing on a daily basis, compared to the regional average of 3.48 trips per person.

Trip rates per person in retirement homes are derived from a retired person's model developed in Tucson (Arizona) and controlled to ITE trip generation rates for retirement homes (averaging ITE codes 250 through 253). Tucson is one of the few models that have retired persons trip rates developed by trip purpose from household survey data. The ITE average vehicle trip rate is 2.55 trips per unit per day, converted to 3.37 person trips per unit per day, using average regional auto occupancy of 1.32 persons per vehicle. This is further converted to 3.37 person trips per person per day, using a conversion factor of 1.0 person to unit rate. The results of this model indicate that there are 3.37 trips per person from retirement housing on a daily basis, compared to the regional average of3.48 trips per person.

Table 6. Group Quarters Trip Generation Rates

Trip Purpose	College Dormitories	Military Quarters	Retirement Homes	PSRC Regional Average for Household
Home-Based Work	-	0.37	0.10	0.60
Home-Based College	1.18	-	-	0.08
Home-Based School	-	-	0.03	0.29
Home-Based Shop	0.40	0.74	0.70	0.40
Home-Based Other	1.24	1.09	1.49	1.09
Non-Home-Based	1.00	0.76	1.04	1.03
Total	3.82	2.97	3.37	3.48

Table 7. Group Quarters Trips

County	College Dormitories	Military Quarters	Retirement Homes	Total
King	42,516	689	46,211	89,416
Snohomish	-	8,557	1,714	10,270
Pierce	10,537	19,657	13,850	44,044
Kitsap	267	6,423	11,423	18,113
Total	**53,321**	**35,324**	**73,198**	**161,843**
Percent of Total Regional Trips	0.5%	0.3%	0.6%	1.4%
Percent of Total Regional Population	0.4%	0.4%	0.7%	1.5%
Difference	0.1%	-0.1%	-0.1%	-0.1%

TRUCK MODEL

The PSRC truck model was derived from the *FASTrucks Forecasting Model*, developed in 2000 for the WSDOT. The truck model uses more disaggregate employment categories than the passenger model. The outputs of the truck model are truck trip tables for heavy-, medium-, and light-weight trucks. The light trucks are commercial vehicles that include light trucks and other nonpersonal-use vehicles.

Cambridge Systematics developed the FASTruck model23 for the WSDOT Office of Urban Mobility as part of a larger study for FAST Freight Mobility (Phase II) led by TranSystems. The FASTruck model was fully integrated with the PSRC regional travel model using the following techniques:

- Commercial vehicles in the PSRC model were deleted and replaced with light, medium, and heavy trucks estimated by the FASTruck model.
- Trip generation and distribution models were applied to estimate light ,medium, and heavy trucks. Trip rates were based on 10 categories of employment, which required stratification of existing employment into these categories.
- These truck trips were then converted to Passenger Car Equivalents (PCE) and assigned in a multi-class assignment with the drive alone and HOV trips in the PSRC passenger demand model.

The development of the truck model was based on using different forecasting methods for internal and external truck trips, because the factors that influence these truck trips are very different. In the case of the external trips, defined as those truck trips that begin and end outside the region, truck trips are affected by

economic factors beyond the region borders. In the case of the internal trips, defined as those truck trips that begin and end within the region, truck trips are affected by economic factors within the region borders. Truck trips that have either an origin or destination outside the region and a destination or origin inside the region are affected by both external and internal factors. These three types of truck trips are, therefore, estimated separately using unique methods for each type.

The truck model was developed using a base year of 1998 and a forecast year of 2020. These were updated to represent the base year of 2000. The truck model was integrated with the passenger model by using the same socioeconomic and network input data and by integrating EMME/2 macros for implementation.

Truck Types

The truck model defines a truck based on relative weight classes and separates light, medium, and heavy trucks for analysis purposes. Medium and heavy trucks are defined to match the definitions used for collecting truck counts by the

WSDOT. While these definitions rely primarily on weight, these categories also are loosely correlated to other defining characteristics of trucks for other purposes. The following general categories of trucks are used:

- Light trucks are defined as four or more tires, two axles, and less than 16,000 lbs. gross vehicle weight (this also includes non-personal use of carsand vans);
- Medium trucks are defined as single unit, six or more tires, two to four axles

and 16,000 to 52,000 lbs. gross vehicle weight; and

- Heavy trucks are defined as double or triple unit, combinations, five or moreaxles, and greater than 52,000 lbs. gross vehicle weight.

In these definitions, the medium trucks are directly correlated to single-unit trucks collected in the WSDOT truck counts, and heavy trucks are directly correlated to double- and triple-unit trucks in the counts. The truck counts do not separate light trucks from passenger cars, so there is no truck count data available for validating the light trucks in this model.24 Light trucks have been included in this analysis primarily, so that all vehicles are represented in the traffic assignments. Light trucks are intended to include all commercial vehicles that are not included in the medium- and heavy-truck categories. Commercial vehicles are not included in the non-home-based trip purpose model as these represent only noncommercial vehicles

The socioeconomic data used in the truck model are consistent with those data used in the passenger model, except that the employment data are stratified into more employment categories. This process provides more accuracy for truck travel and allows for a direct relationship between the commodities being estimated in the external trip model and the allocation of these commodities to TAZs within the region.

The stratification of employment data was provided by PSRC for the base year. The development of these data is not entirely consistent with socioeconomic data used in the passenger model, because there are confidentiality issues; and these data have not been cleaned to the same extent as the existing regional data. The confidentiality issues caused the two-digit SIC code employment data to generally underestimate the total employment, because some employment is not reported using this method. This comparison also demonstrates that there are certain kinds of manufacturing that are not included in the PSRC land use model; these are primarily construction and resources employment.

Table 8. Truck Employment data categories.

	Model Categories		SIC Codes	SIC Codes That Are Empty
	Truck	Passenger		
1	Agriculture/Forestry/ Fishing	Manufacturing	1-2,7-9	3, 4, 5, 6
2	Mining	Manufacturing	10,12-14	11
3	Construction	WTCU	15-17	18, 19
4	Manufacturing – Products	Manufacturing	20-29	
5	Manufacturing – Equipment	Manufacturing	30-39	
6	Transportation/ Communication/ Utilities (TCU)	WTCU	40-42, 44-49	
7	Wholesale	WTCU	50-51	
8	Retail Trade	Retail Trade	52-59	
9	FIRES	FIRES	60-67, 70, 72-73, 75-76, 78-81, 83-84, 86-89	68, 69, 71, 74, 77, 85
10	Education/Government	Education and Government	43, 82, 90-97	98, 99

Employment data in the current truck model excludes employment categories, where the employment location is different than the employer location, such as agriculture, mining, and construction. These categories were included in the development of employment data for the original truck model because they are important to the development of total truck trips. Full-time college employment was not included in the employment data for the FASTruck model, but was included in the PSRC and Seattle models.

In order to provide consistency and forecasting capabilities, a set of adjustment factors were developed that converts the passenger model employment datasetinto the truck model employment dataset.

Truck Model Parameters

The development of the truck model parameters and the data sources used are contained in the FASTruck model documentation. Relevant model parameters and assumptions used in the integration of the truck model with the passenger model are provided herein for reference.

Truck Trip Generation

Truck trip production rates for internal truck travel were developed separately for the three different truck types: light, medium, and heavy.

Table 9. Truck Generation Rates by Employment Category

Employment Category	Truck Type		
	Heavy	Medium	Light
Agriculture/Forestry/Fishing	0.1057	0.1457	1.2311
Mining	5.4488	7.6182	44.8093
Construction	0.0311	0.0451	0.2418
Manufacturing – Products and Equipment	0.0223	0.0277	0.2414
TCU	0.0404	0.0513	0.4754
Wholesale	0.0094	0.0181	0.1369
Retail Trade	0.0034	0.0063	0.0469
FIRES	0.0095	0.0193	0.1488
Education and Government	0.0078	0.0083	0.0903
Households	0.0076	0.0198	0.1620

Truck Special Generator Trips

Special generator trips were developed for the following three generators:

1. Port of Seattle;

2. Port of Tacoma; and

3. Warehouses and distribution centers in the SR 167 corridor.

In the case of the two ports, the port activities are included in several TAZs. All special generator truck trips from the ports are heavy trucks. Port truck trips were estimated by subtracting the truck traffic generated by existing employment in the zone from the total truck traffic expected in each TAZ.

Warehouse and distribution centers in the SR 167 corridor were estimated from a truck survey conducted in February 2006.

Truck External Trips

There are three primary types of external trips represented in the truck model: 1) trips that begin in Puget Sound region and leave the region; 2) trips that begin outside the region and are destined to someplace within Puget Sound region; and 3) trips traveling through the region. The primary source of data for these

trips is the TRANSEARCH commodity flow data for the year 1997, which is converted to truck trips. The Strategic Freight Transportation Analysis (SFTA)collected origin-destination data on commodity flow in 2001-2003 (same locations for each of four seasons) were used to update the TRANSEARCH data.

The TRANSEARCH data were converted from annual truck trips to daily truck trips by dividing by 264 days of operation per year. Since the TRANSEARCH data did not include all of the data needed to develop comprehensive truck trip tables, some adjustments were made to these sources to fill in the gaps in the data source.

Table 10. Truck External Trips

External Stations	TAZ	Total Trucks	Total External Volumes	Percent trucks
I-5 to Olympia	939	7,385	76,194	9.7%
SR 507 to Yelm	940	-	10,168	-
SR 7 to Morton	941	-	2,492	-
SR 706 to Longmire	942	-	2,408	-
SR 123 S of Cayuse Pass	943	-	1,157	-
SR 410 E of Chinook Pass	944	-	997	-
I-90 to Snoqualmie Pass	945	4,165	12,304	33.9%
SR 2 to Stevens Pass	946	427	3,008	14.2%
SR 92 to Monte Cristo	947	-	2,060	-
SR 530 N of Darrington	948	-	3,678	-
SR 9 N of Arlington	949	-	1,263	-
I-5 to Mount Vernon	950	4,253	48,966	8.7%
SR 530 N of Stanwood	951	-	4,346	-
SR 532 to Camano Island	952	28	20,058	0.1%
Mukilteo Ferry to Whidbey Island	953	20	7,682	0.3%
Hood Canal Bridge	954	114	17,033	0.7%
SR 3 to Belfair	955	15	12,809	0.1%
SR 302 to Shelton	956	149	3,369	4.4%
Total		**16,555**	**229,993**	**7.2%**

TRUCK TRIP DISTRIBUTION

The light, medium, and heavy trucks are distributed from origins to destinations using the gravity model technique. This is the same distribution method used in the auto passenger model. The friction factor curves were derived from the *Quick Response Freight Manual*[26] originally, and adjusted to provide the best fit with the average trip lengths from the origin-destination survey of trucks.[27] The re-calibration of the truck trip distribution model involved adjusting the truck trip friction factors to better match observed trip lengths identified in the SFTA.

These friction factors were developed using the following gamma functions:

- Light Trucks, Short Trips = {EXP(3.75-0.08 * "daily travel time"). max. 1};
- Medium Trucks, Short Trips = {EXP(4.75-0.05 * "daily travel time"). max. 1};
- Light Trucks, Long Trips = {EXP(2.1-0.005 * "daily travel time"). max. 1};
- Medium Trucks, Long Trips = {EXP(4.2-0.003 * "daily travel time"). max. 1};
- Light Trucks, Kitsap Pen. = {EXP(4.0-0.05 * "daily travel time"). max. 1};
- Medium Trucks, Kitsap Pen. = {EXP(5.0-0.10 * "daily travel time"). max. 1};
- Heavy Trucks, All Trips = {EXP(4.0-0.10 * "daily travel time"). max. 1};

TRUCK TIME OF DAY

Truck trip tables by type (light, medium, and heavy) are converted to truck trip tables by the five time periods using time period factors developed from the PSRC screenline counts for trucks.

Table 11. Truck Time-of-Day Factors

Time Period	Truck Type		
	Light	Medium	Heavy
A.M. Peak	19.4%	20.8%	20.9%
Midday	34.6%	41.7%	46.8%
P.M. Peak	24.0%	20.4%	18.9%
Evening	12.6%	9.5%	7.1%
Night	9.4%	7.6%	6.3%
Total	**100.0%**	**100.0%**	**100.0%**

TRUCK TRIP ASSIGNMENT

Multi-Class Assignments

Trip assignment of the truck trips was completed using an equilibrium highway assignment. Truck trips were assigned simultaneously with the passenger model, because congestion has a significant impact on travel times experienced by trucks. Truck trips are assigned separately by type using the multi-class

assignment technique for five vehicle types:

1. Single-occupant passenger vehicles;

2. High-occupant passenger vehicles;

3. Light trucks;

4. Medium trucks; and

5. Heavy trucks.

During model calibration of truck trip assignments, it became clear that trucks were not operating at the same speeds as autos and that this fact caused an overestimation of trucks on freeways, compared to arterials. As a result, a 25 percent factor on travel time for trucks traveling on freeways was included in the multi-class assignments of trucks.

Passenger Car Equivalents

This truck model was developed using a conversion of truck volumes to passenger car equivalents (PCE) for assignment purposes. This factor provides ameans to account for the fact that larger trucks take up more capacity on the roads than passenger cars. This model is important to determine the effects on

capacity and congestion for assignment of both trucks and passenger cars. The following assumptions were used:

- Light trucks are 1.0 PCE;
- Medium trucks are 1.5 PCEs; and
- Heavy trucks are 2.0 PCEs.