Bay Area/California High-Speed Rail Ridership and Revenue Forecasting Study

Statewide Model Networks

final

report

prepared for

Metropolitan Transportation Commission and the California High-Speed Rail Authority

prepared by

Cambridge Systematics, Inc.

with

Citilabs

August 2007

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Cambridge Systematics, Inc.
100 Cambridge Park Drive, Suite 400
Cambridge, Massachusetts 02140

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1.0 Introduction

This report documents the data structure and usage of the California Statewide Travel Model for High Speed Rail transportation networks developed for the Bay Area/California High-Speed Rail (HSR) Ridership and Revenue Forecasting Study. Data structure items discussed includes source and structure of input files, data dictionaries/attribute definitions, and naming conventions.

This report also discusses the networks used to develop air, auto, interregional conventional rail (CVR), and HSR travel times and costs (commonly known as skims). The companion report, *Bay Area/California High-Speed Rail Ridership and Revenue Forecasting Study Levels of Service Assumptions and Forecast Alternatives*, (Cambridge Systematics, Inc., with SYSTRA Consulting, Inc.; and Citilabs, August 2006) documents the levels-of-service assumptions used to define the statewide networks.

Four sections follow this introduction, one for each interregional line-haul mode included in the California Statewide Travel Model for High Speed Rail: highway, air, conventional rail, and high-speed rail. Each mode-specific section of this report contains a description of the files that comprise the network, a data-dictionary, and the files and methodology associated with the development of mode-specific skims. Several appendices contain supporting information such as term definitions, file contents, and mode definitions.

2.0 Highway Networks

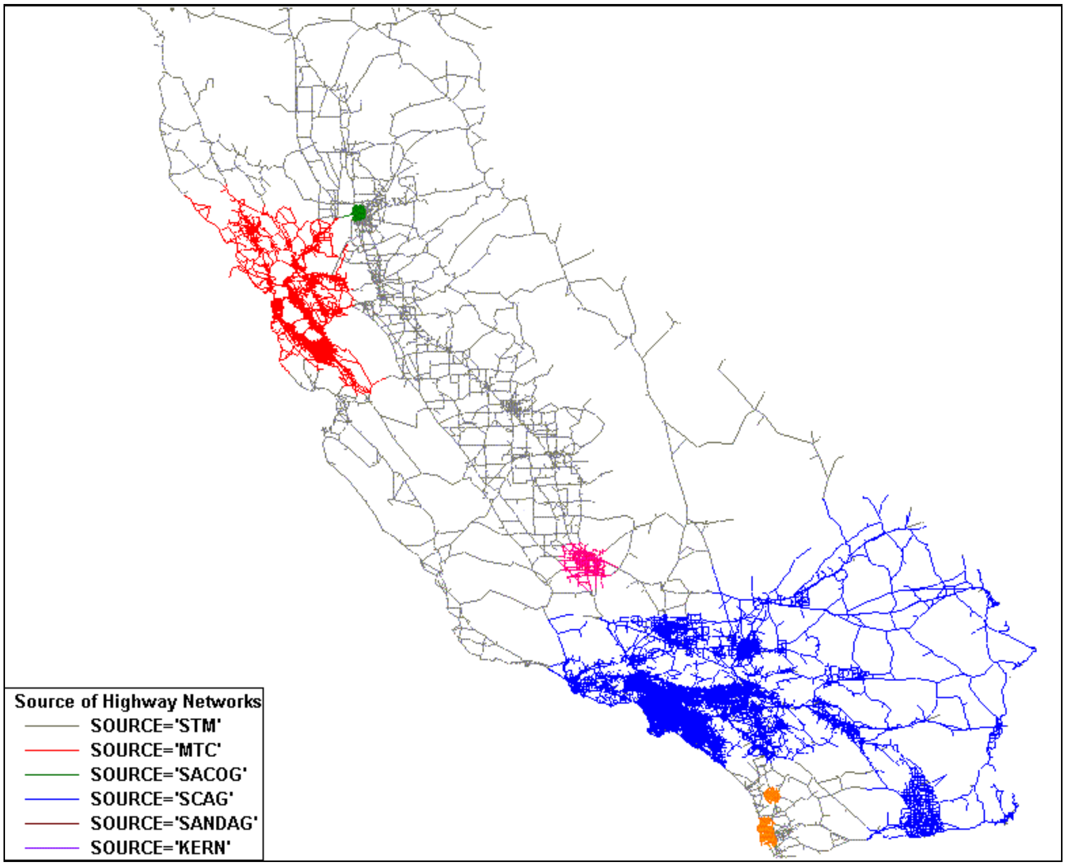
2.1 Network Development

The representation of highway network supply is primarily determined by the level of detail in the highway network and the attributes associated with the roadway system, such as lanes, distances, speed, and capacity. The highway network was developed from the prior statewide travel model previously developed by Caltrans. This network system consisted primarily of the state highway system and major arterials. The more detailed urban model networks were added to the California Statewide Travel Model for High Speed Rail, as follows:

- The entire Metropolitan Transportation Commission (MTC) region highway network;
- The entire Southern California Association of Governments (SCAG) region highway network;
- The San Diego Association of Governors Governments (SANDAG) region highway network was incorporated within a five-mile radius of the three proposed high-speed rail stations;
- The Sacramento Area Council of Governors Governments (SACOG) region highway network was incorporated within a five-mile radius of the proposed high-speed rail station; and
- The Kern County region, highway network was incorporated within a five-mile radius of the proposed high-speed rail station.

Figure 2.1 shows the highway network in the California Statewide Travel Model for High Speed Rail. The new highway network includes 4,667 zones, 169,728 links, and 205,952 nodes. This figure also shows the areas where network detail has been added.

Figure 2.1 New Statewide Model Highway Network



Roadway and area type classifications from the various regional models have been consolidated.

Tables 2.2 and 2.3 identify variables, attributes and data sources for model network links and nodes.

Table 2.1 Highway Network Descriptive Attributes – Links

Variable	Definition
A	A node
B	B node
SOURCE	Network Data Source: • STM – Statewide Model Networks • MTC – MTC Model Networks • SACOG – Model Networks • SCAG – SCAG Model Networks

	• SANDAG – SANDAG Model Networks • KERN – Kern County Networks
COUNTY	County FIPS Code
STREET_NAM	Street Name
PEAK_HR	Peak Hour Count
PEAK_MO	Peak Daily Count
COUNT	Average Daily Traffic Count One-Way
SCREENLINE	Caltrans Screenline
SCLN_LOCAT	Screenline Street Location
CNT_AADT	Average Daily Traffic Count Two-Way

Table 2.2 Highway Network Descriptive Attributes – Nodes

Variable	Definition
N	Node Number
N_Source	Node's number in its original network
SOURCE	Network Data Source: • STM – Statewide Model Networks • MTC – MTC Model Networks • SACOG – Model Networks • SCAG – SCAG Model Networks • SANDAG – SANDAG Model Networks • KERN – Kern County Networks
CO	County FIPS Code
CENTROID	Boolean variable for centroids
TAZ	Traffic analysis zone in which the node resides

Many of the network characteristics are different across the older statewide model and the four MPO models. Speed and capacity definitions by functional class and area type are different for each model. These values are based on local conditions in each region and modifications made during model validation. To take advantage of the work done in each region, values from the individual models were kept intact instead of developing a new lookup table based on area type and functional class. Tables 2.4 and 2.5 show the range of values for free-flow speed and capacity, respectively, by area type and roadway classification.

Table 2.3 Speeds (Miles per Hour) by Area Type and Functional Classification

		Area Type		
No.	Functional Class	Urban	Suburban	Rural
1	Freeway	55-65	60-70	60-70
2	Expressway	40-60	45-60	40-65
3	Major Arterial	30-50	35-60	40-60
4	Minor Arterial	20-50	25-50	25-55
5	Collectors	20-35	25-45	25-55
7	Ramps	20-45	20-45	35-40
8	Freeway-Freeway Connector	40-50	50-55	50-55

Table 2.4 Capacities (Per Lane per Hour) by Area Type and Functional Classification

		Area Type		
No.	Functional Class	Urban	Suburban	Rural
1	Freeway	1,750-2,100	1,750-2,100	1,950-2,100
2	Expressway	900-1,800	900-1,900	900-1,900
3	Major Arterial	800-1,800	800-1,900	800-1,900
4	Minor Arterial	700-1,800	700-1,800	700-1,800
5	Collectors	550-1,600	700-1,600	700-1,600
7	Ramps	500-1,600	600-1,600	1,250-1,600
8	Freeway-Freeway Connector	1,700-2,000	1,800-2,000	1,800-2,000

2.2 DATA DICTIONARY

The highway networks are comprised of three sets of files: highway networks, a parking cost/area type database, and skim matrices. Each of these sets of files are discussed in more detail below.

Highway network files include both unloaded (without assigned traffic volumes; used for skim development) and loaded (with assigned traffic volumes) versions.

Loaded networks are for peak and off-peak-periods. The labeling of the highway networks is:

- (HSR_NETWORK_{YEAR}.NET) for unloaded networks;
- and (HWY_LOAD_PEAK/OFFPEAK_EQUILIB_{YEAR}.NET) for loaded networks.

The input highway network contains 10 attributes (in addition the A and B node) necessary to complete both the traffic assignment and skimming process (noted in the third column). Table 2.6 summarizes all of the highway network attributes. The initial travel time variable (TIME_INIT) must be greater than zero in order for a congested speed to be calculated.

Table 2.5 Highway Network Attributes

Variable	Definition	Required for Assignment and Skims	Highway Assignment Input	Highway Assignment Output	Highway Skim Input
A	A node	x			
B	B node	x			
SOURCE	Network Data Source				
DISTANCE	Distance (miles)	x	x		x
LANES	Number of Lanes (in one direction)	x	x		
SPEED	Speed (miles per hour)	x	x		x
CAPACITY	Capacity (vehicles per lane per hour)	x	x		
FTYPE	Facility Type/Facility Type Code (see Table 2.8)	x	x		x
AREATYPE	Area Type	x			x
STREET_NAM	Street Name				
USE	Lane Use restrictions (see Table 2.9)	x	x		
TOLL	Reference to Tolling Location	x			x
TOLLVALUE	Toll in cents	x			x
TIME_INIT	Initial Travel Time (in minutes)		x		
COUNTY	County FIPS				
PEAK_HR	Peak Hour Count				
PEAK_MO	Peak Daily Count				
V_31	Volume for Assignment Time Period			x	

Table 2.6 Highway Network Attributes (continued)

Variable	Definition	Required for Assignment and Skims	Highway Assignment Input	Highway Assignment Output	Highway Skim Input
TIME_31	Congested Travel Time (in minutes) for Assignment Time Period			x	
VC_31	Volume-to-Capacity Ratio for Assignment Time Period			x	x
CSPD_31	Congested Speed (miles per hour) for Assignment Time Period			x	
VDT_1	Vehicle Miles Traveled				
VHT_1	Vehicle Hours Traveled				
V1_1	Volume from urban models			x	
V2_1	Volume from statewide model			x	
V3_1	Volume from interregional model			x	
VT_1	Volume in reverse direction			x	
V1T_1	Volume from urban models reverse direction			x	
V2T_1	Volume from statewide model reverse direction			x	
V3T_1	Volume from interregional model reverse direction			x	

Several network attributes for both links and nodes exist solely for informational and summary purposes. They are described in Table 2.7 and 2.8.

Table 2.6 Highway Network Descriptive Attributes – Links

Variable	Definition
A	A node
B	B node
SOURCE	Network Data Source: • STM – Statewide Model Networks • MTC – MTC Model Networks • SACOG – Model Networks • SCAG – SCAG Model Networks • SANDAG – SANDAG Model Networks • KERN – Kern County Networks
COUNTY	County FIPS Code
STREET_NAM	Street Name
PEAK_HR	Peak Hour Count
PEAK_MO	Peak Daily Count
COUNT	Average Daily Traffic Count One-Way
SCREENLINE	Caltrans Screenline
SCLN_LOCAT	Screenline Street Location

Table 2.7 Highway Network Descriptive Attributes – Nodes

Variable	Definition
N	Node Number
N_Source	Node's number in its original network
SOURCE	Network Data Source: • STM – Statewide Model Networks • MTC – MTC Model Networks • SACOG – Model Networks • SCAG – SCAG Model Networks • SANDAG – SANDAG Model Networks • KERN – Kern County Networks
CO	County FIPS Code
CENTROID	Boolean variable for centroids

TAZ	Traffic analysis zone the node resides in

Table 2.8 through Table 2.11 describe the lane use definitions, functional classifications, area types, and toll values that are referenced in the prior paragraphs and tables. The lane use definitions shown in Table 2.8 describe car pool and truck lane restrictions. The functional classifications shown in Table Table 2.9 describe the roadway types used in the highway assignment to assign different congested travel time functions. The area types described in Table 2.11 are used to calculate terminal and intrazonal times.

A toll is assessed if a path crosses a link with a TOLL attribute value greater than zero. Although California bridge tolls are assessed in one direction, modeled tolls are assessed in both directions to eliminate issues with toll avoidance in the non-toll direction. Tolls are simply divided in two and assessed in both directions within the model. The resulting toll values shown in Table 2.10 are hard coded in the script.

Table 2.8 Lane Use Definitions (USE)

Lane Use Code	Definition
1	No restrictions
2	Shared ride two and above
3	Shared ride three and above
4	No trucks

Table 2.9 Functional Classifications (FTYPE)

FTYPE	Functional Class
1	Freeway
2	Expressway
3	Major Arterial
4	Minor Arterial
5	Collectors
7	Ramps
8	Freeway-Freeway Connector

Table 2.10 Toll Values per Direction (2000 and 2030)

TOLL Attribute	Location	Cost
1	Benicia/Martinez	\$1.50
2	Carquinez	\$1.50
3	Richmond-San Rafael	\$1.50
4	Golden Gate	\$2.50
5	San Francisco-Oakland Bay Bridge	\$1.50
6	San Mateo-Hayward	\$1.50
7	Dumbarton	\$1.50
8	Antioch	\$1.50

The parking cost and area-type database (PARKING_COST.DBF) lists the TAZs with their area-type and parking cost. This database is static and is not calculated dynamically from the input socioeconomic data file.

A definition of the area types is provided below in Table 2.11. “People per square mile” is taken to be the maximum of either the residential or employment population of the zone.

Table 2.11 Area Type Definitions

Area Type	Area Type Number	People Per Square Mile
Central Business District	1	Over 20,000

Urban	2	10,001 to 20,000
Small Urban	3	6,001 to 10,000
Suburban	4	1,001 to 6,000
Rural	5	1,000 or Less

A logarithmic regression model predicted the parking cost of small urban, urban, and central business district TAZs. Suburban and Rural zones are assumed to have free parking. A daily parking cost is assessed on the destination zone of the highway skim and is assumed to be constant, without respect to the duration of the activity. The logarithmic regression parameters were estimated using zonal employment as a predictor and assuming a minimum parking cost of five dollars per day.

$$ParkingCost_{Zone_i} = \max(3.827 * Ln(Employment_i) - 16.354, 5)$$

Intrazonal tolls and parking costs are set to zero.

2.3 HIGHWAY SKIMS

Three level-of-service parameters are skimmed from the loaded highway networks for both the peak and off-peak time periods. Skims include congested travel times, distances and costs (including tolls, parking and auto operating costs). A skim is a link value summed up for all the links on a path between each origin and destination.

Congested Travel Time

Peak and off-peak highway travel-time skims are the sum of the minimum congested travel times[1] and terminal times. The congested travel times are based on the peak and off-peak multi-user class highway assignments. While highway assignment is done with multiple user classes (drive alone, shared-ride-two, shared-ride-three, and truck), only a single value (the equivalent of shared-ride-three – or zero-restrictions) for all users is skimmed from the network. The peak assignment period is the sum of the three-hour a.m. and three-hour p.m. peak-periods (for a total of six periods). The off-peak-period is assumed to be 10 hours. The time period of the assignment is used to calculate the total capacity for a given road for that time period. To prevent unrealistically slow travel times

[1] In its current application, input highway travel time skims are static and based on all-or-nothing highway assignments refined to produce congested travel times consistent with the Bureau of Public Roads formula.

that can occur when using static assignment, a minimum congested speed is imposed of 10 mph in the peak and 12 miles per hour in the off-peak. The congested travel-time is calculated based on the Bureau of Public Roads formula[2] after imposing the minimum travel speed.

Terminal times are added to the congested travel time to get the total congested travel time skim. Auto terminal represent the average time to access one's vehicle at each end of the trip. The California Statewide Travel Model for High Speed Rail uses the same terminal times as the prior statewide model. They are based on the area type of the trip ends and are assessed at both the origin and destination of the trip (see Table 2.13).

Table 2.12 Auto Terminal Times

Area Type	Origin Terminal Time (minutes)	Destination Terminal Time (minutes)
Central Business District	2	5
Urban	1	2
Small Urban	1	1
Suburban	1	1
Rural	1	1

Intrazonal travel times are calculated as a portion of the average travel time to the three closest zones. The portion varies with the area type of the zone (2/3 for the Central Business District; ½ for urban areas, 1/3 for small urban and suburban areas and ½ for rural areas). This methodology is consistent with the prior California statewide model.

Auto Distance

Travel distance skims are based on an uncongested travel-time skim, and are therefore static in nature. This static nature prevents trips between a particular origin-destination pair from switching between using the "short" travel models and "long" travel models among model iterations (see the *California High-Speed Rail Model Validation Report*).

Costs

The California Statewide Travel Model for High Speed Rail includes auto operating costs, tolls and parking costs. Both the tolls and parking costs are calculated directly in the skimming process for a given origin-destination pair.

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[2] $Time_{congested} = Time_{freeflow} * (1 + 0.15(Volume / Capacity))^4$

The auto operating cost for an origin-destination pair is calculated on a distance-basis.

The auto operating cost is assumed to be 16 cents per mile in 2000 and 20 cents per mile in the 2030 "base" scenarios, and is assumed to include both fuel and non-fuel costs. These values are consistent with those used in the MTC 2005 Regional Transportation Plan. All costs are represented in 2005 dollars. The 2030 "high-end" scenarios use an auto-operating cost of 30 cents per mile. The auto operating cost per mile can be changed in the control file input (calhsrmod.ctl) to the compiled trip frequency, destination choice, and mode choice executable part of the model and is not part of the skimming process.

The tolls are summed up for the chosen path for each origin-destination pair according to what is coded in the TOLL and TOLLVALUE attributes in the network (see Table 2.11). The parking cost is taken from the parking cost and area-type database entry associated with the destination-end TAZ. The parking cost is added to the value of toll and the sum output as one table in the LOS skim matrix.

3.0 Air Networks

3.1 Network Development

Fifty-seven airport to airport pairs had non-stop commercial intrastate air traffic in both 2000 and 2005. To capture this travel, the California Statewide Travel Model for High Speed Rail includes a total of 18 commercial airports. Airport-to-airport pairs that required a connecting flight within California were not considered. Air level of service information, including gate-to-gate travel time, fares, and reliability, are based on averages of Federal Aviation Administration data obtained from the 10 percent ticket sample, supplemented with Internet queries in August, 2006. Future year air service was assumed to be the same as 2005. These data, which are included in the network information described below, were documented in the *Bay Area/California High-Speed Rail Ridership and Revenue Forecasting Study Level-of-Service Assumptions and Forecast Alternatives Report (August, 2006)*

Figure 3.1 shows the location of all the airports included in the California Statewide Travel Model for High Speed Rail network. They include Arcata (ACV), Sacramento (SMF), Oakland (OAK), San Francisco (SFO), San Jose (SJC), Modesto (MOD), Monterey (MRY), Fresno (FAT), Bakersfield (BFL), Santa Barbara (SBA), Oxnard (OXR), Burbank (BUR), Los Angeles (LAX), Ontario (ONT), Santa Ana (SNA), Palm Springs (PSP), and San Diego (SAN). Airports that are not included did not have significant interregional non-stop commercial service within the state.

Figure 3.1 Airport Locations in Network

3.2 DATA DICTIONARY

This section discusses the files that represent the air networks and level of service from airport-to-airport. The air network is comprised of five files:

1. Airport reference database file (in dBASE4 format);
2. Transit Background network file with geographically located airport nodes and links connecting the airport nodes to the highway network at appropriate access points;
3. Citilabs CUBE PUBLIC TRANSPORT line files representing the headway and gate-to-gate travel time for commercial air service;
4. Airport-to-airport Fare Matrix; and
5. Level-of-service Database file (in dBASE4 format) containing the peak and off-peak fare, gate-to-gate travel time, headway, and reliability for each airport to airport pair[3].

[3] In the most recent model applications peak and off-peak service were assumed to be the same. However, the data structure allows them to differ in the future if desired.

The year 2000 and 2005 values used for the headway, gate-to-gate travel time, fares, and reliability are based on averages of Federal Aviation Administration data obtained from the 10 percent ticket sample, supplemented with Internet queries in August, 2006.

Airport Reference Data File

The airport reference data file AIRPORTS.DBF serves as a lookup table for the airport number (used in the fare matrix and the level of service database file), the node number (used in the transit background network and the line file), and the closest associated TAZ (used when associating the access egress skims to that airport). Information contained in this file is in Table A.1 of Appendix A.

Transit Background Network – Representation of Airports

The transit[4] background network, TMP_PT.NET, contains all the transit nodes and transit access links in addition to the up-to-date highway network (described in Section 2.0). Airports are each represented in the network by a single node and a connecting link. The node number of the airport is equal to the airport number plus 18,500 (The airport reference data file AIRPORTS.DBF serves as a lookup table for the airport number (used in the fare matrix and the level of service database file), the node number (used in the transit background network and the line file), and the closest associated TAZ (used when associating the access egress skims to that airport). Information contained in this file is in Table A.1 of Appendix A.

For example, Santa Ana is airport number 2, and its node number is 18502. The airport node has only one attribute other than its x and y coordinates and that is 'AIRZ', which refers to the airport's fare zone number. In all cases the fare zone number is the same as the airport number (so AIRZ for the Santa Ana airport is 2).

An airport connecting link exists between the airport node and the highway node (in Figure 3.2 18502-140894). They all have the following attributes and values:

DISTANCE = 0.01 miles

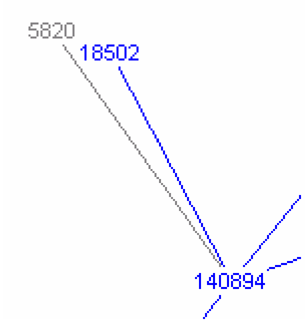
SPEED = 20 mph

FACILITY = AIR ACCESS

TIME_INIT = 0.1

[4] Note that the term "transit" is used here because this is how the Citilabs CUBE software treats the air mode.

Figure 3.2 Air Background Network



Airport to Airport Fare Matrix

The one-way fares of each airport-to-airport pair are defined in the airport-to-airport fare matrix, AIR.MAT. The row number refers to the airport number of the origin airport and the column number of the destination airport. The fares are represented in 2005 dollars. The values used for airfares can be found in the *Level-of-Service Assumptions and Forecast Alternatives Report.*

Public Transport Line File

Service between airports is represented by a Citilabs CUBE PUBLIC TRANSPORT transit line in the file "AIR_{YEAR}.LIN" where {year} is replaced by the year being evaluated. Service is coded in each direction, so each airport pair has two transit lines, one in each direction. The line file attributes are shown in Table 3.1

Table 3.1 Air Line File Attributes

NAME	Surrounded by quotes this should be the origin airport code followed by a hyphen and the destination airport code
MODE	The mode for air is 4
OPERATOR	The operator number for air is 143.
XYSPEED	This should be a number greater than zero. In this case it is set to a default value of 300; however the speed is not used in determining the travel time because the travel time is "hard-coded" into the line file using the attribute TIME.
ONEWAY	This should be set to true or "T"
HEADWAY[1]	The headway for this service during headway period 1. Headway period 1 is the peak-period. In its current application the air level-of-service is expected to remain constant throughout the day; therefore the same level of service is used for the peak time period (headway period

	1) and off-peak time period (headway period 2).
N=,TIME=,N=,	Represents the origin and destination airport nodes with the time it takes to get from one to the other in the middle.

The file airlos.dbf contains information about the level-of service between airport pairs. This file contains six fields:

1. Origin airport number;
2. Destination airport number;
3. One-way airfare;
4. Air service headway;
5. Airplane in-vehicle time; and
6. Air service reliability.

This information is identical to that found by combining data from the airline files, and airfare files, with the addition of a reliability value. The reliability also is calculated based on the 10 Percent FAA sample used to derive other level of service data. Values for the assumed level of service for air can be found in the *Levels-of-Service Assumptions and Forecast Alternatives Report*.

3.3 AIR SKIMS

For each time period, there are two files that comprise the total "air skim" for a total of four files:[5]

1. AIR_PEAK_STOPS.MAT;
2. AIR_OFFPEAK_STOPS. MAT;
3. AIRPORT_TO_AIRPORT_PEAK. MAT; and
4. AIRPORT_TO_AIRPORT_OFFPEAK. MAT.

These four files should reside in the air skims folder for the modeling scenario at the conclusion of running the airport skimming process. Three additional files should be in the same folder in order to commence the interregional travel model executable (which does the application of the trip frequency, destination choice, and mode choice models):

1. AIRPORTS.DBF (the same as discussed in the skim inputs);

[5] In its current application, the peak and off-peak air skims are assumed to be the same, so only two unique files are created. They are then copied and renamed to become the other time period.

2. PEAK_ACCESS_EGRESS.MAT; and
3. OFFPEAK_ ACCESS_EGRESS.MAT.

Best Path Skim for Air Trips

The matrix files AIR_PEAK_STOPS and AIR_OFFPEAK_STOPS have the same format and are created in the same way. They are the result of a TAZ-to-TAZ "best-path" skimming process for the Air mode and contain two tables for each TAZ-to-TAZ pair. The first table indicates the airport node that should be accessed from the origin TAZ, and the second table indicates the airport node that should be used on the destination end. Each airport node has a TAZ associated with it, which is found from airport.dbf (Table A.1) and is used to find the access/egress skims. The number used to represent the airport in the table is the "airport node" (which is equal to 18500 plus the "airport number").

For example, the OD pair 784 to 3040 has a value of 18511 for the access airport node and 18508 for the egress airport node. Each airport node has a TAZ associated with it, which is found from airport.dbf (Table 6.1) and is used to find the access/egress skims. This means that the best path air trip from TAZ 784 to 3040 involves the following path:

- An access trip from TAZ 784 to TAZ 1755 (which is Monterey, according to Table 6.1);
- A flight from Airport 11 (Monterey) to Airport 8 (San Francisco); and
- An egress trip from node TAZ 3239 to TAZ 3040.

The access and egress trip skims are found in {PEAK/OFFEAK}_ACCESS_EGRESS.MAT. The information about the flight between airports is found in AIRPORT_TO_AIRPORT_{PEAK/OFFPEAK}.mat.

Path Building Assumptions

The following assumptions were made in determining the "best path" air skims:

- All available local transit modes in the system as well as auto and walk could be used to access and egress airports;
- The maximum distance for auto access was assumed to be 100 miles, the same assumption that was made for high-speed rail;
- Air would not be used if the access and egress distances to and from the airport are greater than the distance it would take to drive between the origin and destination;
- Air would not be used if the "best path" origin airport and destination airport are the same; and
- Air would not be used if the distance between the origin TAZ and destination TAZ is less than 100 miles and the access or egress distance is greater than 25 miles.

Airport to Airport Level of Service

The airport to airport level of service skims (AIRPORT_TO_AIRPORT_PEAK.MAT and AIRPORT_TO_AIRPORT_OFFPEAK.MAT) are a direct conversion of the air level of service input DBF file (AIRLOS.DBF). The formats of these matrices are the origin airport number to the destination airport number, resulting in an 18 by 18 matrix. It contains four tables:

1. Fare, the one-way airfare;
2. Headway, the average time between flights;
3. In-vehicle time, the average time to get from one airport gate to the other; and
4. Reliability, the percent of time that the flight arrives within one hour of its scheduled arrival time.

Note, these level-of-service characteristics come directly from AIRLOS.DBF, not from any other input file. Therefore, if an airfare or air level-of-service change needs to be made; it must be made in both the air network files (such as AIR.MAT and the airline files) as well as AIRLOS.DBF. Separate AIRLOS.DBF files exist for the 2000 base year and the future year (which is based on 2005 LOS).

4.0 Conventional Rail Skims

4.1 Network Development

The California Statewide Travel Model for High Speed Rail includes interregional conventional rail (CVR) service for the San Joaquin, Altamont Commuter Express (ACE), Capitol Corridor, Pacific Surfliner, and Metrolink (Oceanside line) for a total of 85 stations. Many other rail lines operate at an intraregional level and are included as available access modes to the interregional service. These intraregional links include BART, Caltrain, Metrolink, MUNI metro, the Sacramento LRT, and others. All CVR services in the California Statewide Travel Model for High Speed Rail are shown in Figure 4.1. This section focuses on the CVR networks and skims.

Figure 4.1 Conventional Rail in Network

Level-of-service characteristics for CVR were determined in several ways. Station-to-station conventional rail fares are the per-ride cost of a multiride ticket (typically 10 to 20 ride tickets), where offered. Exceptions are the Pacific Surfliner and San Joaquin routes, where one-way ticket costs are used. Interregional in-vehicle time and headways are from 2000 and 2005 service schedules. Reliability measures were estimated for each interregional line based on available on-time performance data. The *Levels-of-Service Assumptions and Forecast Alternatives Report* details this methodology and all assumed levels of service for both the base and future years.

4.2 DATA DICTIONARY

This section discusses the files that represent the CVR networks and level-of-service from interregional rail station to interregional rail station. The CVR networks are composed of six types of files:

1. CVR Station reference database file (in dBASE format);
2. Transit Background network file with geographically located CVR nodes and links connecting the CVR nodes to the highway network at appropriate access points;
3. CVR Network file with geographically located CVR nodes and stations for determining station-to-station levels of service;
4. Citilabs CUBE PUBLIC TRANSPORT line files representing the headway and station-to-station travel times for CVR service;
5. Station-to-station fare matrices for:
   a. Metrolink;
   b. Pacific Surfliner;
   c. Altamont Commuter Express;
   d. Capitol Corridor; and
   e. San Joaquins.
6. CVR Reliability database.

Interregional Conventional Rail Station Reference Database File

The CVR station reference database file (CVR_STATIONS.DBF) contains a list of all the CVR stations with their station number, node number, and closest TAZ. This file must be manually updated for any stations that are added. Table A.2 in Appendix A lists the contents of the file.

Transit Background Network – Representation of Interregional Conventional Rail Stations

The transit background network, TMP_PT.NET, contains all the transit nodes and transit access links in addition to the highway network (described in Section 2.0). Conventional rail stations are each represented in the network by a single node and a connecting link. See Table 6.2 for a listing of the conventional rail node numbers, stations, and station numbers (this information also is contained in the reference database file CVR_STATIONS.DBF). For example conventional rail station number 1 has a node number of 19781. In addition to their x and y coordinates, CVR nodes have attributes for their fare zones (see Table 6.2 for a list). An access link is coded between the conventional rail station node and the highway node (in Table 6.2 19781-8011). It has the following attributes and values:

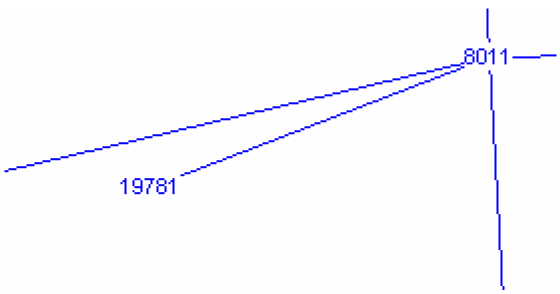
DISTANCE = 0.01 miles

SPEED = 20 mph

FACILITY = Rail Access

TIME_INIT = 0.1

Figure 4.2 Conventional Rail in Transit Background Network



Interregional Conventional Rail Network

A network consisting of only conventional rail nodes and stations is used to calculate the station to station in vehicle time and composite headways. The network contains two nodes per CVR station: 1) the station (numbered 1 through 85), and 2) the conventional rail node. Table A.2 in Appendix A provides a correspondence between the two. One additional node, node number 99, also is coded into the network and is used as a "pass-through" node. Both the station and the corresponding conventional rail node are geographically located in the same spot. In addition to their x and y coordinates, the station nodes have attributes of their fare zones (see Table A.2 for a list).

There are two types of links in the network: 1) Access links between the station and the conventional rail node, and 2) links between the conventional rail node and the pass-through node. Both links are two-way and have the following attributes:

FACILITY: CVR

TIME_INIT: 0.1

DISTANCE: 0.25

SPEED: 25

Public Transport Line Files

Three Citilabs CUBE PUBLIC TRANSPORT line files comprise the CVR service:

- ACE_SJQ_CAP.LIN (Altamont Commuter Express, San Joaquin, and Capitol Corridor lines);
- Pacsurf.tpl (Pacific Surfliner); and
- Metrolink_Orange.lin (Metrolink Orange).

A description of each part of the line file is in Table 4.1. The first part of each line defines the name, mode, operator number, and service headways. The second part lists the station nodes where the train stops as well as the time it takes to travel between them.

Table 4.1 Interregional Conventional Rail Line File Attributes

NAME	The mode number, line name, and direction
MODE	The mode number, defined in Table 7.1.
OPERATOR	The operator number, defined in Table 7.2 lists the transit operators available in the model.
XYSPEED	This should be a number greater than zero. In this case it is set to a default value of 27; however the speed is not used in determining the travel time because the travel time is "hard-coded" into the line file using the attribute TIME.
ONEWAY	This should be set to true or "T"
HEADWAY[1]	The headway for this service during headway period 1. Headway period 1 is the peak-period. HEADWAY[2] represents the assumed headway for the off-peak time period
N=,TIME=,N=,	Represents the origin and destination airport nodes with the time it takes to get from one to the other in the middle.

The values used for travel times and peak and off-peak headways can be found in *the Levels-of-Service Assumptions and Forecast Alternatives Report.*

Interregional Conventional Rail Fare Matrices

The one-way fares of each CVR station pair within a single line are defined in their corresponding fare matrix (shown in Table 4.2). The row number refers to the fare zone number of the origin station and the column number the fare zone number of the destination station. These are the origin and destination within a *single line.* Note that if multiple lines are taken, the fares are added together.

The fare zone for each CVR line is a node attribute for all CVR stations in both the Transit Background Network and the CVR Network. The fare zone attribute names, zone-to-zone fare matrix name, and their associated CVR lines are shown below in Table 4.2.

Table 4.2 Interregional Conventional Rail Fare Zones

Conventional Rail Line	Zone-to-Zone Fare Matrix Name	Fare Zone Node Attribute
Metrolink Orange Line	Metrolink.mat	MLKZ
Pacific Surfliner	PacSurf.mat	PACZ
Altamont Commuter Express	ACE.mat	ACEZ
Capitol Corridor	Capitol.mat	CAPZ
San Joaquins	SJQ_Fare.mat	SJQZ

The fares are represented in 2005 dollars. The values used for airfares can be found in the *Levels-of-Service Assumptions and Forecast Alternatives Report.*

Reliability Database

The CVR reliability is stored in a database (CVR_RELIABILITY.DBF) that has the origin station number, destination station number and the reliability of that station pair, represented to the nearest percent. The reliability is the percent of time that the arrival at the destination station is within an hour of the scheduled arrival time. The reliability by line is documented in the *Levels-of-Service Assumptions and Forecast Alternatives Report.* If a station pair spans more than one line (requires a transfer) the portion with the worst reliability is used.

4.3 CONVENTIONAL RAIL SKIMS

There are two files that comprise the total "conventional rail skim" for each time period for a total of four files:

1. CVR_PEAK_STOPS.MAT;
2. CVR_OFFPEAK_STOPS. MAT;
3. CVR_STATION_TO_ STATION_PEAK. MAT; and
4. CVR_STATION_TO_ STATION_OFFPEAK. MAT.

These four files should reside in the cvr skims folder for the modeling scenario at the conclusion of running the CVR peak and off-peak skimming processes. Three additional files should be in the same folder in order to commence the California Statewide Travel Model for High Speed Rail executable (which does the application of the trip frequency, destination choice, and mode choice models):

1. CVR_STATIONS.DBF (the same as discussed in the skim inputs);
2. PEAK_ACCESS_EGRESS_CVR.mat; and
3. OFFPEAK_ACCESS_EGRESS_CVR.mat.

Best Path Skim for Interregional Conventional Rail Trips

The matrix files CVR_PEAK_STOPS and CVR_OFFPEAK_STOPS have the same format and are created in the same way. They are the result of a TAZ-to-TAZ "best-path" skimming process for the CVR mode and contain two tables for each TAZ-to-TAZ pair. The first table indicates the CVR station node that should be accessed from the origin TAZ, and the second table indicates the CVR station node that should be used on the destination end. Each CVR node has a TAZ associated with it, which is found from CVR_STATIONS.DBF (Table 6.2) and is used to find the access/egress skims. The number used to represent the conventional rail station in the table is the "conventional rail node" (see Table 6.2 for a list).

For example, the OD pair 191 to 3001 has a value of 18605 for the access conventional rail node and 33049 for the egress conventional rail node. Each CVR node has a TAZ associated with it, which is found from CVR_STATIONS.DBF (Table 6.2) and is used to find the access/egress skims. This means that the best path trip from TAZ 191 to 3001 involves the following path:

- An access trip from TAZ 191 to TAZ 886;
- A train ride from station 11 to station 20; and
- An egress trip from node TAZ 3991 to TAZ 3001.

The access and egress trip skims are found in {PEAK/OFFPEAK}_ACCESS_EGRESS.MAT. Information about train trips between stations are found in CVR_STATION_TO_STATION_{PEAK/OFFPEAK}.MAT.

Path Building Assumptions

The following assumptions were made in determining the "best path" conventional rail skims:

- All available transit modes in the system as well as auto and walk could be used to access and egress CVR stations;
- The maximum auto access distance was assumed to be 50 miles – half the amount assumed for high-speed rail and air;
- Conventional rail would not be used if the auto access time was greater than in-vehicle time;
- Conventional rail would not be used if the "best path" origin station and destination station were the same;
- Conventional rail would not be used if the distance between the origin TAZ and destination TAZ is less than 100 miles and the access or egress distance is greater than 25 miles;
- Conventional rail would not be used if the drive access plus drive egress time is greater than the time it would take to drive from the origin TAZ to the destination TAZ; and
- Conventional rail would not be used if the number of transfers on interregional lines was greater than two.

Conventional Rail Station-to-Station Level of Service

The CVR station-to-station level of service skims (CVR_STATION_TO_STATION_PEAK.MAT and CVR_STATION_TO_STATION_OFFPEAK.MAT) are created from skimming only CVR service line files on the conventional rail only network from each station to every other station. The resulting skim matrix format are the origin conventional rail station number to the destination conventional rail station number, resulting in an 85 by 85 matrix. It contains four tables:

1. Fare, the one-way fare in 2005 dollars;
2. Headway, calculated as the maximum of the transfer headway (if applicable) and initial headway;
3. In-vehicle time, the average time to get from one conventional rail station to another; and
4. Reliability, the percent of time that the flight arrives within one hour of its scheduled arrival time.

The fare, headway, and in-vehicle time are outputs from the skimming process. The reliability is a direct conversion of the file CVR_RELIABILITY.DBF, discussed in the previous section.

5.0 High-Speed Rail Networks

5.1 Network Development

The California Statewide Travel Model for High Speed Rail was used to test two base scenarios of high-speed rail and 35 additional network and alignment alternatives. A total of 48 high-speed rail stations were coded into the model networks; however, every station was not used in each alternative. Additionally, several sensitivity tests were conducted that varied the level of service. The base level of service for this study had 30 percent more service than was assumed in the 2000 Operating Plan.

Figure 5.1 General High-Speed Rail Network

5.2 DATA DICTIONARY

This section discusses the files that represent the high-speed rail networks and level-of-service from high-speed rail station to high-speed rail station. The interregional high-speed rail networks are composed of six types files:

1. High-Speed Rail Station reference database file (in dBASE format);
2. Transit background network with geographically located high-speed rail nodes and links connecting the high-speed rail nodes to the highway network at appropriate access points;
3. High-Speed Rail Network with geographically located high-speed rail nodes and stations for determining station-to-station levels of service;
4. Citilabs CUBE PUBLIC TRANSPORT line files representing the headway and station-to-station travel times for high-speed rail service;
5. Station-to-station fare database for high-speed rail; and
6. High-Speed Rail Reliability database.

High-Speed Rail Station Reference Database File

The high-speed rail station reference database file (HSR_STATIONS.DBF) contains a list of all the high-speed rail stations with their station number, node number, and closest TAZ. This file must be manually updated for any stations that are added. The high-speed rail node number is equal to the high-speed rail station number plus 200,000 (see Table A.3 in Appendix A for a list).

Transit Background Network – Representation of High-Speed Rail Stations

The transit background network, TMP_PT_HSR.NET, contains all the transit nodes, transit access links, high-speed rail nodes, and high-speed rail access links, superimposed on an up-to-date highway network (described in Section 2.0). High-speed rail stations are each represented in the network by a single node and a connecting link. See Table A.3 for a listing of the high-speed rail node numbers, stations, and station numbers (this information also is contained in the reference database file HSR_STATIONS.DBF). In addition to their x and y coordinates, high-speed rail nodes have an attribute ("HSRZ") for their fare zones, which is equal to the high-speed rail station number. An access link is coded between the high-speed rail station node and the highway node that the station is to be accessed from (in Figure 5.2 this is link 25999-200001). All access links have the following attributes and values:

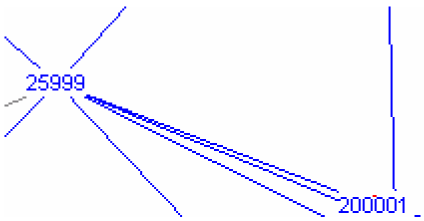
DISTANCE = 0.01 miles

SPEED = 20 mph

FACILITY = HSR Access

TIME_INIT = 0.1

Figure 5.2 High-Speed Rail Station in Background Network



High-Speed Rail Network

A network consisting of only high-speed rail nodes and stations is used to calculate the station to station in-vehicle times, fares and composite headways. The network contains two nodes for each high-speed rail station: 1) the high-speed rail station (numbered 1 through 48), and 2) the high-speed rail node. Table A.3 in Appendix A provides a correspondence between the two attributes. One additional node, node number 99, also is coded into the network and is used as a "pass-through" node. Both the station and the corresponding high-speed rail node are geographically located in the same spot.

There are two types of links in the network: 1) Access links between the high-speed rail station and the high-speed rail node, and 2) links between the high-speed rail nodes and the pass-through nodes. Both link types are two-way and all have the following attributes:

FACILITY: HSRZ

TIME_INIT: 0.1

DISTANCE: 0.25

SPEED: 20

Public Transport Line Files

The high-speed rail Citilabs CUBE PUBLIC TRANSPORT line file dictates the location and amount of high-speed rail service in the scenario. There are service-types for high-speed rail lines:

1. **Express Service –** Stops only in San Diego, Los Angeles/Union Station, Sacramento, Bernal (if using Altamont Pass), San Jose (if using Pacheco Pass) and the final Bay area destination;
2. **Semi-Express Service –** A few more stops than express service;
3. **Suburban-Express Service –** Stops in major suburban stops around the major metropolitan areas in addition to the downtown stops;

4. **Regional Service –** goes across metropolitan areas; and
5. **Local Service –** Stops at every station along its path.

There are five basic routes for high-speed rail service:

1. San Diego to/from Sacramento;
2. San Diego to/from Bay Area;
3. Orange County to/from Sacramento;
4. Orange County to/from Bay Area; and
5. Sacramento to/from Bay Area.

Other variations may occur depending on the scenario. The service types are further detailed in the *Levels-of-Service Assumptions and Forecast Alternatives Report.*

A description of each part of the line file is in Table 5.1. The first part of each line defines the name, mode, operator number, and service headways. The second part lists the station nodes where the train stops as well as the time it takes to travel between them.

Table 5.1 High-Speed Rail Line File Attributes

NAME	The abbreviated service type (Express, Semi-Express, Suburban, Regional, or Local), the abbreviated starting place, and ending place.
MODE	The mode number, always 144 for high-speed rail
OPERATOR	The operator number, always 144 for high-speed rail
XYSPEED	This should be a number greater than zero. In this case it is set to a default value of 10; however the speed is not used in determining the travel time because the travel time is "hard-coded" into the line file using the attribute TIME.
ONEWAY	This should be set to true or "T." All service is coded separately in each direction.
HEADWAY[1]	The headway for this service during the a.m. and p.m. peak time period.
HEADWAY[2]	The headway for this service during the off-peak time period.
N=,TIME=,N=,	Represents the origin and destination high-speed rail nodes with the time it takes to get from one to the other in the middle.

TRail simulation software (run by PB), determined the values used for station-to-station high-speed rail travel times. The operating plan determined the service headways. *The Levels-of-Service Assumptions and Forecast Alternatives Report* lists the resultant the station-to-station service levels for the base cases.

High-Speed Rail Fare Database

The one-way fares of each high-speed rail station pair within a single line are defined in a database with a column for the origin station number, destination station number, and the one-way fare (in 2005 dollars). Fares are comprised of a single boarding fee plus a distance-based fare. Section 2 of the *Levels-of-Service Assumptions and Forecast Alternatives Report* provides further details on the high-speed rail fare assumptions for the base cases.

Reliability Database

The high-speed rail reliability is stored in a database (HSR_RELIABILITY.DBF) consisting of the origin station number, destination station number and the reliability of that station pair, represented to the nearest percent. At this time, the reliability of all high-speed rail trips is assumed to be 99 percent. The reliability assumptions are documented in *the Levels-of-Service Assumptions and Forecast Alternatives Report.*

5.3 HIGH-SPEED RAIL SKIMS

There are two files that comprise the total high-speed rail skim for each of two time periods – a total of four files:

1. HSR_PEAK_STOPS.MAT;
2. HSR_OFFPEAK_STOPS. MAT;
3. HSR_STATION_TO_ STATION_PEAK. MAT; and
4. HSR_STATION_TO_ STATION_OFFPEAK. MAT.

These four files should reside in the HSR skims folder for the modeling scenario at the conclusion of running the high-speed rail peak and off-peak skimming processes. Three additional files should be in the same folder in order to commence the California Statewide Travel Model for High Speed Rail executable (which does the application of the trip frequency, destination choice, and mode choice models):

1. HSR_STATIONS.DBF (the same as discussed in the skim inputs);
2. PEAK_ACCESS_EGRESS.MAT; and
3. OFFPEAK_ACCESS_EGRESS.MAT.

Best Path Skim for High-Speed Rail Trips

The matrix files HSR_PEAK_STOPS and HSR_OFFPEAK_STOPS both have the same format and are created in the same way. They are the result of a TAZ-to-TAZ "best-path" skimming process for the high-speed rail mode and each contain two tables for each TAZ-to-TAZ pair. The first table indicates what high-speed rail station should be accessed from the origin TAZ, and the second table indicates what high-speed rail station should be used on the destination end. The number used to represent the high-speed rail station in the table is the "high-speed rail node" (see Table 6.3 for a list).

For example, the OD pair 3001 to 568 has a value of 200001 for the access high-speed rail node and 200025 for the egress high-speed rail node. Each HSR node has a TAZ associated with it, which is found from HSR_STATIONS.DBF (or Table 6.3) and is used to find the access/egress skims. This means that the best path trip from TAZ 3001 to 568 involves the following path:

- An access trip from TAZ 3001 to TAZ 3014;
- A train ride from station 1 to station 25; and
- An egress trip from node TAZ 6137 to TAZ 568.

The access and egress trip skims are found in {PEAK/OFFPEAK}_ACCESS_EGRESS.MAT. Information about train trips between stations are found in HSR_STATION_TO_STATION_{PEAK/OFFPEAK}.MAT.

Path Building Assumptions

The following assumptions were made in determining the "best path" high-speed rail skims:

- All available local transit options in the system as well as auto and walk can be used to access and egress high-speed rail stations;
- The maximum distance for auto access to high-speed is assumed to be 100 miles (the same distance as air);
- High-speed rail will not be used if the auto access or auto egress time is greater than in-vehicle time;
- High-speed rail will not be used if the "best path" origin station and destination station are the same;
- High-speed rail will not be used if the distance between the origin TAZ and destination TAZ is less than 100 miles and the access or egress distance is greater than 25 miles; and
- High-speed rail will not be used if the drive access plus drive egress time is greater than the time it would take to drive from the origin TAZ to the destination TAZ.

High-Speed Rail Station-to-Station Level of Service

The high-speed rail station-to-station level of service skims (HSR_STATION_TO_STATION_PEAK.MAT and HSR_STATION_TO_STATION_OFFPEAK.MAT) are created from skimming only high-speed rail service line files on the high-speed rail only network from each station to every other station. The resulting skim matrix format is the origin high-speed rail station number to the destination high-speed rail station number, resulting in a 48 by 48 matrix. It contains four tables:

1. Fare, the one-way fare;
2. Headway, calculated as the maximum of the transfer headway (if applicable) and initial headway;
3. In-vehicle time, the average time to get from one high-speed rail station to another; and
4. Reliability, the percent of time the train is within one hour of scheduled arrival.

The fare, headway, and in-vehicle time are outputs from the skimming process. The reliability is a direct conversion of the file HSR_RELIABILITY.DBF, discussed in the previous section.

Appendix A

Table A.2 Airport Node, Station, and TAZ Numbers

Airport	Airport Code	Airport Number	Airport Node	TAZ
San Diego	SAN	1	18501	1176
Santa Ana	SNA	2	18502	5820
Long Beach	LGB	3	18503	686
Los Angeles	LAX	4	18504	582
Ontario	ONT	5	18505	6137
Burbank	BUR	6	18506	5111
San Jose	SJC	7	18507	3434
San Francisco	SFO	8	18508	3239
Oakland	OAK	9	18509	3874
Sacramento	SMF	10	18510	973
Monterey	MRY	11	18511	1755
Oxnard	OXR	12	18512	1602
Palm Springs	PSP	13	18513	896
Santa Barbara	SBA	14	18514	1372
Arcata	ACV	15	18515	261
Bakersfield	BFL	16	18516	2044
Fresno	FAT	17	18517	1940
Modesto	MOD	18	18518	2294

Table A.3 Interregional Conventional Rail Node, Station, and TAZ Numbers

Station Number	Station Node	TAZ
1	19781	2202
2	19783	2214
3	19741	2241
4	33107	3324
5	33043	3416
6	33041	3537
7	33042	3545
8	33108	3718
9	33106	3739
10	33044	3774
11	19605	886
12	19722	889
13	19626	1635
14	19719	1660
15	33043	3416
16	33041	3537
17	33044	3774
18	33046	3829
19	33048	3967
20	33049	3991
21	33050	4014
22	33051	4057
23	33054	4092
24	33055	4262
25	19723	6203
26	19635	1918
27	19770	1971
28	19620	2074
29	19673	2091
30	19671	2132
31	19665	2184
32	19740	2245
33	19675	2313
34	19759	2315
35	19652	2045
36	33048	3967
37	33049	3991
38	33051	4057
39	33054	4092

Table A.2 Interregional Conventional Rail Node, Station, and TAZ Numbers (continued)

Station Number	Station Node	TAZ
40	33058	4189
41	19723	6203
42	19609	6624
43	153410	652
44	153430	871
45	153431	874
46	191111	1223
47	153470	5337
48	153475	5341
49	153514	5475
50	153411	5753
51	153412	5881
52	153433	5902
53	153504	5905
54	153434	5975
55	153432	5995
56	19748	871
57	19654	875
58	19753	1209
59	19697	1223
60	19742	1322
61	19647	1324
62	19726	1367
63	19745	1368
64	19727	1376
65	19623	1379
66	19763	1589
67	19738	1597
68	19618	1614
69	19698	1615
70	19724	4928
71	19625	5054
72	19767	5073
73	19614	5116
74	19641	5601
75	19657	5625
76	19638	5753
77	19603	5881
78	19746	5902
79	191115	1209
80	191111	1223

Table A.3 Interregional Conventional Rail Node, Station, and TAZ Numbers (continued)

Station Number	Station Node	TAZ
81	191113	1216
82	191114	1212
83	191116	4622
84	191117	1180
85	191118	4768

Table A.4 High-Speed Rail Station, Node, and TAZ Numbers

Station Name	Station Number	HSR Node	TAZ
San Francisco - Transbay	1	200001	3014
Millbrae	2	200002	3240
Redwood City	3	200003	3316
San Jose	4	200004	3538
Gilroy	5	200005	3707
Oakland – 7th St.	6	200006	3985
Oakland Airport	7	200007	3895
Union City	8	200008	3801
Dublin/Pleasanton	9	200009	3730
Sacramento	10	200010	6514
Stockton	11	200011	2244
Tracy DT	12	200012	2269
Modesto	13	200013	2294
Merced	14	200014	2145
Fresno	15	200015	1918
Bakersfield	16	200016	6607
Palmdale	17	200017	5030
Sylmar	18	200018	5164
Burbank	19	200019	5130
Los Angeles Union Station	20	200020	5344
Norwalk	21	200021	5468
Anaheim	22	200022	5881
Irvine	23	200023	5995
East San Gabriel Valley	24	200024	5728
Ontario	25	200025	6137
Riverside	26	200026	6036
Temecula	27	200027	6072
Escondido	28	200028	4587
University City	29	200029	4667
San Diego	30	200030	4819
Visalia	31	200031	342
Los Banos	33	200033	2133

Table A.3 High-Speed Rail Station, Node, and TAZ Numbers

Station Name	Station Number	HSR Node	TAZ
Livermore DT	34	200034	3722
Bernel/680	35	200035	3739
Shinn	36	200036	3778
Morgan Hill	37	200037	3702
City of Industry	38	200038	5728
Warm Springs	39	200039	3752
Modesto (Briggsmore)	40	200040	2313
Greenville/UPRR	41	200041	3715
San Francisco – King St.	42	200042	3109
Palo Alto	43	200043	3356
Tracy ACE	44	200044	2280
Livermore/I-580	45	200045	3715
Greenville Rd/I-580	46	200046	3715
Oakland – 12th St	47	200047	3969
Castle AFB	48	200048	2144

Appendix B

The following table lists all the transit modes that are presently in the California Statewide Model for High-Speed Rail. The air, intercity conventional rail, high-speed rail modes are all considered "main modes" in the model. The remaining modes are used for access or egress to/from the main modes.

Table B.5 Transit Mode List

Mode Number	Mode Name	Mode Category
3	Rail Transit	Intercity Conventional Rail
10	West Berkeley	Bus
11	BWS	Bus
12	Emery	Bus
13	Stanford Shuttles	Bus
14	Caltrain Shuttles	Bus
15	VTA Shuttles	Bus
16	Palo Alto/Menlo Park	Bus
17	Wheels Ace Shuttles	Bus
18	Amtrak Shuttles	Bus
19	Fairfield Transit	Bus
20	MUNI Metro	LRT
21	MUNI Cable Cars	LRT
22	MUNI Richmond Dist	Bus
23	MUNI Mission Bayshore	Bus
24	MUNI Other	Bus
26	SamTrans Express	Bus
27	SamTrans Coastal	Bus
28	SamTrans N_Bayside	Bus
29	SamTrans S_Bayside	Bus
30	SamTrans Intercity	Bus
31	SCVTA-LRT	LRT
32	SCVTA-Local	Bus
33	SCVTA-Limited	Bus
34	SCVTA-Express	Bus
35	DB X	Bus
37	AC Transbay	Bus
38	AC Local North	Bus
39	AC Local South	Bus
40	AC Fremont/Newark	Bus
41	AC BRT	Bus
42	Wheels-Dublin	Bus
43	Wheels-Pleasanton	Bus
44	Wheels-Livermore	Bus
45	Wheels-Intercity	Bus
47	Union City	Bus

Table B.1 Transit Mode List (continued)

Mode Number	Mode Name	Mode Category
49	AirBART	Bus
51	CCTA-Local	Bus
52	CCTA-Express	Bus
54	Tri-Delta	Bus
56	WestCAT	Bus
57	ML30Z	Bus
59	Vallejo-Local	Bus
60	Vallejo-BARTLink	Bus
62	Fairfield-Local	Bus
63	Fairfield-CityLink	Bus
64	Fairfield-BARTLink	Bus
65	American Canyon	Bus
66	Vacaville	Bus
68	Benicia	Bus
70	NVT	Bus
71	Vine	Bus
73	Sonoma-Local	Bus
74	Sonoma-Intercity	Bus
75	Valley of the Moon	Bus
76	Santa Rosa	Bus
78	Petaluma	Bus
80	GGT SF	Bus
81	GGT SF Ferry Feeder	Bus
82	Ferry Feeder	Bus
83	GGT Marin/Sonoma	Bus
84	GGT Richmond	Bus
90	East Bay Ferries	Ferry
91	GGT Larkspur Ferry	Ferry
92	GGT Sausalito Ferry	Ferry
93	Tiburon Ferry	Ferry
94	Vallejo Ferry	Ferry
95	Harbor Bay Ferries	Ferry
100	BART	Urban Rail
101	Caltrain	Urban Rail
102	Amtrak-Capitol	Intercity Conventional Rail
103	Amtrak-SJQ	Intercity Conventional Rail
104	ACE	Intercity Conventional Rail
105	Amtrak-NWP	Intercity Conventional Rail
106	Amtrak-Tri-Valley	Intercity Conventional Rail
107	Oak Airport LRT	LRT
108	SACOG RT Light Rail	LRT
109	SACOG RT Bus	Bus
110	SACOG Yolobus commuter Lines	Bus
111	SACOG Yolobus regular lines	Bus
112	SACOG Roseville commuter Service, El Dorado transit commuter lines	Bus

Table B.1 Transit Mode List (continued)

Mode Number	Mode Name	Mode Category
113	SACOG Folsom Commuter Service	Bus
114	SACOG Folsom stage lines	Bus
115	SACOG Placer County Transit, El Dorado transit local lines	Bus
116	SACOG UNITRANS	Bus
117	KERN Bakersfield Bus Transit	Bus
118	SCAG mode 6	Bus
119	SCAG mode 7	Bus
120	SCAG mode 8	Bus
121	SCAG Metrolink OTHER	Urban Rail
122	SCAG Metrolink ORANGE	Intercity Conventional Rail
123	SCAG Local MTA	Bus
124	SCAG Express MTA	Bus
125	SCAG Urban Rail	Urban Rail
126	SCAG LA Express	Bus
127	SCAG Local Foothill	Bus
128	SCAG Local LA1	Bus
129	SCAG Local LA2	Bus
130	SCAG Local Inglewood	Bus
131	SCAG Local non-LA	Bus
132	SCAG Other Express	Bus
133	SCAG HSR	Bus
134	SCAG Rapid Bus	Bus
135	SANDAG Commuter Rail	Urban Rail
136	SANDAG Light Rail	LRT
137	SANDAG Regional BRT(YelloW)	Bus
138	SANDAG Regional BRT(Red)	Bus
139	SANDAG Limited Express	Bus
140	SANDAG Express	Bus
141	SANDAG Local	Bus
142	Amtrak_STM	Intercity Conventional Rail
143	Air	Air
144	High-Speed Rail	High-Speed Rail
200	Walk Access	Non-Transit
300	Auto Access	Non-Transit
400	Walk Egress	Non-Transit
500	Walk Transfers	Non-Transit
600	Drive Egress	Non-Transit

Table B.6 Transit Operator List

Transit Operator Number	Transit Operator Name
1	MUNI
2	MUNI Cable Cars
3	SamTrans
4	SamTrans Express
5	VTA
6	VTA Express
7	DBX
8	AC Transit
9	AC Transbay
10	WHEELS
11	Union City Transit
12	AirBART
13	CCTA
14	CCTA Express
15	Tri-Delta
16	WestCAT/ML30Z
17	Vallejo Transit
18	Vallejo BARTLink
19	Fairfield Transit
20	American Canyon
21	Vacaville
22	Benicia Transit
23	NVT and Vine
24	Sonoma County Transit
25	Valley Of The Moon
26	Santa Rosa
27	Petaluma Transit
28	Golden Gate Transit
29	East Bay Ferries
30	Golden Gate Ferries
31	Tiburon Ferry
32	Vallejo Ferry
33	Harbor Bay Ferry
34	BART
35	Caltrain
36	Amtrak
37	ACE
38	Shuttles
39	West Berkeley
108	SACOG RT Light Rail
109	SACOG RT Bus
110	SACOG Yolobus commuter Lines
111	SACOG Yolobus regular lines
112	SACOG Roseville commuter Service, El Dorado transit

Table B.2 Transit Operator List (continued)

Transit Operator Number	Transit Operator Name
113	SACOG Folsom Commuter Service
114	SACOG Folsom stage lines
115	SACOG Placer County Transit, El Dorado transit local lines
116	SACOG UNITRANS
117	KERN Bakersfield Bus Transit
118	SCAG OPERATOR 6
119	SCAG mode 7
120	SCAG mode 8
121	SCAG Metrolink OTHER
122	SCAG Metrolink ORANGE
123	SCAG Local MTA
124	SCAG Express MTA
125	SCAG Urban Rail
126	SCAG LA Express
127	SCAG Local Foothill
128	SCAG Local LA1
129	SCAG Local LA2
130	SCAG Local Inglewood
131	SCAG Local non-LA
132	SCAG Other Express
133	SCAG HSR
134	SCAG Rapid Bus
135	SANDAG Commuter Rail
136	SANDAG Light Rail
137	SANDAG Regional BRT(YelloW)
138	SANDAG Regional BRT(Red)
139	SANDAG Limited Express
140	SANDAG Express
141	SANDAG Local
142	STM-Amtrak Rail
143	AIR
144	High-Speed Rail