4: FUTURE TRAVEL DEMAND

This chapter describes the methodology for determining future travel demands for the 2020 horizon year for the Richland Citywide Transportation Plan. Travel forecasts consider the land development plans within the greater Tri-City area and existing and committed transportation systems. The forecasts are evaluated to assess 2020 performance conditions, and locations within the city that fall below identified performance standards which are flagged for potential solutions. The needs and alternative solutions for each travel mode is analyzed in detail in Chapter 6 through 10 of this document.

Approach and Methodology

The 2020 travel forecasts were prepared using a refined version of the BFCG regional travel demand model that was originally developed for the Regional Transportation Plan. The refinements were made to improve the forecasts for city streets, and to ensure that the assumptions for street improvements and land use developments were consistent with the 2020 plan. The refinements focused on:

- Representing the city's major street system that is planned to be in place by 2020, and
- Reviewing assumed land use growth within the city limits.

As a part of this study process, the study area street network was refined and verified to ensure that it reflects the RTP Financially Constrained projects list for motor vehicles. The RTP incorporates many other system improvements for other modes, but only the motor vehicle improvements are explicitly considered in making travel forecasts. The refinements generally focused on the number of travel lanes, posted travel speeds, and the type of traffic controls at major intersections. The assumed street network was consistent with the Motor Vehicle projects included in the Benton-Franklin Council of Governments Regional Transportation Plan under the Financially Constrained scenario. The motor vehicle projects that were included in the 2020 base analysis for the citywide study are discussed and listed later in this chapter.

Future Land Use

Land use is a key factor in developing a functional transportation system. The amount of land that is planned to be developed, the type of land uses, and how the land uses are mixed together have a direct relationship to expected demands on the transportation system. Understanding the amount and type of land use is critical to taking actions to maintain or enhance transportation system operation.

Projected land uses were developed for the greater Tri-Cities area during the latest RTP update. The land use assumptions within Richland were reviewed to ensure that they reasonably reflected year 2020 development per the city's adopted Comprehensive Plan. Complete land use data sets were developed for the following conditions:

- Existing 2001 Conditions (base travel forecast for the region)
- Year 2010 Conditions
- Year 2020 Conditions

In order to calculate the future population and employment base for the Richland study area, Richland was broken into 43 sectors called "traffic analysis zones" (TAZ's), which are shown in Figure 4-1. 2001 was considered the base year and population and employment numbers were then forecasted, based on vacant and developable land, in conjunction with the comprehensive plan, in each TAZ for 2010 and 2020.

Table 4-1 gives a summary of anticipated growth for the City of Richland based on the RTP land use forecasts. Jobs were expected to grow at a much faster rate than households, most notably in the Horn Rapids Industrial area located west of Stevens Drive and north of SR 240. In the region as a whole (area covered by the BFCG model), households are projected to grow at a similar rate to Richland, however, jobs are projected to grow at a much slower rate (about 20-22 percent over the planning horizon). A detailed review was made of the initial RTP employment forecasts for the Horn Rapids Industrial Area, and the initial estimate of 11,700 was downgraded to 8,300 for the 2020 horizon used in this study. The reduction of 3,400 employees was incorporated into the 2020 travel forecasts used for this study.

Table 4-1: City of Richland Land Use Projections

Land Use	2001	2020	Increase	Percent Increase
Households	15,682	21,276	+5,594	36%
Employment (RTP)	20,791	34,209	+13,418	65%
Employment (Revised)	20,791	30,809	+10,018	48%

Hanford Reservation Employment Assumptions

The Hanford Reservation Site is the largest employer in the region. According to the land use assumptions in the BFCG model,[1] the base year total employment associated with Hanford is 16,107 employees. This is expected to increase to 17,535 by 2010 and 20,832 by 2020.

One component of the worker activity in the Hanford Reservation is the tank waste remediation project that is expected to be operational in 2007. According to the RTP, employment associated with the construction and operation of this facility peaks[2] this year at 4,500 workers, and it will decline to a low of 200 workers in 2011. The reduction of 4,300 workers within the Hanford Reservation has been assumed in the 2020 land use and travel forecasts used in this study.

Travel Forecast Adjustments

Travel model forecasts are adjusted to account for differences between the base year

[1] *Regional Transportation Plan for the Tri-Cities Metropolitan Area and the Benton-Franklin-Walla Walla RTPO, 2001-2020*, Table 6.1 – Land Use Categories. The employment totals noted include LU9: Hanford Outer Area, and LU10: Hanford Inner Area.

[2] Benton-Franklin Council of Governments, *Regional Transportation Plan*, November 2001, page 2-5

model forecasts and actual traffic counts. This adjustment is done to determine plan horizon year traffic volumes. A growth increment is calculated by subtracting the base year model from the future year model, the difference is factored (based on the number of years of growth) and result is added to existing traffic volumes. For example, the land use projections in Table 4-1 account for 19 years of growth (2020 minus 2001). Traffic counts in 2003 capture a portion of this growth. Therefore, the growth increment is factor by 17/19ths to proportionately reduce the total growth. The resulting growth is added to base year traffic counts to determine the 2020 horizon year forecasts.

Table 4-2: Richland Land Use by Traffic Analysis Zone

TAZ	2001 Households	2001 Employment	2010 Households	2010 Employment	2020 Households	2020 Employment
5	0	1251	0	3395	0	2799
6	0	287	0	885	0	1450
8	251	39	553	44	835	49
10	26	46	26	46	26	46
11	2	755	2	1219	2	1361
14	250	42	306	125	383	164
15	698	275	1234	1247	1676	1680
17	236	0	500	0	819	0
18	50	106	176	347	302	507
19	0	30	0	30	0	30
20	0	0	0	0	0	0
21	702	50	747	111	795	128
22	468	45	850	74	1246	93
23	923	169	1245	237	2081	288
24	884	77	1086	146	1290	194
29	1	327	1	612	2	946
30	333	1100	333	1726	333	2063
32*	156	3102	233	4128	311	4050
33*	0	2485	0	2830	0	2979
34	701	1410	701	1460	701	1510
35	510	43	510	43	510	43
36	265	2	265	2	265	2
37	473	27	473	38	484	38
38	652	75	652	75	652	75
39	770	7	770	12	770	12
40	368	0	368	3	368	3
41	516	349	536	349	556	349
42	539	64	539	64	539	64
43	488	2390	488	2503	488	2561
44	543	18	543	18	543	18
45	706	0	706	0	706	0
46	596	108	596	108	596	108
47	459	61	459	61	459	67
48	505	9	505	12	505	13
49	0	3568	0	3568	0	3568
50	85	183	85	183	85	183

TAZ	2001 Households	2001 Employment	2010 Households	2010 Employment	2020 Households	2020 Employment
51	1	947	1	983	1	1048
52	105	68	210	166	315	388
53	485	5	485	10	485	15
54	385	151	385	173	385	215
55	471	587	471	587	471	587
56	16	497	16	707	16	1079
57	430	36	430	36	430	36
171	325	0	335	0	345	0
172	308	0	423	0	500	0

Source: Benton-Franklin Council of Governments Travel Demand Model for 2000, 2010 and 2020 with adjustments for reduced employment in the Horn Rapids Industrial Park Area. Refer to Figure 4-1 for location and boundaries of Traffic Analysis Zones (TAZ).

* - TAZ's that are part of the Hanford Reservation Site.

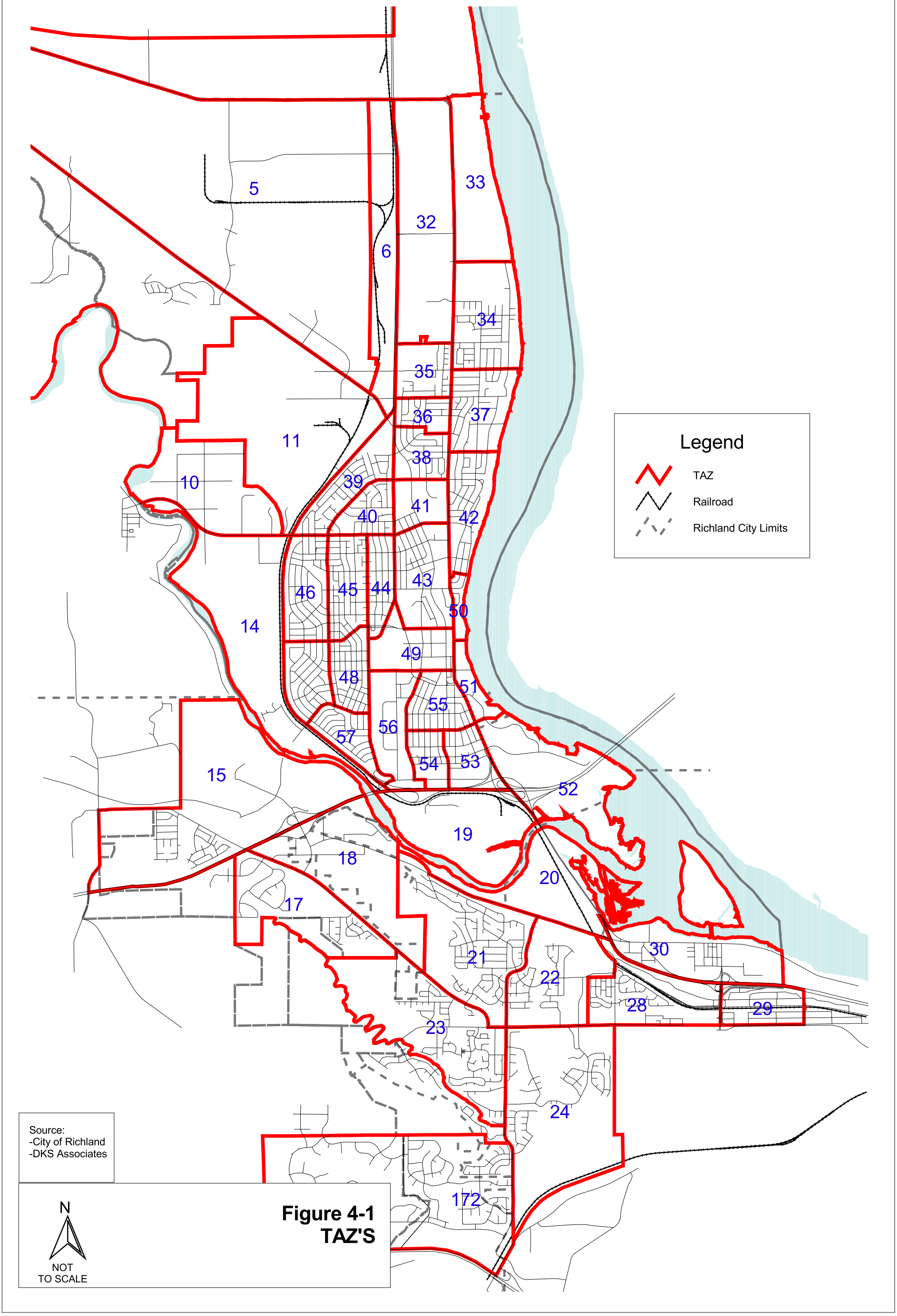

Figure 4-1
TAZ'S

Future (2020) System Assumptions

The Benton Franklin Council of Governments (BFCG) regional travel demand forecast model was used to determine future (2020) traffic volumes for the City of Richland. The 2020 base model assumed RTP programmed improvements as a base case scenario. The improvements that are located within the City of Richland and have an impact on motor vehicle roadway capacity are listed in Table 4-3. Other projects in the area (i.e. adjacent cities and counties) are included as listed in the RTP (see appendix for detail). These other projects could have impact on travel behavior within Richland.

Table 4-3: RTP Projects Included in Future (2020) Travel Demand Modeling

Project	Estimated Cost ($1,000s)	Model Updates
Center Parkway from Tapteal to Gage: Construct 3 lane road	$500	Included in model
First Street from George Washington Way to Stevens: Widen existing street	900	Included in model
Traffic Signal-GWW and Knight	200	Intersection control updated
Traffic Signal-Gage and Bellerive	150	Intersection control updated
Traffic Signal-GWW and First	150	Intersection control updated
Traffic Signal-Keene and Queensgate	200	Intersection control updated
Traffic Signal-Van Giesen and Wright	200	Intersection control updated
Traffic Signal-Keene and Shockely	200	Intersection control updated
Traffic Signal-Van Giesen and Thayer	150	Intersection control updated
Traffic Signal-Swift and Goethals	200	Intersection control updated
Traffic Signal-Steptoe and Tapteal	200	Intersection control updated
Traffic Signal-Leslie and Reata	200	Intersection control updated
Traffic Signal-SR240 and Logston	200	Intersection control updated
Spengler Road from Stevens to Logston. Construct 3 lane roadway	600	1 lane each direction plus center turn lane
Traffic Signal-Keene and Westcliff	200	Intersection control updated
Stopetoe Street from Gage to Clearwater. Construct a 5-lane roadway	1,500	2 lanes each direction plus center turn lane
Traffic Signal-SR240 and Kingsgate	200	Intersection control updated
Interstate 182: Install exit ramp to Wellsian Way	1,500	1 lane exit off of I-182.
Traffic Signal-SR224 and Jones	200	Intersection control updated
Keene Road Widening from Queensgate to West Limits: Existing road widened and a bridge was constructed across I-182.	4,200	Additional lane in each direction
Battelle Boulevard from Stevens to Kelly: Construction of a two lane road	600	Additional lane in each direction
Duportail Street from Kennedy to Keene: Construction of a 5 lane road	500	2 lanes each direction and a center left turn lane

Project	Estimated Cost ($1,000s)	Model Updates
Duportail Street from SR 240 across Yakima River: Construction of a four lane bridge plus pedestrian and bicycle ways	9,000	2 lanes in each direction
Wellsian Way and Stevens Drive Realignment	2,000	3 lanes west of Wellsian Way to Duportail street, 4/5 lanes east of Stevens Drive
Leslie Road Widening from Meadow Hills to Reata	1,500	Additional lane in each direction
Logston Boulevard from Robertson to Battelle: Construction of a 3 lane rural section	1,700	Additional lane in each direction
Jones Road from Kingsgate to Van Giesen: Construction of a three lane rural road	2,850	1 lane in each direction and center turn lane
Duportail Street widening from Wellsian to SR240	1,000	Addition of center turn lane
SR 240/I-182 to Columbia Center Boulevard: Replace Yakima River Bridge with eight lane structure, add general purpose lane each direction	69,000	Additional 2 lanes in each direction

Benton-Franklin COG Area Travel Demand Forecast Model

The development of future traffic system needs for Richland depends on the ability to accurately forecast travel demand resulting from estimates of future population and employment for the City. The objective of the transportation planning process is to provide the information necessary for making decisions on when and where improvements should be made in the transportation system to meet travel demands.

BFCG (Benton-Franklin Council of Governments) has developed an urban area travel demand model as part of the Regional Transportation Plan Update process to help identify street and roadway needs. Traffic forecasting can be divided into several distinct but integrated components that represent the logical sequence of travel behavior (Figure 4-2). These components and their general order in the traffic forecasting process follow:

- Trip Generation
- Trip Distribution
- Traffic Assignment

The initial roadway network used in the traffic model was the existing streets and roadways. Future land use scenarios were tested and roadway improvements were added in to mitigate traffic conditions, using programmed improvements as a starting basis. Forecasts of PM peak hour traffic flows were produced for every major roadway segment within the Richland area. Traffic volumes are projected on most arterials and collector streets. Some local streets are included in the model, but many are represented by centroid connectors in the model process.

Trip Generation. The trip generation process translates land use quantities (in numbers of dwelling units and various types of employment) into vehicle trip ends (number of vehicles entering or leaving a TAZ) using trip generation rates established during the model verification process. The trip rates were based upon Institute of Transportation Engineers research,[3] NCHRP report 187, and documentation and adjusted to suit the Tri-Cities area in the calibration process.

Trip Distribution. This step estimates how many trips travel from one zone in the model to any other zone. The distribution is based on the number of trip ends generated in each zone pair, and on factors that relate the likelihood of travel between any two zones to the travel time between the zones.

In projecting long-range future traffic volumes, it is important to consider potential changes in regional travel patterns. Although the locations and amounts of traffic generation in Richland are essentially a function of future land use in the city, the distribution of trips is influenced by growth in neighboring areas such as West Richland, Kennewick, Pasco, etc. External trips (trips which have either an origin or destination in Richland and the other trip end outside Richland) and through trips (trips which pass through Richland and have neither an origin nor a destination there) were projected using trip distribution patterns based upon census data and traffic counts performed at gateways into the BFCG area.

Traffic Assignment. In this process, trips from one zone to another are assigned to specific travel routes in the roadway network, and resulting trip volumes are accumulated on links of the network until all trips are assigned.

Various techniques exist for auto assignment, such as all-or-nothing, stochastic, incremental capacity restraint and equilibrium capacity restraint. Details of the TModel software that was used for the BFCG/Richland model are described in the Appendix.

Model Calibration. The base 2001 modeled traffic volumes were compared against actual traffic counts across screenlines, on key arterials and at key intersections. Most arterial traffic volumes are closely replicated, based upon detailed calibration. Based on this performance, the model was used for future forecasting and assessment of circulation changes.

Model Application to Richland

Intersection turn movements were extracted from the model at key intersections for both year 2001 and 2020 scenarios. These intersection turn movements were not used directly, but the increment of the future year turn movements over the year 2001 turn movements was applied (added) to existing (actual 2003) turn movement counts in Richland. Actual turn movement volumes used for future year intersection analysis can be found in the appendix (Level of Service Calculations).

[3] *Trip Generation Manual,* Institute of Transportation Engineers.

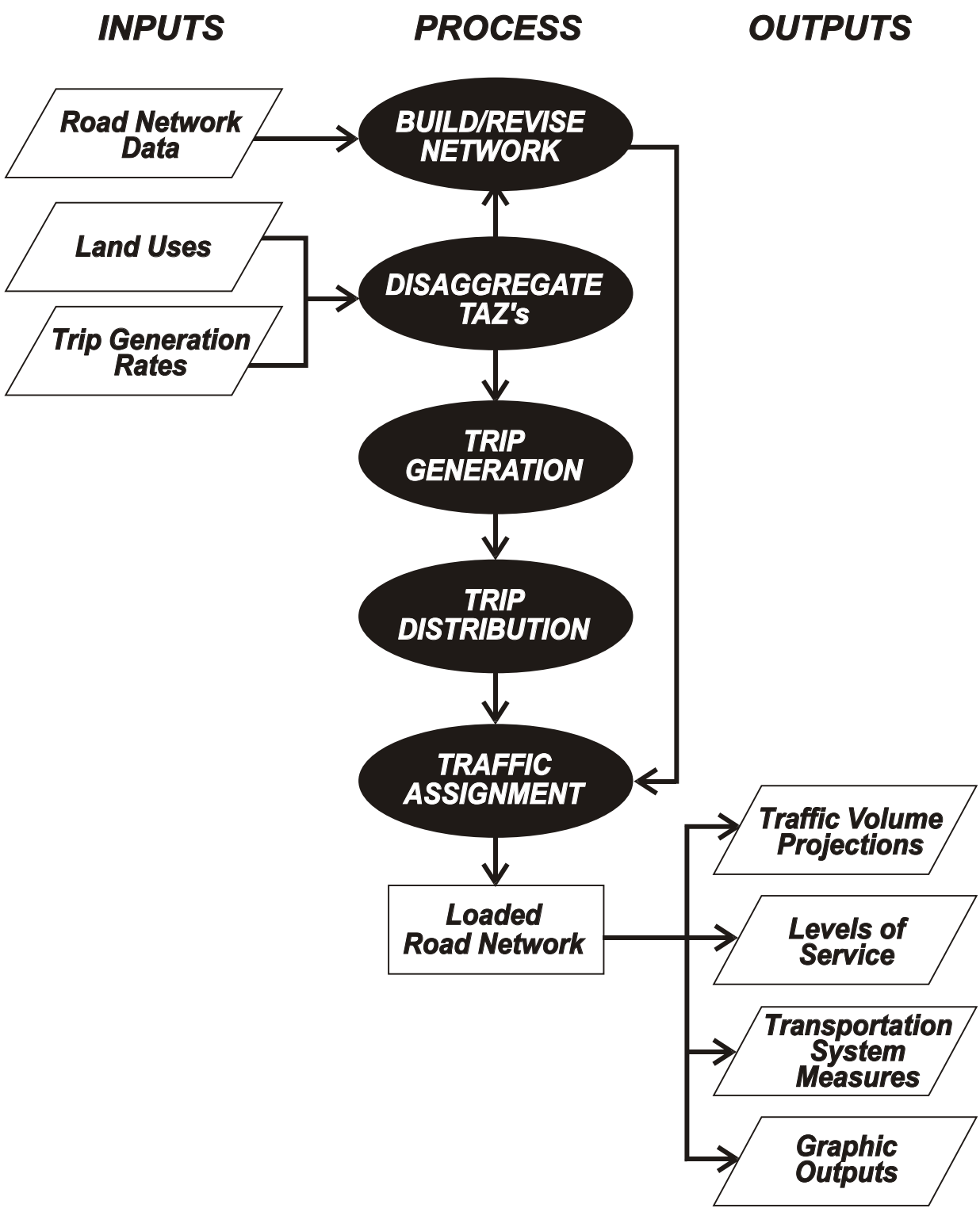

Figure 4-2
TRAFFIC FORECASTING MODEL PROCESS

Performance Measures

A number of performance measures were reported by the refined travel demand model for the City of Richland study area as shown in Table 4-4 below. The first two rows show that the miles and lane-miles of roadway are planned to increase 18 to 28 percent, respectively. These calculations apply only to the principal highways, interstates, arterials and collectors. It is not representative of local street improvements. The next two rows show that the vehicle miles of travel (VMT) and vehicle hours of travel (VHT) will increase 59 to 115 percent, respectively. It is notable that the VHT is twice the VMT growth on a percentage basis, meaning that increased vehicles on the roadway will have substantially slower trips. This finding is further illustrated by the last four rows, which show average speeds dropping from 35 MPH to 26 MPH, overall system delays increasing over 300 percent, and average delay per trip increasing by 169 percent.

Table 4-4: Overview of Travel Demand Model Forecast Performance Measures For Roadways and Highways Within Richland

Performance Measure	Base Year (2001)	Future Year (2020)	Change (2020-2001)	Change (%) (2020-2001)
Total Miles	275	325	+50	+18%
Total Lane Miles	377	481	+104	+28%
Vehicle Miles of Travel (VMT)	112,706	179,361	+66,655	+59%
Vehicle Hours of Travel (VHT)	3,242	6,955	+3,713	+115%
Average Travel Time/VMT (per vehicle mile traveled)	1.73	2.33	+0.60	+35%
Average Speed	34.77	25.79	-8.98	-26%
Vehicle Hours of Delay (VHD)	652	2,813	+2,161	+331%
Average Delay/VMT (per vehicle mile traveled)	0.35	0.94	+0.59	+169%