CHAPTER

4

Future Conditions

The West Linn Transportation System Plan addresses existing system needs and additional facilities that are required to serve future growth. The existing system must be properly managed to ensure that growth does not degrade roadway operations below acceptable standards. Metro's urban area transportation forecast model was used to determine future traffic volumes in West Linn. This forecast model translates assumed land uses into personal travel, selects modes, and assigns motor vehicles to the roadway network. These traffic volume projections form the basis for identifying potential roadway deficiencies and for evaluating alternative circulation improvements. This section describes the forecasting process including key assumptions and the land use scenario developed from the existing Comprehensive Plan designations and allowed densities.

Projected Land Uses

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 areas within the urban growth boundary and reflect the Comprehensive Plan and Metro's land use assumptions for the year 2030. Complete land use data sets were developed for the following conditions:

- Existing Conditions (2005 - most current base travel forecast for the Metro region)
- Future Conditions (2030 forecasts)

The base year travel model is updated periodically and for this study effort, the available base model provided by Metro was for 2005. Land uses were inventoried throughout West Linn by Clackamas County and Metro. This land use database includes the number of dwelling units, the number of retail employees, and the number of other employees. Table 1 summarizes the land uses for existing conditions and the future scenario within the West Linn TSP study area.

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While these summaries only outline land use in West Linn for the purposes of this study, the travel demand forecasts that have been evaluated reflect the regional land use growth throughout the Portland metropolitan area (the four county area). A detailed summary of the uses for each Transportation Analysis Zone (TAZ) within the West Linn study area is provided in the Appendix.

Table 1: West Linn Land Use Summary

Land Use	2005	2030	Increase	Percent Increase
Households (HH)	9,132	11,389	2,257	25%
Retail Employees (RET)	907	1,675	768	85%
Other(Non-Retail) Employees (OTH)	3,021	4,709	1,688	56%

At the existing level of land development, the transportation system generally operates without significant deficiencies in the study area. As land uses are changed in proportion to each other (i.e. there is a significant increase in employment relative to household growth), there will be a shift in the overall operation of the transportation system. Retail land uses generate higher amounts of trips per acre of land than do households and other land uses. The location and design of retail land uses in a community can greatly affect transportation system operation. Additionally, if a community is homogeneous in land use character (i.e. all employment or residential), the transportation system must support significant trips coming to or from the community rather than within the community. Typically, there should be a mix of residential, commercial, and employment type land uses so that some residents may work and shop locally, reducing the need for residents to travel long distances.

Table 1 indicates that significant growth is expected in West Linn in the coming decades. The transportation system in West Linn should be monitored to make sure that land uses in the plan are balanced with transportation system capacity. This TSP balances needs with the forecasted 2030 land uses.

For transportation forecasting, the land use data is stratified into geographical areas called transportation analysis zones (TAZs), which represent the sources of vehicle trip generation. There are approximately 10 Metro TAZs within the West Linn TSP study area. These 10 TAZs were subdivided, as part of this plan, into 40 TAZs to more specifically represent land use in West Linn. The disaggregated model zone boundaries are shown in Figure 4-1.

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Figure 4-1: Transportation Analysis Zones

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Metro Area Transportation Model

A determination of future traffic system needs in West Linn requires 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 to the transportation system to meet travel demand as developed in an urban area travel demand model as part of the Regional Transportation Plan update process. Metro uses VISUM, a computer based program for transportation planning, to process the large amounts of data for the Portland Metropolitan area. For the West Linn TSP, the Clackamas County focused area model was used to forecast 2030 travel with substantially more detail added into the West Linn area.

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 are as follows:

- Trip Generation
- Trip Distribution
- Mode Choice
- Traffic Assignment

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Figure 4-2: Travel Forecasting Model Process

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Trip Generation

The trip generation process translates land use quantities (number of dwelling units, retail, and other employment) into vehicle trip ends (number of vehicles entering or leaving a TAZ or sub-TAZ) using trip generation rates established during the model verification process. The Metro trip generation process is elaborate, entailing detailed trip characteristics for various types of housing, retail employment, non-retail employment, and special activities. Typically, most traffic impact studies rely on the Institute of Transportation Engineers (ITE) research for analysis[1]. The model process is tailored to variations in travel characteristics and activities in the region. For reference, Table 2 provides a summary of the approximate average evening peak hour trip rates used in the Metro model. These are averaged over a broad area and thus, are different than driveway counts represented by ITE. This data provides a reference for the trip generation process used in the model.

Table 2: Approximate Average PM Peak Hour Trip Rates Used in Metro Travel Demand Model

	Average Trip Rate/Unit		
Unit	In	Out	Total
Household (HH)	0.43	0.19	0.62
Retail Employee (RET)	0.78	0.69	1.47
Other Employee (OTH)	0.07	0.29	0.36

Source: DKS/Metro

Table 3 illustrates the estimated growth in vehicle trips generated within the greater West Linn area during the PM peak period (2-hr peak) between 2005 and 2030. It indicates that vehicle trips in West Linn would grow by approximately 40 percent between 2005 and 2030 if the land develops according to Clackamas County and Metro's 2030 land use assumptions. The great majority of the expected growth lies outside of the current city limits. Refer to appendix for details about the trip growth for each TAZ. Assuming a 20-year horizon to the 2030 scenario, this represents an annualized growth rate of between 1 and 2 percent per year.

Table 3: Existing and Future Projected Vehicle Trips (PM Peak 2-Hour Period)

Trip Type	2005 Trips	2030 Trips	Growth
Single Occupancy Vehicles	6,615	9,106	2,491
High Occupancy Vehicles	2,361	3,530	1,170
Medium Trucks	19	31	12
Heavy Trucks	24	40	15

[1] *Trip Generation Manual*, 7th Edition, Institute of Transportation Engineers, 2001.

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Trip Distribution

This step estimates how many trips travel from one zone in the model to any other zone. 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 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 West Linn are essentially a function of future land use in the city, the distribution of trips is influenced by regional growth, particularly in neighboring areas such as Oregon City, Lake Oswego as unincorporated areas to the west of West Linn. External trips (trips that have either an origin and not a destination in West Linn or have a destination but not an origin in West Linn) and through trips (trips that pass through West Linn 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 Metro area Urban Growth Boundary (UGB) calibration.

Mode Choice

This is the step where it is determined how many trips will be by various modes (single-occupant vehicle, transit, truck, carpool, pedestrian, bicycle, etc.). The 2005 mode splits are incorporated into the base model and adjustments to that mode split may be made for the future scenario, depending on any expected changes in transit or carpool use. These considerations are built into the forecasts used for 2030.

Traffic Assignment

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

Network travel times are updated to reflect the congestion effects of the traffic assigned through an equilibrium process. Congested travel times are estimated using what are called “volume-delay functions” in EMME/2. There are different forms of volume/delay functions, all of which attempt to simulate the impact of congestion on travel times (greater delay) as traffic volume increases. The volume-delay functions take into account the specific characteristics of each roadway link, such as capacity, speed and facility type. This allows the model to reflect conditions somewhat similar to driver behavior.

Model Verification

The base 2005 modeled traffic volumes were compared against actual traffic volume counts across screenlines (an imaginary line where several parallel roadways would

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intersect), on key arterials, and at key intersections. Most arterial traffic volumes meet screenline tolerances for forecast adequacy. Based on this performance, the model was used for future forecasting and assessment of circulation change.

Intersection turn movements were extracted from the model at key intersections for both the base year 2005 and forecast year 2030 scenarios. These intersection turn movements were not used directly, but a portion of the increment of the year 2030 turn movements over the 2005 turn movements was applied (added) to existing (actual 2003) turn movement counts in West Linn. A post processing technique is utilized to refine model travel forecasts to the volume forecasts utilized for 2030 intersection analysis.

Comment [d1]: Recommend that the highlighted sentence be removed. I think it will cause there to be unneeded questioning/concern at the City Council and the following sentence that refers to "post processing technique" already addresses that you work some "magic" with the data to make it work.

Future (2030) System Assumptions

The Metro regional travel demand forecast model was used to determine future (2030) traffic volumes for the City of West Linn. The 2030 base model assumed RTP programmed improvements as a base case scenario. The improvements that are located within the City of West Linn and have an impact on motor vehicle roadway capacity are listed in Table 4. Other projects in the area (i.e. adjacent cities and counties) are included as listed in the RTP. These other projects could have impact on travel behavior within West Linn.

Table 4: RTP Projects Included in Future (2030) Travel Demand Modeling

RTP #	Project Name (Facility)	Project Location	Project Description	Est. Project Cost in 2003 dollars	RTP Program Years
5199	I-205 Auxiliary Lanes	I-5 to Stafford Road	Add auxiliary lanes as part of pavement preservation project	$8,000,000	2004-09
5013	I-205 Climbing Lanes	Willamette River to West Linn in Clackamas County	New SB Truck climbing lane at I-205 bridge (between Willamette River and 10th Street) - PE/ROW in financially constrained system	$46,200,000	2016-25

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Future Facility Needs

This section identifies study area intersection deficiencies resulting from increases in vehicle volumes as forecasted by the 2030 financially constrained Metro RTP model for the 2030 base case scenario. Additionally, this section also identifies citywide circulation and safety improvement needs.

Both regional and local traffic volumes are projected to increase on many of the streets within the city. Figure 4-3 shows the percent increase in PM peak hour volume between 2006 and 2030. As illustrated in this figure, two-way traffic volumes are predicted to increase city wide by the year 2030. Notable roadways with traffic volume increases are Highway 43, 10th Street on both sides of I-205, and Rosemont Road. Two-way traffic volumes on these streets are projected to increase during the PM peak hour by as many as 995 vehicles per hour (vph) on Highway 43, 1085 vph on 10th Street, and 690 vph on Rosemont Road. Traffic volumes on the streets intersecting the above named streets are projected to increase greatly as well.

Many of the study intersections fail to meet performance standards either for the City of West Linn or for the Oregon Department of Transportation (ODOT) as a result of the increases in volume. Traffic operations for each study intersection was rated as good, adequate, or poor during the 2030 PM peak hour and shown in Figure 4-4. Many of the city and state intersections will experience poor operating conditions. The deterioration in operations is a direct result of both city and regional growth. The future operational analysis for each intersection is outlined in greater detail in the following sections.

Comment [d2]: Requested on an earlier version that the Parker/Salamo intersection be added. This has not happened yet and probably just an oversight. If you don't feel it is appropriate, please let me know.

The local street network in the City of West Linn is mostly built out and has connectivity restrictions between the downtown area and among some of the city's neighborhoods. Because of the city's developmental history and its geography, there are many winding, long blocks and cul-de-sacs outside of the downtown area. This type of street layout forces out-of-direction travel when traveling between and within neighborhoods, and greater use of local streets to compensate for lack of connectivity to more major facilities. Few direct routes exist in the central area of the city; most of the designated arterials zigzag through neighborhoods. In addition, I-205 bisects the City of West Linn, serving as a major barrier between neighborhoods to the south and the rest of the city. Many intercity trips concentrate along the few streets that do connect across I-205, such as 10th Street and Willamette Drive.

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Figure 4-3: Percent Increase

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Figure 4-4: Intersection Deficiencies

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Future Intersection Capacity Analysis

The impact of growth on the local roadways was evaluated at the same 25 intersections examined for Existing Conditions. The 2030 operational analysis (summarized in Table 5) found many study intersections, both city streets and on State Highways, would reach or exceed full capacity and experience high levels of congestion and delay without additional improvements to the existing transportation system.

These results are referred to as the 2030 base case scenario, since is assumes only those improvements that have already been identified for funding within the next 20 years. Subsequent chapters will develop circulation and operational alternatives to the 2030 base case and make recommendations about which are most efficient and cost effective in complying with the transportation goals and policies, as previously described in Chapter 2.

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Table 3: Weekday PM Peak Hour Intersection Level of Service

		Existing (2006)			Future Base Case (2030)			Mobility Standard		
Intersection # on Map	Intersection	LOS	Average Delay (Sec)	Volume/ Capacity (v/c)	LOS	Average Delay (Sec)	Volume/ Capacity (v/c)	Agency	Minimum	Standard Met?
	Signalized Intersections									
2	Highway 43 / Marylhurst Dr-Lazy River Way	B	16.3	0.8	C	26.7	0.94	ODOT	v/c 0.99	Yes
4	Highway 43 / Cedaroak Dr	B	10.4	0.65	B	18.3	0.82	ODOT	v/c 0.99	Yes
5	Highway 43 / Hidden Springs Rd	C	25	0.83	D	42.8	1	ODOT	v/c 0.99	No
8	Highway 43 / West A St	B	12.5	0.74	C	31.1	0.97	ODOT	v/c 1.1	Yes
12	Highway 43 / Hood St-McKillican St	C	23.6	0.76	E	62.7	1.07	ODOT	v/c 1.1	Yes
13	Highway 43 / I-205 SB	C	26.5	0.85	E	69.1	>1.0	ODOT	v/c 0.85	No
14	Highway 43 / I-205 NB	A	8	0.3	B	10.2	0.41	ODOT	v/c 0.85	Yes
25	10th St / Blankenship Dr	D	55	0.63	F	>80.0	>1.0	ODOT	v/c 0.85	No
26	10th St / I-205 SB	C	34.4	0.61	F	>80.0	>1.0	ODOT	v/c 0.85	No
27	10th St / I-205 NB	B	16.1	0.65	E	64.3	>1.0	ODOT	v/c 0.85	Yes
	All-Way Stop Intersections									
19	Salamo Rd / Rosemont Rd	E	38.3	>1.0	F	>50.0	>1.0	City	LOS D	No
20	Rosemont Rd / Summit St	A	9.2	0.37	B	12.2	0.57	City	LOS D	Yes
21	Sunset Ave / Cornwall St	A	7.6	0.15	A	7.8	0.16	City	LOS D	Yes
29	Willamette Falls Dr / 10th St	C	23.8	0.87	F	>50.0	1.24	City	LOS D	No
	Unsignalized Intersections									
1	Highway 43 / Arbor Dr	B/F	>50.0	0.03 / 0.37	B/F	>50.0	0.04/>1.0	ODOT	v/c 0.99/0.90	No
3	Highway 43 / Walling Way	B/E	42.2	0.04 / 0.21	B/F	>50.0	0.00/0.92	ODOT	v/c 0.99/0.90	Yes
6	Highway 43 / Jolie Pointe Rd	A/E	47.3	0.03 / 0.22	B/F	>50.0	0.12/>1.0	ODOT	v/c 0.99/0.90	No
7	Highway 43 / Pimlico Dr	B/F	>50.0	0.16 / >1.0	C/F	>50.0	0.37/>1.0	ODOT	v/c 0.99/0.90	No
9	Highway 43 / Holmes St	B/F	>50.0	0.02 / 0.65	B/F	>50.0	0.03/>1.0	ODOT	v/c 0.99/0.90	No
10	Highway 43 / Lewis St	B/E	40	0.01 / 0.15	B/F	>50.0	0.01/0.54	ODOT	v/c 0.99/0.90	Yes

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		Existing (2006)			Future Base Case (2030)			Mobility Standard		
Intersection # on Map	Intersection	LOS	Average Delay (Sec)	Volume/ Capacity (v/c)	LOS	Average Delay (Sec)	Volume/ Capacity (v/c)	Agency	Minimum	Standard Met?
11	Highway 43 / Burns St	B/F	>50.0	0.23 / >1.0	D/F	>50.0	0.49/>1.0	ODOT	v/c 1.1/0.90	No
15	Highway 43 / Willamette Falls Dr	A/F	>50.0	0.21 / >1.0	D/F	>50.0	0.77/>1.0	ODOT	v/c 0.99/0.90	No
16	Willamette Falls Dr / Sunset Ave	A/B	13.6	0.29 / 0.31	A/E	47.6	0.67/0.74	City	LOS D	No
17	Rosemont Rd / Carriage Way	A/C	21.9	0.09 / 0.21	A/F	>50.0	0.12/0.51	City	LOS D	No
18	Rosemont Rd / Hidden Springs Rd	A/C	18.6	0.10 / 0.14	B/F	>50.0	0.07/>1.0	City	LOS D	No
22	Salamo Rd / Bland Circle	A/B	38.3	0.00 / 0.09	A/D	34.6	0.02/0.60	City	LOS D	Yes
23	Salamo Rd / Barrington Dr	A/C	15.8	0.04 / 0.20	A/C	21.8	0.05/0.93	City	LOS D	Yes
24	Blankenship Road / Tannler Dr	A/F	>50.0	0.13 / 0.52	B/F	>50.0	0.19/>1.0	City	LOS D	No
28	10th St / 8th Ave	A/F	>50.0	0.13 / 0.73	B/F	>50.0	0.18/>1.0	City	LOS D	No
30	Willamette Falls Dr / 12th St	A/C	22.7	0.17 / 0.23	B/F	>50.0	0.44/>1.0	City	LOS D	No
31	Willamette Falls Dr / Dollar St (East)	A/C	20.6	0.01 / 0.21	A/F	>50.0	0.15/0.74	City	LOS D	No
32	Willamette Falls Dr / 19th St	A/B	13.0	0.01 / 0.04	A/C	17.6	0.01/0.06	City	LOS D	Yes
33	Willamette Falls Dr / Ostman Rd	A/C	23.6	0.03 / 0.06	B/F	>50.0	0.01/0.23	City	LOS D	No
34	Willamette Falls Dr / Dollar St (West)	A/B	12.1	0.03 / 0.07	A/F	>50.0	0.13/0.71	City	LOS D	No

Notes: LOS = Level of Service
Delay = Average vehicle delay in the peak hour for entire intersection in seconds.
MOE = Measure of Effectiveness
Unsignalized Intersection Operations:
A/A = Major street turn LOS / Minor street turn LOS
Delay = Worst Case for Minor Street
#/# = Major street turn v/c / Minor street turn v/c

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Traffic Signal Warrants

Traffic signal warrant 11 (Peak Hour Volume) from the *Manual on Uniform Traffic Control Devices* (MUTCD) was evaluated for the unsignalized study intersections that did not meet operational standards in the 2030 base case[2]. The intersections that would meet the minimum traffic volume warrant for signalization by the year 2030 are listed in Table 6.

On arterial streets, signals should generally be spaced at least 1,000 feet apart for efficient operation, but signalizing some of the intersections that meet this warrant would result in shorter spacing. A detailed traffic engineering evaluation must be conducted to evaluate site conditions, signal spacing, and all MUTCD warrants before the installation of any traffic signal. ODOT signal design and signal phasing guidelines should be followed for all new traffic signal installations.

Table 6: Traffic Signal Warrant Analysis for PM Peak Hour Volume

Intersection	Warrant Met for Existing (2006)?	Warrant Met for Future Base Case (2030)?
Highway 43/ Arbor Dr.	No	No
Highway 43/ Jolie Pointe Rd.	No	No
Highway 43/ Pimlico Dr.	No	Yes
Highway 43/ Holmes St.	No	No
Highway 43/ Burns St.	Yes	Yes
Highway 43/ Willamette Falls Dr.	Yes	Yes
Willamette Falls Dr./Sunset Ave./Chestnut St.	No	Yes
Rosemont Rd./Carriage Wy.	No	No
Rosemont Rd./Hidden Springs Rd.	No	Yes
Rosemont Rd./Salamo Rd	No	Yes
10th St / 8th Ave	No	Yes
Willamette Falls Dr / 10th St	Yes	Yes
Blankenship Rd./Tannler Dr.	No	Yes
Willamette Falls Dr./12th St.	No	Yes
Willamette Falls Dr./Dollar St. East	No	No
Willamette Falls Dr./Ostman Rd.	No	No
Willamette Falls Dr./Dollar St. West	No	No

[2] *Manual on Uniform Traffic Control Devices for Streets and Highways*, Federal Highway Administration, 2003 Edition