APPENDIX I

Traffic Analysis

1.	Transportation Modeling Report – January, 2004
2.	Memorandum: DKS Associates – August 19, 2002
3.	Earth Tech Report: Little Bear Creek Corridor Redevelopment Alternatives Traffic Impact Analysis – April 22, 2002 (excerpt)

TRANSPORTATION MODELING FOR THE DOWNTOWN AND LITTLE BEAR CREEK CORRIDOR MASTER PLAN

City of Woodinville
Departments of Community Development and Public Works
January 2004

Background

The City's Comprehensive Plan, pursuant to the Growth Management Act, requires that the land use and transportation elements of the City's Comprehensive Plan be consistent. Essentially, this means that the City's transportation network, including future transportation projects, should be adequate to serve the development estimated to occur under the Comprehensive Plan's 20-year planning period. Making such future projections is not easy; and City staff has relied on actual development patterns and the Comprehensive Plan's land inventories to guide future estimates of development. A computerized transportation "model" is a tool to make predictions of future traffic volumes and predict whether the transportation network and future projects will adequately serve the land use. In order to meet the adopted City standard, intersections must be operating at Level of Service (LOS) "E" or better. Attachment A describes the different levels of service and provides additional information on the City's transportation model.

City staff worked with consultants to model the transportation impacts of development estimated to occur as a result of adoption of the Downtown and Little Bear Creek Master Plan. To provide a basis for comparison, modeling was also performed on the transportation impacts of development estimated to occur under the existing Comprehensive Plan and Zoning regulations without adoption of the Master Plan.

Transportation Modeling Process

The following steps were followed in the transportation modeling effort for the Downtown and Little Bear Creek Corridors:

1. Build the model. The model must be modified to reflect the configuration of existing and proposed streets and intersections in the City. The configuration includes the size, type and location of right, left and center turn lanes at each intersection; the location, width and number of lanes for streets; intersection timing and other aspects of the transportation network. The list of projects proposed on the 6 year TIP are included in the configuration of the network for future scenarios for the year 2012. For the future year 2022, the City's entire list of Comprehensive Plan roadway capacity projects are included.

2. Calibrate the model. This involves verifying existing land uses and employee counts, and counting traffic. This correlates real life land use with traffic generation and volumes, so that future traffic volumes can be accurately predicted.

3. Forecast future development. Since the amount of development estimated to occur as a result of a land use plan depends upon the private sector, a comprehensive plan does not typically provide specific estimates of future development. However, in order to model the land use, assumptions must be made about the amount, location and type of future development resulting from each land use plan to be modeled. For the Downtown and Little Bear Creek Corridor Master Plan, four different development scenarios were modeled to reflect a range of possibilities that could occur in the future. The development estimated for each scenario is shown in Table 1, and the assumptions for each are described below. For all scenarios, the amount and location of developable and redevelopable land reported in the Comprehensive Plan Buildable Lands Report was the basis for the amount and location of development possible. The differences between the scenarios is based on different Floor Area Ratios (FAR), height, and mixes of land use (residential, office, and commercial) that are estimated in the Downtown and Little Bear Creek Corridor as a result of policy changes and different market conditions. Recent actual developments were used to estimate FARs. Because the Master Plan does not propose changes to development regulations in areas outside the downtown and little Bear Creek Corridor, the amount of development estimated in the Residential, Neighborhood Business, Tourist Business and Industrial zones are held constant in all scenarios. Table 1 below shows the aggregated estimated totals for development square feet by general land use type, dwelling units, and employees for each of four land use scenarios. Table 2 show estimated commercial development square feet and dwelling units by each zone or area analyzed. Following Table 2 is a description of the four land use scenarios.

Table 1

Estimated Future Development in all Zones with Four Development Scenarios

Development Scenarios	Total SF	Retail Commercial (SF)	Office (SF)	Other (Manufacturing, Finance, Education, Wholesale, Services)	Dwelling Units (DUs)	Employment
Existing Zoning (Low)	1,903,041	488,400	292,900	1,121,741	2,940	2,996
Existing Zoning (High)	2,217,493	631,000	366,600	1,219,893	3,271	3,575
Master Plan (Low)	1,892,836	407,600	572,600	912,636	3,577	3,088
Master Plan (High)	2,081,511	498,100	655,500	927,911	4,168	3,458

Table 2

Summary of future Development Estimates for Existing Zoning Versus the Downtown and Little Bear Creek Corridor Master Plan

Zone or Area	Existing Zoning		Draft Master Plan	
CBD Core Area	**Low**	**High**	**Low**	**High**
Retail/Com./Office (SF)	335,237	523,809	136,190	261,904
Residential (dwelling units)	864	1,152	1,435	1,833
CBD TOD Site (du's)	129	172	195	388
General Business (com SF)	440,733	566,656	629,618	692,579
Industrial Zone (com SF)	1,194,807	1,194,807	1,194,807	1,194,807
NB Zone (com SF)	170,824	170,824	170,824	170,824
Residential Zones (du's)				
R-1	158	158	158	158
R-4	497	497	497	497
R-6	598	598	598	598
R-8	170	170	170	170
R-24	4	4	4	4
R-48	520	520	520	520
Total:	1,947	1,947	1,947	1,947

Description of Land Use Scenarios:

Existing Comprehensive Plan Land Use - Low scenario
This scenario is based on the assumption that future development will favor auto-oriented uses, as has occurred in the past. This scenario assumes an average floor area ratio (FAR) of 0.35 in the Little Bear Creek Corridor, and a FAR of 1.1 in the Downtown Core.

Existing Comprehensive Plan Land Use – High scenario
This scenario is based on the assumption that future development will favor auto-oriented uses, as has occurred in the past. This scenario assumes an average floor area ratio (FAR) of 0.45 in the Little Bear Creek Corridor, and a FAR of 1.6 in the Downtown Core.

Master Plan Land Use - Low Scenario.
This scenario is based on the assumption that policy changes that broaden the uses allowed in the Little Bear Creek Corridor, and increase the maximum height in the Downtown and Little Bear Creek Corridor will result in the development of more residential units Downtown and more office uses in the Little Bear Creek Corridor. This scenario assumes an average floor area ratio (FAR) of 0.50 in the Little Bear Creek Corridor, and a FAR of 1.5 in the Downtown Core.

Master Plan Land Use – High Scenario
This scenario is based on the assumption that policy changes that broaden the uses allowed in the Little Bear Creek Corridor, and increase the maximum height in the Downtown and Little Bear Creek Corridor will result in the development of more residential units Downtown and more office uses in the Little Bear Creek Corridor. This scenario assumes an average floor area ratio (FAR) of 0.55 in the Little Bear Creek Corridor, and a FAR of 2.0 in the Downtown Core.

4. Assign future development to Transportation Analysis Zones. The transportation model analyzes transportation according to land use within transportation analysis zones (TAZs). Multiple TAZs make up the Downtown Core, Little Bear Creek Corridor and other zones. Development is divided up by employment sector (Retail, FIRES, Education, Government, WTCU and Manufacturing), and then divided up further and assigned to TAZs based on the amount of developable land and the zoning within the TAZ. The FIRES sector includes Finance, Insurance, Real Estate, and Service industries. WTCU includes Wholesale, Transportation, Communication and Utilities industries.

5. Run the model, analyze results, check for errors. The model provides traffic volumes at selected intersections based on the development estimated under each scenario. Staff and consultants review the model results and determine the level of service each intersection will be operating at in the future.

Results and Conclusions

A description of the transportation modeling process and results is contained in Attachment A. The results show there are very few differences between the existing zoning "high" scenario and Master Plan scenarios. The Downtown Master Plan scenarios are not anticipated to increase travel delays significantly at any of the study intersections over what would occur under existing zoning. All intersections except for the intersection of Woodinville-Snohomish Road and NE 195th Street, are operating at Level of Service "E" or better in all future scenarios.

Table 3 shows a comparison of intersection levels of service, along with other comparison factors for the four scenarios.

City of Woodinville
Comparison of Future Development Scenarios
Year 2022 Estimated Growth for all Land Use Zones

Table 3

	Existing Zoning (Low)	Existing Zoning (High)	Master Plan (Low)	Master Plan (High)
Total SF	1,903,041	2,217,493	1,892,836	2,081,511
Retail Commercial (SF)	488,395	631,000	407,600	498,100
Office (SF)	292,900	366,600	572,600	655,500
Other [1]	1,121,746	1,219,893	912,636	927,911
Dwelling Units (DUs)	2,940	3,271	3,577	4,168
Employment	2,996	3,575	3,088	3,458
Assessed Value	$ 922,611,100	$ 1,048,319,300	$ 1,077,813,600	$ 1,244,923,600
Property Tax (Annual receipts)	$1,273,203	$ 1,446,681	$ 1,487,383	$ 1,717,995
Sales Tax (Annual receipts)	$1,037,839	$ 1,340,875	$ 866,150	$ 1,058,463
Utility Tax (Annual receipts)	$378,782	$ 427,440	$ 435,500	$ 500,011
REET (One-time, as properties are sold)	$2,306,528	$ 2,620,798	$ 2,694,534	$ 3,112,309
Parks Impact Fees (One-time fee)	$5,280,240	$ 5,874,716	$ 6,424,292	$ 7,485,728
Traffic Mitigation (One-time fee, current method)	$1,893,912	$ 2,137,198	$ 2,177,501	$ 2,500,053
Traffic Impact Fees (One-time fee, proposed ord.)	$12,982,085	$ 15,061,270	$ 14,403,741	$ 16,075,848
Open space provided (Acres)[2]	6.4	6.4	12	12
Peak Hour Intersection Level of Service (LOS) Number of intersections at:				
LOS A	0	0	1	0
LOS B	5	6	5	5
LOS C	3	3	3	4
LOS D	3	1	1	1
LOS E	0	0	0	0
LOS F	0	1	1	1

1 Other includes industries such as manufacturing, education, transportation and utilities.

[2] Little Bear Creek Linear Park (Lumkin) = 6.4, proposed Park Blocks = 5.6

Comparison Table Assumptions

The purpose of Table 3 is to provide a comparison between the four possible future development scenarios.

Total Square Feet
Total square feet are the total number of square feet of new non-residential development estimated to occur by the year 2022 for each future development scenario. The total number of square feet is derived by adding the square feet estimated in each zone from Table 2, and is based on build–out of all lands considered buildable in the Buildable Lands Report and Comprehensive Plan.

Retail Commercial (SF), Office (SF) and Other
The total square feet was categorized into five basic employment sectors based on the percentage of total square feet that has occurred in these categories in the past. The five basic employment sectors are: Retail, FIRES (Financial, Insurance, Real Estate, Services), Education, Government, WTCU (Wholesale, Trade, Communications, Utilities) and Manufacturing. In this table, "Retail commercial" includes square feet in Retail, "Office" includes square feet in FIRES, and "Other" includes Education, Government, WTCU, and Manufacturing.

Dwelling Units
Dwelling Units are the total number of dwelling units estimated to occur by the year 2022 for each future development scenario. The total number of dwelling units is derived by adding the total dwellings estimated in each zone from Table 2.

Employment
Employment is categorized into five basic employment sectors: Retail, FIRES (Financial, Insurance, Real Estate, Services), Education, Government, WTCU (Wholesale, Trade, Communications, Utilities) and Manufacturing. Employees in each sector were estimated based on the following ratios of employees to total square feet:

- Retail, FIRES – 1 employee per 500 sf
- Education, Government – 1 employee per 400 sf
- WTCU, Manufacturing – 1 employee per 700 sf

Assessed Value
Assessed values were assumed to be equal to property market values, which were based on estimates for current land, hard and soft costs and developer profit margins. The typical residential unit of 800-1,000 square feet would be valued at about $225,000 in the Downtown, "Office" space at about $200 per square foot of rentable area, "Retail Commercial" at about $175 per square foot, "Other" at $100 per square foot. Residential units outside of the Downtown were assumed to be single family residences valued at $275,000.

Property Tax

Property tax was assumed to be $1.38 for every $1,000 of assessed value. The annual property tax receipt was derived by dividing the assessed value by 1,000 and multiplying the result by $1.38.

Sales Tax

These revenues would be generated by the new retail commercial space identified under each alternative. The City receives 0.85% of retail sales as its share of the sales tax. Average retail sales volumes were assumed to be $250 per square foot per year. The annual sales tax receipts were derived by multiplying the number of square feet of retail commercial by $250, and then multiplying by 0.0085.

Utility Tax

The City currently receives approximately $500,000 per year in utility from the existing base of residential, industrial, office and retail space which is estimated at about 8.2 million square feet. This equates to a tax rate effectively of about $0.06 per square foot of space. The utility tax was derived by multiplying the square feet of space by $0.06 to get annual utility tax receipts. A dwelling was assumed have 1500 square feet.

REET

The Capital Project and Special Capital Project funds each receive a tax of ¼% on the sales proceeds of each real estate transaction. This assumes that each newly developed property is eventually sold. This does not take into account properties that change hands more than once.

Parks Impact Fees

The City receives a one-time fee of $1,796 per unit for each residential unit.

Traffic Mitigation (SEPA)

These fees are collected from Developers by the City through the SEPA process. Between 1993 and 2001, these fees averaged around $50,000 per year. During this time period, there was an average of about 167,000 square feet developed per year. Thus, the average traffic mitigation fee per square foot of built area was about $0.30 per square foot. The impact fees were derived by adding the total square feet of commercial and residential development and multiplying it by $0.30. Residential square feet were assumed to be 1500 square feet per dwelling.

Traffic Impact Fees

These fees were determined based on the new traffic impact fee ordinance that bases impact fees on the number of trips produced by business type, the size of the business, and its location. Since the land use for the DTLBCC scenarios is broken into larger categories, the following assumptions were made:

- Off-site trips/unit for retail commercial is 3.29. This is an average of the trips per unit of all retail land uses, with the post office and motor vehicle licensing uses removed since these already exist within the City.
- Offsite trips/unit for Education is 0.54. This is the average of elementary, junior high and highschool.
- Off-site trips/unit for Manufacturing is 2.64. This is the average for general light industrial, manufacturing, and industrial park.
- Off-site trips/unit for Finance, Insurance, Real Estate, and Government is 5.37. This is the average for Research & Development Center, Business Park, Office Building, and Office Park.

Open Space provided (Acres)

This assumes 6.4 acres for the Little Bear Creek Linear Park under all scenarios, and 5.6 acres for the Park Blocks under the Master Plan Low and High Scenarios.

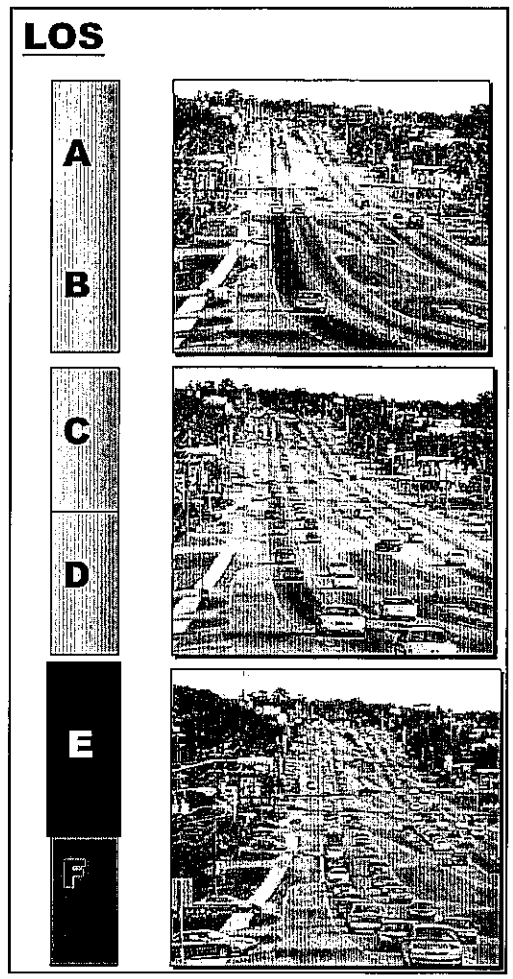
Attachment A

City of Woodinville
Downtown & Little Bear Creek Corridor Master Plan
Transportation Modeling Study Summary

February 2, 2004

Traffic Operations and Levels of Service

- A measure of how well the traffic flows.
- Based on how much congestion is acceptable. The City has adopted **LOS E** through out the City.
- LOS measured for the PM Peak Hour. The PM peak hour typically contains the highest number of vehicles.
- Two ways to measure LOS
  1. **Intersection LOS** – Measured in terms of *Average Delay per Vehicle.* This measurement is typically used for development review.
  2. **Roadway LOS** – Measured in terms of *Available Roadway Capacity.* This measurement is mostly used when performing long-range transportation planning.



Intersection Level of Service Definitions

Signalized intersection level of service is defined in terms of the average total vehicle delay of all movements through an intersection. Vehicle delay is a method of quantifying several intangible factors, including driver discomfort, frustration, and lost travel time. Specifically, level of service criteria are stated in terms of average delay per vehicle during a specified time period (for example, the PM peak hour). Vehicle delay is a complex measure based on many variables, including signal phasing (i.e., progression of movements through the intersection), signal cycle length, and traffic volumes with respect to intersection capacity. Table A-1 shows level of service criteria for signalized intersections, as described in the *Highway Capacity Manual* (Transportation Research Board, Special Report 209, 2000).

Level of Service Criteria for Signalized Intersections

Level of Service	Control Delay Per Vehicle (Seconds)	General Description (Signalized Intersections)
A	≤10	Free Flow
B	>10 - 20	Stable Flow (slight delays)
C	>20 - 35	Stable flow (acceptable delays)
D	>35 - 55	Approaching unstable flow (tolerable delay, occasionally wait through more than one signal cycle before proceeding)
E	>55 - 80	Unstable flow (intolerable delay)
F	> 80	Forced flow (jammed)

Unsignalized intersection level of service criteria can be further reduced into two intersection types: all-way stop-controlled and two-way stop-controlled. All-way, stop-controlled intersection level of service is expressed in terms of the average vehicle delay of all of the movements, much like that of a signalized intersection. Two-way, stop-controlled intersection level of service is defined in terms of the average vehicle delay of an individual movement(s). This is because the performance of a two-way, stop-controlled intersection is more closely reflected in terms of its individual movements, rather than its performance overall. For this reason, level of service for a two-way, stop-controlled intersection is defined in terms of its individual movements. With this in mind, total average vehicle delay (i.e., average delay of all movements) for a two-way, stop-controlled intersection should be viewed with discretion. Table A-2 shows level of service criteria for unsignalized intersections (both all-way and two-way, stop-controlled).

Level of Service Criteria for Unsignalized Intersections

Level of Service	Average Total Delay (sec/veh)
A	≤10
B	>10 - 15
C	>15 - 25
D	>25 - 35
E	>35 - 50
F	>50

Transportation Planning Tools Used for the Downtown and Little Bear Creek Corridor Master Plan Transportation Modeling Study

Travel Demand Models

- Land Use and Transportation Interaction
- Where do people want to go?
- How can they get there?
- PM Peak Hour Roadway and Intersection Volumes
- Roadway and Intersection Improvement Needs

PM Peak Hour Traffic Operations Analyses

- Levels of Service
- Intersection Delays
- Volume-to-Capacity Ratios
- Evaluate Improvement Concepts

Micro-Simulation Modeling

- Impacts of Signal Operations
- Traffic Queues
- Roadway and Intersection Improvement Strategies
- Communication Tool

What Have We Done to Date?

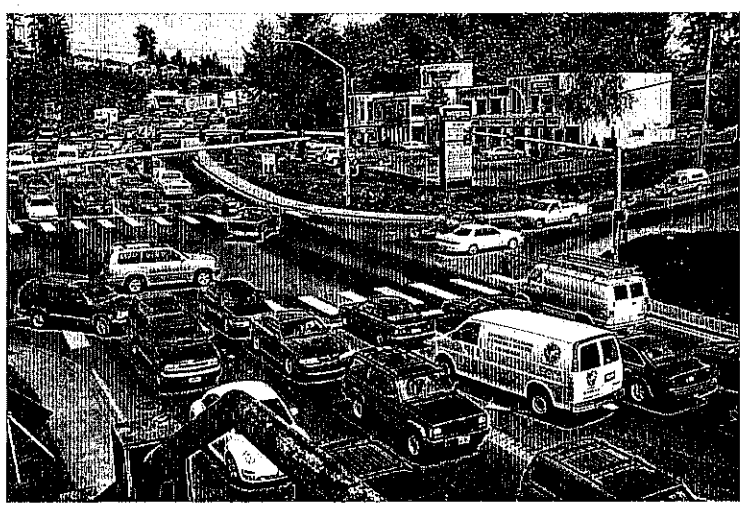
- **Reviewed Existing Conditions** – Analyzed current PM peak hour LOS along study area roadways and intersections.

- **2012 Land Use Projections** – Estimated short-term land use growth using a straight line regression from the 2022 land use forecasts.

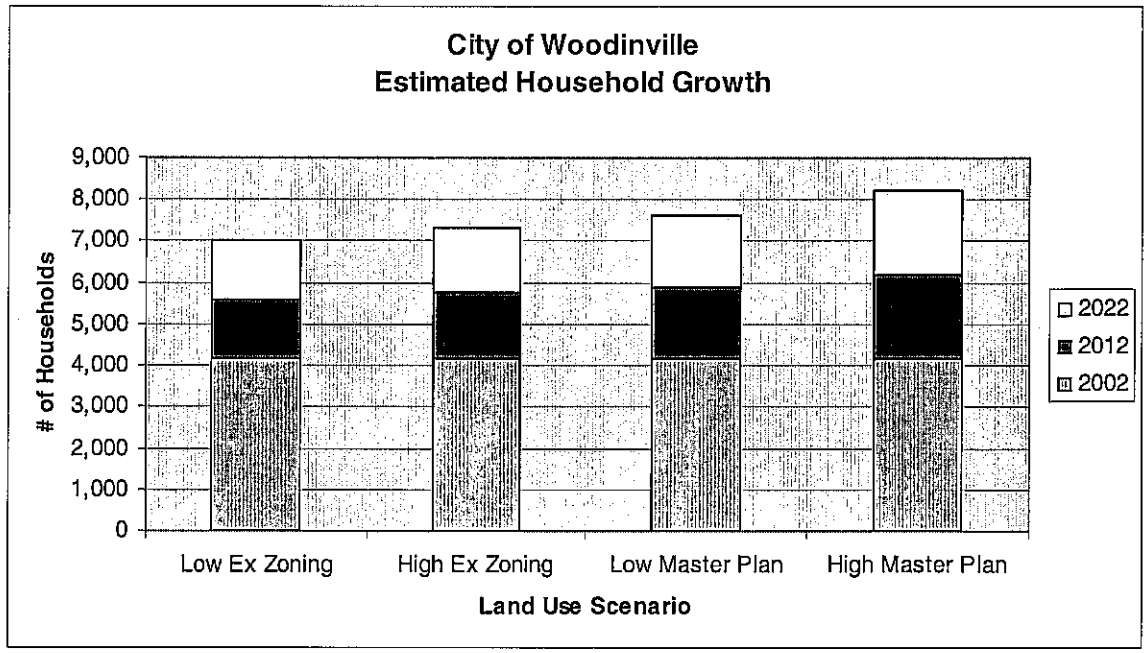
- **Downtown and Little Bear Creek Corridor Master Plan Land Use Projections** Assumed all developable land in the study area would be built-out to maximum density according to anticipated zoning. Thought to represent approximately 20 years out.

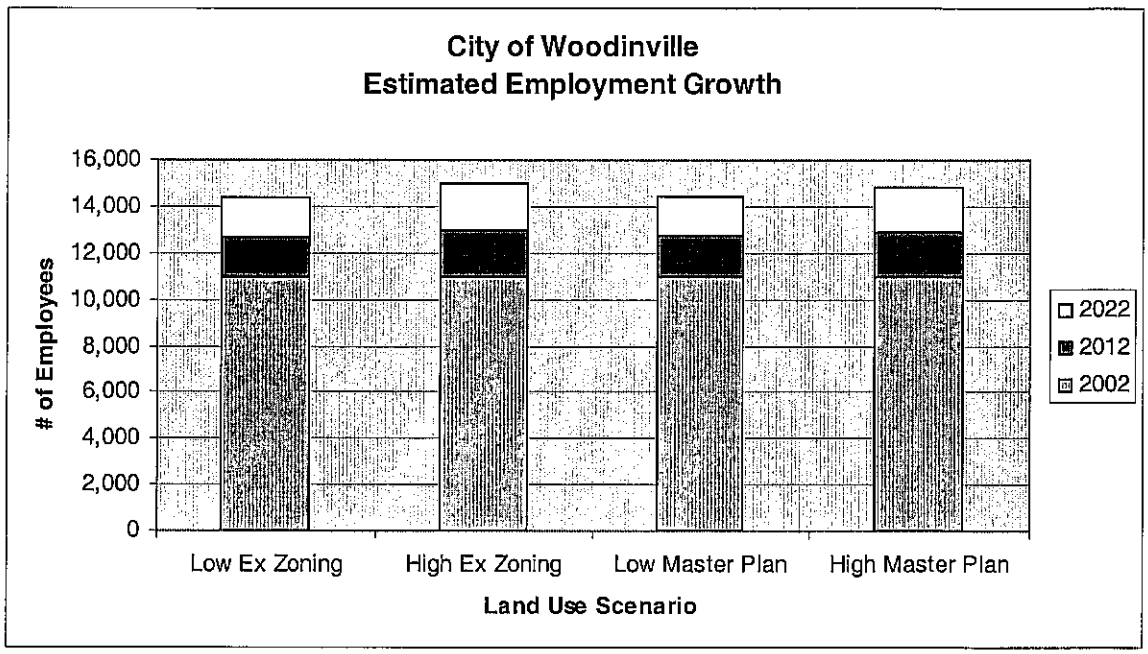
- **Estimated Traffic Forecasts** – Based on *trip generation* from future land uses. Trip generation is defined as how many vehicle trips a particular land use typically generates during the PM peak hour. Trip rates are based on the Institute of Transportation Engineers (ITE) *Trip Generation Manual* containing trip rates measured from various traffic studies.

- **Modeled Short-term and Long-term Improvement Project Lists** – Modeled 6-year Transportation Improvement Plan (TIP) and 20-year Transportation Facilities Plan (TFP). Assumed all projects on respective plans would be constructed during the next 20 years.



Land Use Summary





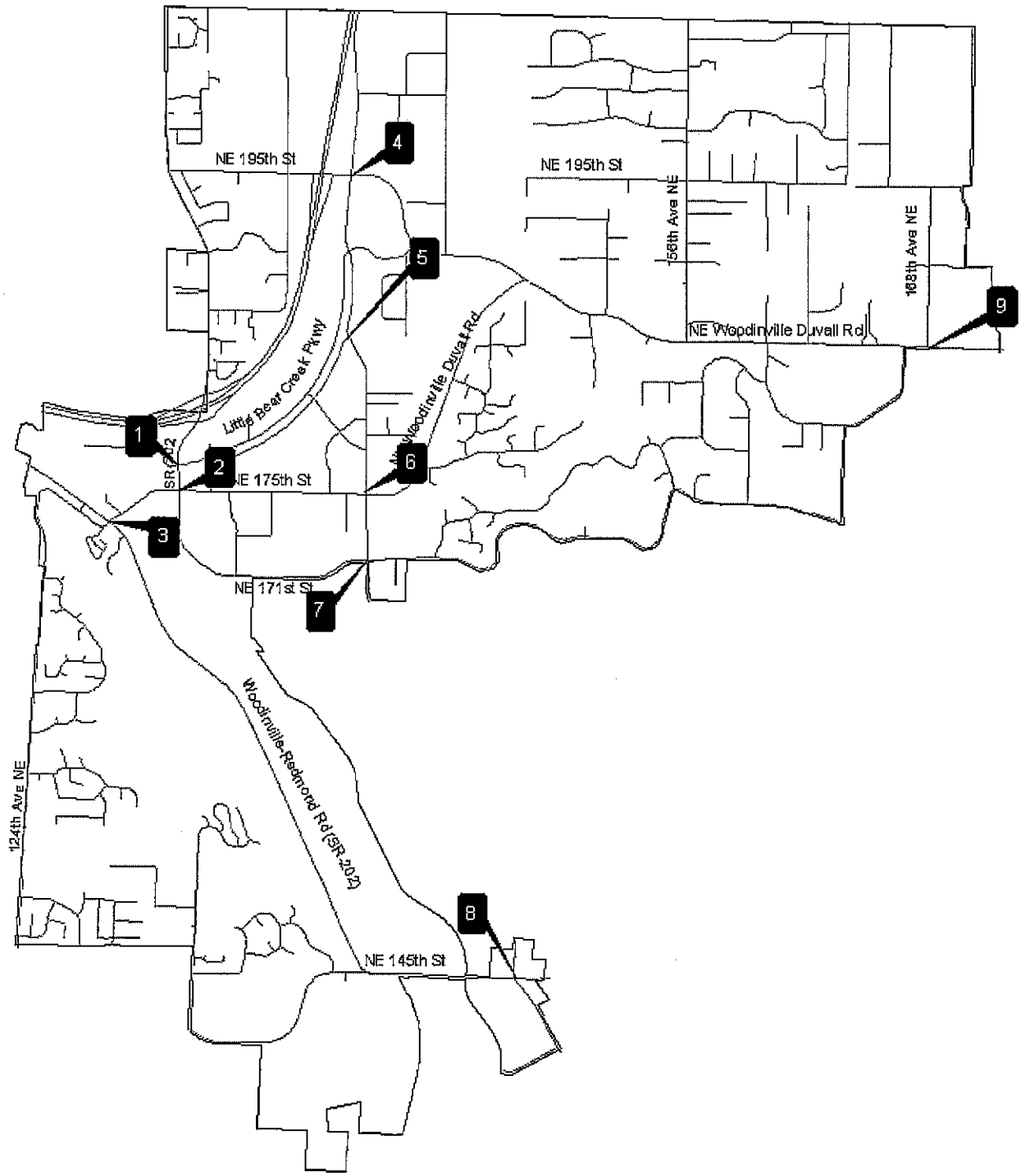
Future Roadway Project List

Major Transportation Capacity Improvements		
Model Year	Location (limits)	Improvement
City of Woodinville Improvements		
2012	SR 202 (148th Ave NE—Woodinville Dr)	Widen roadway to 3 lanes.
2012	SR 202 (Woodinville Dr—SR 522)	Widen roadway to 6 lanes between NE 175th St and SR 522 and 4 lanes between NE 131st St and Woodinville Dr. Install signal at Woodinville Dr intersection.
2012	138th Ave NE (NE 171st St—NE 175th St)	Extend existing 2-lane roadway south to NE 171st Street.
2012	Woodinville-Snohomish Road (NE 175th St—SR 9)	Widen roadway to 3 lanes.
2012	Woodinville-Duvall Road (140th Ave NE—North Woodinville Way)	Construct additional southbound lane.
2012	Little Bear Creek Parkway (131st Ave NE—NE 181st Pl)	Widen roadway to 3 lanes.
2012	132nd Ave NE (Woodinville-Snohomish Road — Little Bear Creek Pkwy)	Construct new roadway across railroad tracks.
2022	Woodinville-Duvall Rd (North Woodinville Way—Avondale Rd)	Widen roadway to 3 lanes.
2022	156th Ave NE (NE Woodinville-Duvall Rd—City Limits)	Widen roadway to 3 lanes.
2022	NE Woodinville Dr (SR 202—New 120th Ave NE Overpass)	Widen roadway to 4 lanes.
2022	Downtown Grid System	Extend several roadways and create a one-ay couplet south of NE 175th St.
Major County or Neighboring City Improvements		
2012	NE 124th Street (Willows Road—SR 202)	Widen roadway to 4 lanes.
2012	Novelty Hill Road (Avondale Rd—Trilogy Parkway)	Widen roadway to 5 lanes.

2012	Avondale Road (NE 137th St—Woodinville-Duvall Rd)	Widen roadway to 4 lanes.
2012	68th St NE (Simons Road—SR 522)	Widen roadway to 6 lanes.
2012	39th Ave SE (240th St SE—228th St SE)	Construct new 2 lane roadway.
2022	Bothell Way NE (SR 522—228th St SE)	Widen to 4 lanes.
Major State Improvements		
2012	I-405 (SR 522—SR 520)	Construct additional southbound lane.
2012	I-405 (NE 70th St—NE 124th St)	Construct additional northbound lane.

Major Transportation Capacity Improvements (continued)

Model Year	Location (limits)	Improvement
2012	I-90 (I-5—Bellevue Way)	Add HOV lanes in each direction.
2012	SR 520 (West Lake Sammamish Parkway—Union Hill Road)	Widen highway to 4 lanes north of SR 202 and add HOV lanes south of SR 202.
2022	SR 522 (Paradise Lake Rd—SR 2)	Widen highway to 4 lanes.
2022	SR 522 (NE 195th St Interchange)	Construct NB On-Ramp and SB Off-Ramp.
2022	120th Ave NE Overpass	Build a new overpass over SR 522.
2022	I-405 (Entire Length)	Add one general purpose lane and one HOV lane in each direction.
2022	SR 520 (I-5—Eastern End of Bridge))	Add HOV lanes in each direction.
2022	SR 9 (SR 522—SR 2)	Widen highway to 4 lanes.



Study Intersections

City of Woodinville Downtown Master Plan

N

City of Woodinville – Level of Service

Int#	Intersections	Existing 2003		2012 LE[5]		2012 HE[5]		2012 LMP[5]		2012 MP[5]		2022 LE[5]		2022 HE[5]		2022 LMP[5]		2022 MP[5]	
		LOS[1]	Delay[2]	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay
1	Little Bear Creek Parkway / SR 202	C	34.5	D	40.4	D	38.7	D	42.4	D	39.1	C	30.9	D	37.0	C	29.7	D	35.5
2	NE 175th St / 131st Ave NE (SR 202)	D	39.0	D	53.8	D	51.9	D	48.8	D	51.7	C	33.1	D	36.5	C	32.4	D	38.8
3	127th Pl NE / Wood-Red Rd NE (SR 202)	F	>120	C	28.0	C	28.6	C	28.5	C	29.2	B	15.1	B	15.2	B	15.5	B	15.7
4	NE 195th St / Wood-Sno Rd NE	C	33.3	D	42.0	D	45.1	D	46.3	D	46.1	F	91.2	F	128.1	F	108.2	F	111.1
5	Wood-Sno Rd / 140th Ave NE	B	15.7	B	10.9	B	10.8	B	10.2	B	10.9	B	13.5	B	13.8	B	13.2	B	13.7
6	NE 175th St / 140th Ave NE	D	41.5	C	30.1	C	30.2	C	30.7	C	31.0	C	31.9	C	33.7	C	30.7	C	33.8
7	NE 171st St / 140th Ave NE	C	22.9	C	21.7	C	21.4	C	20.8	C	21.2	C	22.4	C	22.9	C	22.8	C	22.5
8	NE 145th St / 148th Ave NE (Hollywood Hills)[6]	F	85.9	B	12.0	B	12.3	B	12.1	B	12.4	B	12.0	B	18.5	B	18.8	C	20.7
9	NE Wood-Duvall Rd / 168th Ave NE	B	16.6	B	11.6	B	11.7	B	11.5	B	11.8	B	13.9	B	14.9	B	14.4	B	15.0

1. Level of service.
2. Average delay in seconds per vehicle.
3. Volume-to-capacity ratio.
4. Worst movement (unsignalized intersection in existing conditions).
5. LE = Low Existing Zoning Scenario, HE = High Existing Zoning Scenario, LMP = Low Master Plan Scenario, MP = High Master Plan Scenario.
6. Evaluated as a two-lane roundabout in 2012 and 2022. A one-lane roundabout design operated at LOS F conditions.

NOTE: Shading indicates intersections not meeting adopted LOS standards.

Land Use Scenario Results

The model was used to develop 2012 and 2022 traffic forecasts. Four land use scenarios, as outlined in the LOS Summary table, were evaluated on each of the future networks. City, County, and State improvement project lists were reviewed to include the roadway projects shown in the Major Transportation Capacity Improvements table. Projects anticipated to be completed between 2012 and 2022 were only included in the 2022 forecast year. The 2012 and 2022 land use scenarios were applied to each of the future networks for eight total alternate forecast scenarios.

The 2012 and 2022 networks added transportation projects that were reasonably anticipated to be funded for construction within the next 10 and 20 years, respectively. The improvements were defined based on current local agency Transportation Improvement Programs and the state's transportation improvement project list. The Major Transportation Capacity Improvements table summarizes projects that were included in the future networks. The project list contains a column listing the model year in which the project is shown in the model. All projects that are shown to be completed by 2012 are also included in the 2022 model network.

Future Scenarios

The LOS Summary Table lists the LOS analysis results for each of the future land use scenarios for both 2012 and 2022. Generally, the resulting LOS values for each of the land use scenarios were very similar. The High Existing and High Master Plan land use scenarios resulted in higher delays for some intersections, but nothing significant enough to change the overall LOS values. As a result, the land use scenarios for the Downtown Master Plan are not anticipated to increase delays significantly at any of the study intersections over what would occur under existing zoning. The same mode splits (people who use another mode of transportation other than driving) where assumed for all scenarios to insure a conservative approach. However, higher mode splits for the Downtown Master Plan can be assumed due to the mixed-use component of plan, resulting in fewer cars downtown.

Improvements along SR 202 and installation of a new traffic signal are anticipated to improve LOS at the 127th Place NE/Woodinville-Redmond Road NE (SR 202) intersection from an F to a C by 2012. In 2022, the intersection is estimated to operate at an LOS B because of the new SR 522 overpass and Woodinville Drive roadway improvements.

The proposed two-lane roundabout at the 145th Street/148th Avenue NE (Hollywood Hills) intersection was evaluated with the SIDRA software program. The software is commonly used to evaluate roundabout operations. The results of the evaluation indicate the new two-lane roundabout will improve intersection operations from LOS F to LOS B for all the 2012 and 2022 scenarios.

The intersection at NE 195th Street/Woodinville-Snohomish Road is estimated to operate at LOS F in 2022 for all four land use scenarios. The difference in delay is greatest between the low existing zoning and the high existing zoning scenarios. The high existing zoning scenario is estimated to increase the delays at the intersection the greatest because much of the industrial and commercial land use growth is focused north of NE 195th Street. The LOS F results from heavy eastbound and northbound left-turns. Double left-turn lanes would be needed on the west and south approaches in order to increase the overall intersection LOS.

Key Projects in the Future

The future modeling network reflects complete build out of the six-year TIP and twenty-year TFP respectively. The modeling results reflect that the projects identified in the six and twenty year transportation plans adequately address future deficiencies associated with new growth. There are a couple of key projects that have the most impact in the future.

- **I-405 Widening Project** – This project will add 2 lanes northbound and southbound. This increase in capacity will divert trips from the Sammamish Valley Corridor (SR-202). This project will reduce congestion initially and keep trips from diverting to SR-202.

- **SR-202/SR-522 Overpass (CCRP)** – This project will build a new 4 lane overpass over SR-522, connecting into NE 180th Street in Bothell, creating a new corridor. This project will divert trips from the existing SR-202/SR-522 interchange to the new corridor. Without this project LOS will be degrade within the City.

- **132nd Avenue NE Railroad Crossing** – This project will add a crossing to provide an alternative to using the existing SR-202 underpass. This also creates a viable parallel corridor to Little Bear Creek Parkway.

- **SR-202/127th Place Intersection Signalization** – This project will improve flow dramatically on SR-202 by installing a traffic signal. There will also be capacity improvements.

- **SR-202/NE 175th Street Intersection** – Capacity improvements will improve traffic operations at a key location.

- **SR-522/NE 195th Street North Ramps** – Creates another gateway to the City that will reduce pressure on the SR-522/SR-202 interchange. Will also improve LOS on Woodinville-Snohomish Road by allowing trips to use both the new interchange and the existing SR-522/SR-9 interchange. Does not improve PM Peak Hour conditions as much as it will improve non-peak hour conditions. This is due mainly to the travel patterns of PM Peak commute traffic.

- **Woodinville-Snohomish Road/NE 195th Street Intersection** – Improvements will need to be made to address the increase in left turns to and from 195th Street from Woodinville-Snohomish Road as a result of the new north ramps and additional growth in the North Industrial area.

- **Future Downtown Grid Roads** – These new connecting streets will distribute traffic from new development by providing alternatives to the existing main corridors which will reduce congestion in the downtown core.

DKS Associates

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MEMORANDUM

DATE: August 19, 2002

TO: George Crandall, Crandall Arambula

FROM: R. S. McCourt, PE, PTOE

SUBJECT: **Downtown Woodinville Master Plan Transportation Overview** P02025x0

Based upon the proposed master plan for the downtown Woodinville area, we have summarized provided a brief overview of transportation issues. A comparison of vehicle trip generation is provided for the master plan, along with a summary of the potential for trip chaining and multi-stop trips based upon the mix of land uses. The overall circulation pattern is discussed in the context to the overall capacity with or without a grid of street. While further more detailed transportation analysis will be undertaken as the plan progresses in implementation, this overview outlines some key features and issues with the plan.

TRIP GENERATION COMPARISON

The proposed downtown Woodinville master plan outlines a mix of future land uses for the area generally bounded by SR-522, 131st Avenue, 171st Street and 140th Avenue. Two specific subareas were evaluated: one 34 acre area north of NE 177th Place (Little Bear Creek) and a second 37 acre area between NE 171st Street and NE 175th Street (Downtown Core). A comparison of the vehicle trip generating potential of these two sub areas was conducted for the proposed Woodinville Downtown Master Plan with the uses that exist today and those that could be expected by-right given current zoning. Table 1 summarizes the land use comparison for the two subareas.

A significant share of the current land use in downtown Woodinville is retail or commercial oriented activity. These uses tend to peak at the same time (on weekdays at lunchtime and during the PM peak period 4-6 PM and on Saturdays between 1-5 PM – with Saturdays 20 to 50 percent higher than an average weekday[1]). When a critical mass of other uses do not exist (such as residential or office use) they depend upon external traffic to achieve business success. This external traffic means that all the motor vehicle demand is attracted from sources around or outside downtown, with little attraction from downtown. While some uses generate chained,

[1] *Trip Generation Informational Report, 6th Edition*, Institute of Transportation Engineers, 1997.

multi-stop trips (meaning a person stops at several retail destinations), these trips commonly are made via automobile when they are spread out over several free-standing pads.

Table 1
Woodinville Downtown Subarea Land Use Comparison

Scenario	Retail/Commercial	Office	Residential
Downtown Core Subarea			
Existing	172,000 SF	-	130 DU
Current Zoning	147,000 SF	38,000 SF	1,420DU
Proposed Plan	147,000 SF	76,000 SF	2,842 DU
Little Bear Creek Subarea			
Existing	296,000 SF	-	-
Current Zoning	575,000 SF	-	-
Proposed Plan	-	650,000 SF	400 DU

When a mix of land uses are developed at significant levels, there is potential for interaction among land uses, particularly walk trips[2]. The proposed Woodinville Downtown Master Plan would generate nearly the same number of trips as would be the case if the land built out under current zoning; however, the potential to capture trips (walk and internal) due to the proposed mixed-use concept would result in 15% fewer external vehicle trips (Table 2), prior to accounting for pass-by trips. Further reductions in vehicle trips could be developed by planning for independent senior housing in the residential element of the plan.

Table 2
Net Vehicle Trip Generation Comparison

Scenario	Approximate PM Peak Hour External Vehicle Trips
Existing Base Condition	2,200
Existing Zoning	3,400
Proposed Woodinville Downtown Plan	2,900

Impact of Mixed-Use Concept on Traffic Impacts

A second benefit of the proposed Woodinville Downtown Master Plan's mixed use concept is the variation in peak traffic between the various uses. Retail tends to peak on Saturdays (typically 30% higher vehicle trip generation than an average weekday[3]). Office uses generate little traffic on weekends and residential activity tends to be lower on weekends. By balancing future uses in the downtown, optimal use of existing and planned roadway capacity can be developed. Further development of retail, particularly auto-oriented retail, would have greater traffic impacts since all the traffic in the downtown would peak at the same time and the same days.

[2] *Trip Generation Handbook,* Institute of Transportation Engineers, 1998.
[3] *Trip Generation Informational Report, 6th Edition,* Institute of Transportation Engineers, 1997.

Planned Improvements

The 2002-2007 Capital Improvement Plan for the City of Woodinville outlines several roadway projects in the downtown area. Most occur on state highways and are joint projects. These projects address several short term capacity needs in the downtown. Table 3 summarizes the key downtown projects.

Table 3
Planned Roadway Projects in the Downtown Area
2002-2007

Project	Summary	Cost
Little Bear Creek Parkway	Widen to three lanes with sidewalks and bike lanes from 133rd to Woodinville-Snohomish Rd.	$3.95 M
195th from SR 522 to Woodinville Snohomish Rd.	Add traffic signals and turn lanes	$0.4 M
SR 202/SR 522 Interchange	Relieve congestion by adding lanes, ramps and/or overcrossings	$1.33 M
175th Strteet/131st Avenue NE	Add turn lanes	$0.4 M

SOURCE: *2002-2007 Capital Improvement Plan*, City of Woodinville, October 2001.

SITE PLAN CONCEPT

The proposal to build a street grid in the downtown core areas provides the frame work with pedestrian oriented development that can effectively encourage walking between uses (internal trip capture) and increase the number of stops or activity that a person can accomplish with a single vehicle trip – minimizing possible impacts. The increased number of public streets provides a substantial circulation benefit by dispersing traffic to numerous outlets, allowing traffic to balance capacity needs. Unlike large free-standing retail sites with limited access points where traffic concentration onto the arterial system can result in congestion, the proposed grid affords opportunity to increased capacity by utilizing the capacity of arterial, collector and local streets effectively.

Key capacity constraints to the downtown exist at gateway points to SR 522 at 132nd Avenue NE and NE 195th Avenue. Planned improvements in the area propose to increase capacity at these locations. The key intersection from a motor vehicle capacity standpoint, based upon prior studies in the downtown area, would include:

- SR 522 interchanges at 132nd Avenue NE and NE 195th Avenue
- 131st Avenue NE/Little Beard Creek Parkway
- 131st Avenue NE/NE 175th Street
- NE 175th Street/140th Avenue NE
- Woodinville/Snohomish Road/NE 195th Street

Further study of operational capacity needs would be necessary to identify future needs to serve downtown Woodinville development.

From a pedestrian access standpoint, the grid of streets improves the walking environment for retail and residential uses substantially. Retail and residential uses can benefit from the exposure, on-street parking and compact environment. Adequate accommodation of publicly accessible, shared, off-street parking is critical to supporting these uses in a grid environment. Linkages between Burke Gilman Trail, Wilmot Gateway Park and Little Bear Creek trail need to be developed that provide for continuous travel and safe crossings of public streets. Enhanced pedestrian crossings will need to be developed (curb extensions, in-road lights, flashers, signing, pavement marking, advanced pedestrian detection and/or other treatments).

Woodinville Downtown Master Plan

Trip Generation Comparison

DKS Associates ##########

EXISTING

			PMTrip Rates/GSF					
		Size	Existing	In	Out	In Trips	Out Trips	Total
Office	710	0	1.5	0.17	0.83	0	0	0
Retail	820	468	4.5	0.48	0.52	1011	1095	2106
Residential	220	130	0.67	0.67	0.33	58	29	87
								2193

EXISTING ZONING

			PMTrip Rates/GSF					
		Size	Existing	In	Out	In Trips	Out Trips	Total
Office	710	38	1.5	0.17	0.83	10	47	57
Retail	820	722	4.5	0.48	0.52	1560	1689	3249
Residential	220	142	0.67	0.67	0.33	64	31	95
								3401

PROPOSED

			PMTrip Rates/GSF			Inbound Summary			Outbound Summary			NET
		Size	Proposed	In	Out	In Trips	Reduction	Net	Out Trips	Reduction	Net	TOTAL
Office	710	726	1.5	0.17	0.83	185	35	150	904	41	863	1013
Retail	820	147	4.5	0.48	0.52	318	120	198	344	175	169	367
Residential*	220	3242	0.55	0.67	0.33	1195	164	1031	588	97	491	1522
						1697		1378	1836		1523	2902

* - Note lower residential trip rate used due to large size

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Final Report

Little Bear Creek Corridor Redevelopment Alternatives Traffic Impact Analysis

Prepared for:
City of Woodinville, Washington

Prepared by:
Earth Tech
10800 NE 8th Street
Bellevue, WA 98004

April 22, 2002

Table of Contents

Traffic Forecasts

The Woodinville Traffic Model consists of a road network model and a trip table derived from land use, for a base year of 1998 and a forecast year of 2020. The current version of the model uses Tmodel2 software; however, this is a translation to Tmodel2 of an earlier model created using emme2 software, which was itself based on the PSRC four-county regional traffic forecasting system. The conversion to Tmodel2 included a major simplification of the model from the regional zone structure of 1220 Traffic Analysis Zones to the current structure of 243 zones, and a corresponding simplification of the road network from 19,000 links to just 4,000 links.

The emme2 trip tables were derived from trip tables of the PSRC regional traffic model, and only indirectly account for local land use details. There is no independent capability in Woodinville at this time to recalculate trip generation and trip distribution directly from local land use. Adjusting the future 2020 trip table for the proposed study area land use changes was accomplished indirectly and awkwardly rather than straightforwardly and simply.

Traffic Network Revisions

The existing Tmodel network represents the study corridor with just three Traffic Analysis Zones (TAZ's). To accurately simulate all of the 43 land parcels in the study, and account for all the variations of existing and proposed land uses, a total of nine TAZ's were created for this study. The existing and future road networks were correspondingly updated to account for those TAZ's and their access locations along Little Bear Creek Parkway (nee 177th Avenue NE).

To better match the traffic model's simulation of existing counts in the study area, revisions were made to improve the accuracy of trip loading on the road network for three TAZ's physically located outside the study area but routing considerable traffic through the study area.

First, to represent the significant flow of retail traffic through the south end of the LBC Parkway corridor between the downtown's new retail centers and the SR 202 interchange, the access points for TAZ 44 were rebalanced to emphasize that path rather than the path via 175th Street to/from SR 202. Also, the trip volumes at TAZ 41 (Target Store) were tripled to reflect current reality. It is not known how those volumes were previously estimated in the 1998 calibration effort, but a large increase was appropriate for present needs. The same TAZ's future volumes were doubled in the future scenarios for consistency. In addition, the running speed of Little Bear Creek Parkway was increased in the model while the speed of 175th Street was reduced. These changes greatly increased the accuracy of the modeled turns at the 131st / LBC Pkwy intersection, and also improved the accuracy of modeled volumes on 175th Street.

Next, the loading point of industrial park TAZ 9 was shifted fromWoodinville – Duvall Way (195th) to 200th Street / 244th Avenue NE. This greatly improved the simulation of turns to/from the north leg of the 195th / LBC Pkwy intersection.

Future Network Assumptions

The future road network includes the improvements currently planned or proposed by the City of Woodinville. This includes in particular the completion of the downtown area street grid, completion of the 195th Street Interchange as a four-legged diamond, and the addition of an overpass across SR 522 effectively extending SR 202 northward to 120th Avenue NE in Bothell across the freeway. The latter proposed overcrossing diverts a significant volume of traffic away from the congested SR 202 interchange with SR 522. It reduces future volumes on 131st Avenue NE below the existing volumes, through the intersection with LBC Parkway.

The proposed overcrossing is a very significant assumption for the analysis of future conditions for the study corridor. Similarly, the addition of the north legs of the 195th Street interchange significantly affects the routing of traffic to, from, and through the study corridor.

Trip Generation/Distribution

Due to the fact that an independent trip generation model does not exist for Woodinville, the trip distribution for each study area TAZ was estimated by analogy to the nearest TAZ with traffic patterns representing the assumed land use type. The applicable row and column of the origin-destination matrix for the "pattern" TAZ was copied to the study area TAZ, then scaled to match the expected trip generation of that TAZ. For general retail and auto retail land use alternatives, the pattern zone was a TAZ in the existing retail core area of Woodinville. For office and industrial land uses, the distribution pattern was patterned after a TAZ representing the existing industrial park area near the north end of the study corridor. A similar pattern methodology was used in the recent Traffic Impact Fee Study, to estimate the travel patterns for all development land use types in each part of the city.

Traffic Forecasts

The traffic forecasting model was run once for each of four scenarios: the existing baseline case and three future alternatives. The baseline model was run solely to determine that the representation of existing conditions was consistent with actual traffic counts. The traffic model refinements described previously were identified and executed in order to improve that consistency. Based on that calibration effort, the future model volumes were deemed suitable for analysis without further adjustment or post-processing in the study corridor. No analysis of other areas has been made.

Following pages depict the results of the traffic forecasting effort. Depicted are three types of information, in three series of plots for the four model runs. All data represents PM peak hour conditions.

- Total traffic volumes on the road network (numeric data, by direction)
- LBC Study Subarea-generated traffic volumes (numeric data, by direction)
- LBC Study Subarea-generated traffic volumes (bandwidth data, by direction)

The bandwidth data provides a good visual representation of the total impact of development in the study corridor. The width of the dark bands corresponds to the directional traffic volumes in the numeric plots. It is apparent that the major impact is that of growth in the corridor, from present to future. The differences between the three alternatives are relatively minor in comparison to the fact of growth from the present.

The numeric data is useful to identify directional flow volumes in absolute terms, and to calculate proportional shares of the total volumes at any location that are attributable to the study area.

Traffic Impacts of Land Use Alternatives

Based on the attached maps of total volumes and subarea volumes, the contributions of study area developments are directly stated below for the north and south ends of the corridor. For simplicity, only the two-way total volume on LBC Parkway is tabulated here. For a more detailed consideration of traffic impacts by direction, see the next section on Level of Service.

The existing conditions for land use and traffic modeling represent 1998, while the comparison traffic counts were from 2000. It is therefore not surprising that the "existing" traffic model volumes are lower than the "existing" counts, even after the relatively adjustments described previously. The future traffic model is nominally associated with the year 2020 for regional background growth, and assumes full development of the land parcels within the study area. For the most basic description of relative impacts between land use policy alternatives, only net changes need to be considered, based on the data below.

Volumes on LBC Parkway north of 131st Avenue NE

Land Use Alternative	Total Volumes	Study Area Trips
Actual Traffic Counts (2000):	745	unknown
Traffic Model Results:		
Existing Land Use (1998):	603	227
Future Alternative #1:	1902	1267
Future Alternative #2:	1899	1316
Future Alternative #3:	1698	1095

Volumes on LBC Parkway south of NE 195th Street

Land Use Alternative	Total Volumes	Study Area Trips
Actual Traffic Counts (2000):	1803	unknown
Traffic Model Results:		
Existing Land Use (1998):	1404	171
Future Alternative #1:	2528	974
Future Alternative #2:	2423	789
Future Alternative #3:	2440	808

Level of Service

For a more detailed analysis of the traffic impacts of the land use policy alternatives, the operating conditions of the two anchor intersections at each end of the corridor were examined, again using the traffic model outputs for data. For intersection analysis, the individual turning movements were used, which add up to the directional and two-way total volumes previously tabulated and mapped. Intersection worksheets are in the appendix.

Letter grades from "A" to "F" are used to describe level of service, by analogy to the common meaning of school grades. LOS "A" represents free flowing conditions with near-zero delay, while LOS "E" represents considerable delays, and full use of available capacity but without breakdown of traffic flow. LOS "F" is reserved for breakdown conditions where the traffic demand exceeds the available capacity, and stop-and-go operations result.

The American Association of State Highway and Transportation Officials (AASHTO) in its authoritative publication, A Policy on Design of Highways and Streets, 2001 ed., states that LOS "C" is the most desirable design goal. Woodinville, like many jurisdictions, regards LOS "D" as an acceptable design goal, in a compromise between traffic performance and other adverse costs to society of building larger transportation facilities to achieve a higher level of service. Some highly urbanized jurisdictions regard LOS "E" as acceptable.

Two methods of calculating intersection level of service are presented in parallel. The two methods differ in absolute ratings, but tend to show similar trends when comparing the net changes between alternatives.

The first definition of Level of Service is based on the Highway Capacity Manual ("HCM") - National Academy of Sciences, Transportation Research Board, Special Report #209, 1998 Update. HCM bases LOS on delay, and calculates the average of all delays for all vehicles using the location at hand under the given circumstances of traffic volumes, physical lane configuration, and traffic signal operational controls.

Future delay at signalized intersections is highly sensitive to signal control settings, which are presently unknown and must be estimated. The future settings were therefore set to represent a mid-range of the cycle lengths and other control settings likely to occur if the corridor to/from SR 522 has interconnected signals and saturated flow conditions. This assumption allowed the analysis of each intersection to be completed without further reference to the remainder of each corridor. This is sufficient for the purposes of comparing the land use plan alternatives.

The second method presented is Intersection Capacity Utilization ("ICU"), which utilizes most of the same assumptions as the HCM method except that signal control details are entirely omitted. The emphasis is on the capacity provided by the available lanes, at an "average" level of signal control settings and efficiencies. The LOS scale for ICU is measured by percentage consumption of capacity. This has some appeal when evaluating growth impacts and relating impact mitigation to development size in quantitative terms.

The following LOS results are all based on the counted or modeled total volumes that use the intersections at hand. Cycle lengths of 130 seconds (131st Ave intersection) and 100 seconds (195th St intersection) match the present cycle lengths at those intersections as obtained from King County traffic operations personnel. The Synchro analysis of each case was set to optimize the phase splits within the given cycle length without changing the cycle length. Longer cycle lengths would reduce the delays in the future cases, but the difference would not be enough to change any LOS ratings, nor change the relative comparisons between the alternatives.

The future results indicate clearly that the existing intersections cannot accommodate the projected travel increases without substantial expansion for more lanes through the intersections, in all directions.

Level of Service on LBC Parkway north of 131st Avenue NE

	Existing Lanes		With Added Lanes	
Land Use Alternative	HCM	ICU	HCM	ICU
Actual Traffic Counts (2000):	C 35s	F 108%	na	na
Traffic Model Results:				
Existing Land Use (1998):	C 31s	F 100%	na	na
Future Alternative #1:	F 176s	H 177%	C 30s	E 92%
Future Alternative #2:	F 192s	H 183%	C 36s	E 98%
Future Alternative #3:	F 185s	H 172%	C 33s	E 97%

Hypothetical improvements considered for the intersection of LBC Parkway at 131st Avenue NE are the addition of one lane eastbound and two lanes westbound on the east leg (only) of LBC Parkway, and the addition of two lanes southbound on 131st Avenue NE (north leg only), to support high turn volumes in most directions.

Level of Service on LBC Parkway south of NE 195th Street

	Existing Lanes		With Added Lanes	
Land Use Alternative	HCM	ICU	HCM	ICU
Actual Traffic Counts (2000):	C 31s	D 88%	na	na
Traffic Model Results:				
Existing Land Use (1998):	D 36s	E 92%	na	na
Future Alternative #1:	F 146s	H 146%	E 56s	G 113%
Future Alternative #2:	F 149s	H 145%	E 67s	G 116%
Future Alternative #3:	F 147s	H 144%	E 62s	G 113%

Hypothetical improvements considered for the intersection of LBC Parkway at NE 195th Street are the addition of one lane eastbound and westbound on the west leg (only) of 195th Street, and the addition of one lane northbound and southbound on LBC Parkway (Woodinville-Snohomish Road), to support high turn volumes to/from the west (SR522 interchange).

Discussion of Results

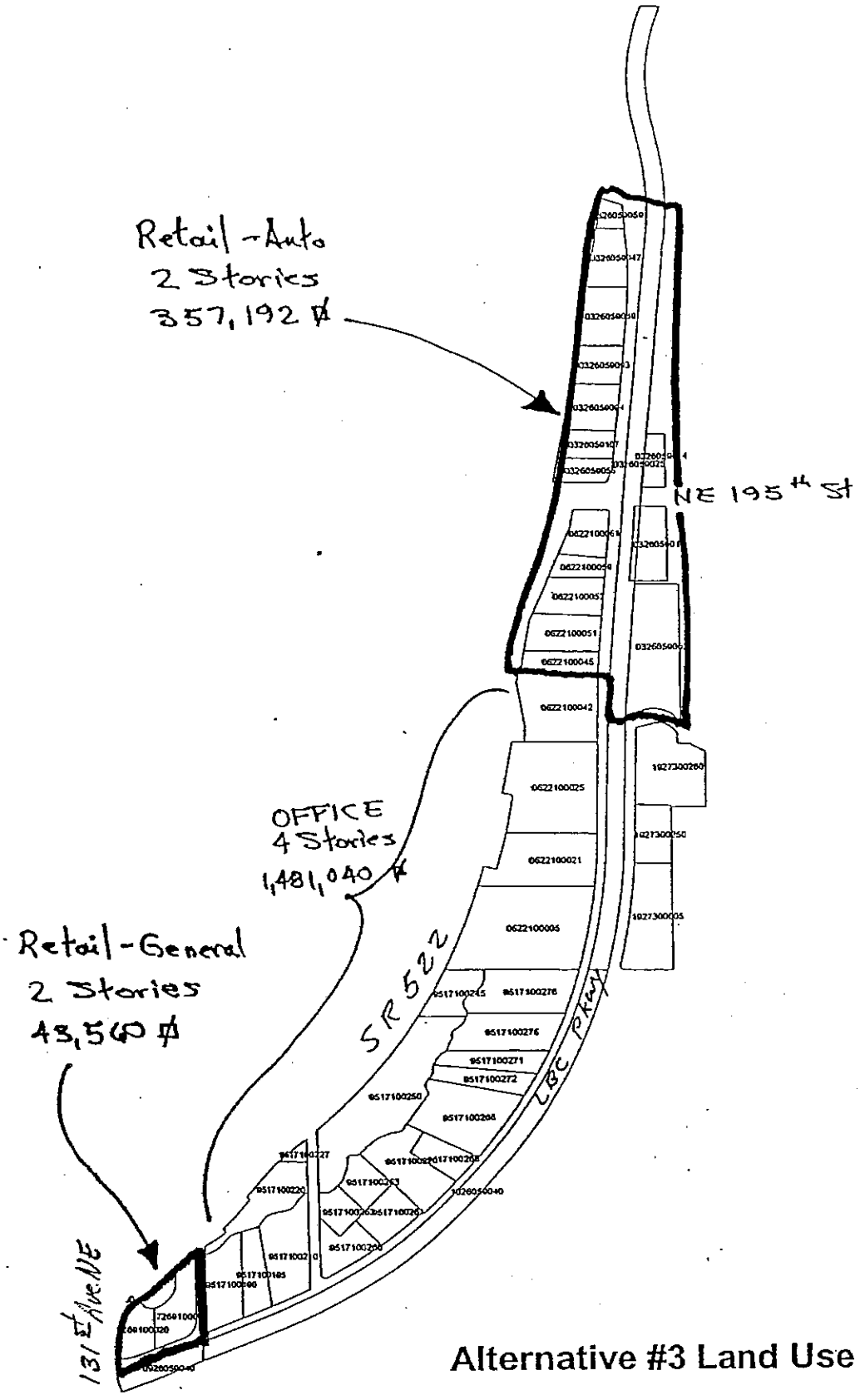
The primary finding is that all three land use alternatives will produce approximately the same future level of service, with rather minor distinctions between the three cases. This outcome is true whether the assumed road conditions are only the existing built network, or the assumptions include substantial future improvements to accommodate future growth. Alternative 2 has slightly higher loadings, higher delay, and more congestion, than the other two alternatives, but the differences are not great enough to change any level of service ratings.

The analysis of future conditions with "existing lanes" represents the case of adding the forecast traffic volumes, with no improvements to the existing intersections. The result is a predictable extreme level of overloading in all future cases, indicating that the assumed level of future growth cannot be served by existing facilities.

The alternative set of analyses "With Added Lanes" documents the results for a hypothetical set of improvements to each intersection to overcome the deficiencies observed with the existing lanes. The hypothetical improvements described are not the only solution available, and serve only to represent the degree of capacity improvements necessary to meet the forecast travel demand at a minimally acceptable level of service. The cases calculated with the hypothetical improvements are in some particulars still not a fully satisfactory solution, but adding still more lanes to achieve a mathematically better result does not appear to be a practical option in reality.

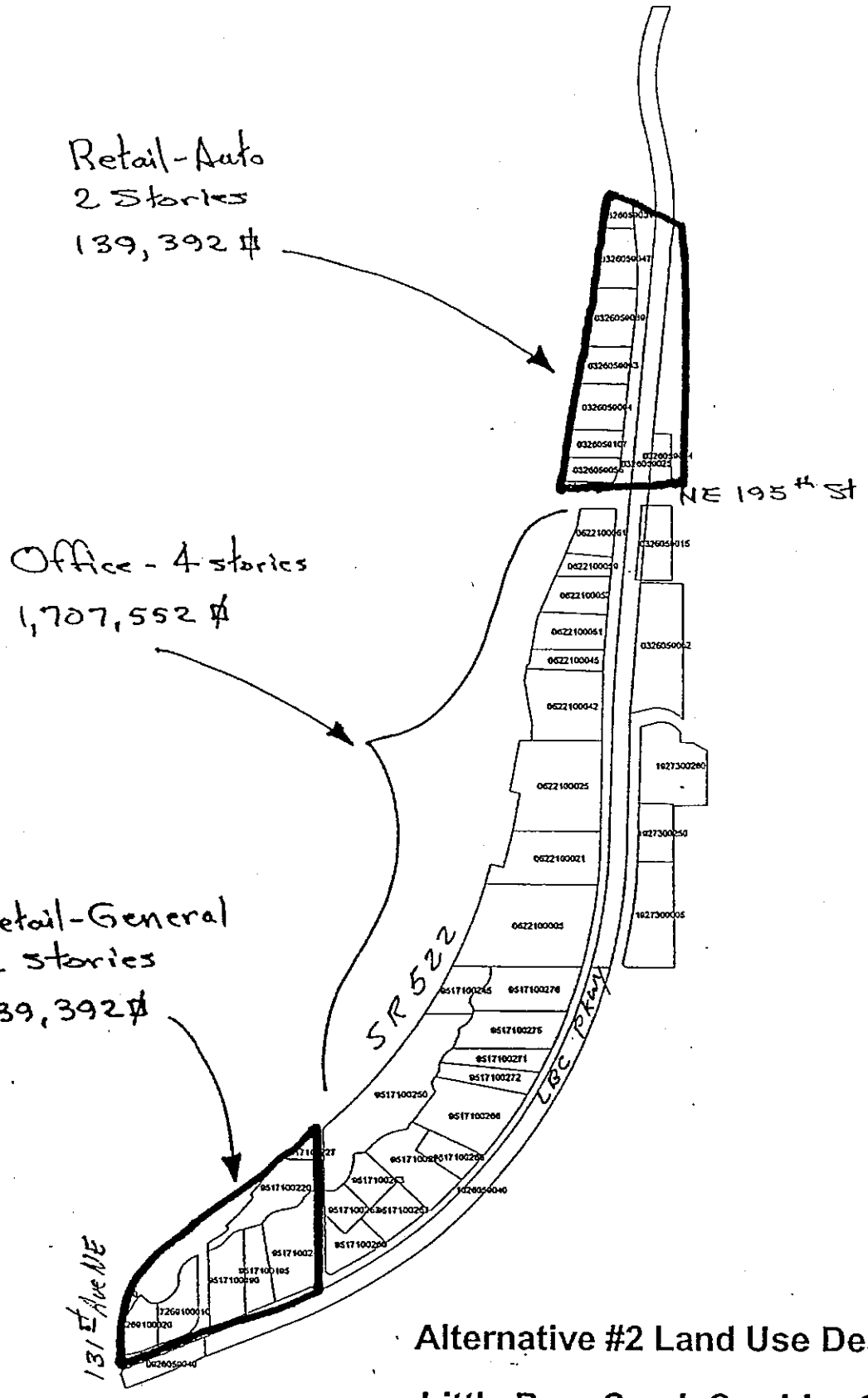
The relatively low future travel demand on 131st Avenue NE is dependent on the existence of the proposed overpass above SR 522 connecting SR 202 to 120th Avenue NE. Without that overpass, much more demand would occur on 131st Avenue NE, and still more lanes would be needed in that corridor.

Without the completion of the 195th Street interchange's north ramps, the volumes on 195th Street would be less, but the users of those ramps would need to be accommodated somewhere else. Volumes on LBC Parkway would be affected both positively and negatively. The situation has not been modeled that combines future travel demand with the existing half-diamond interchange.



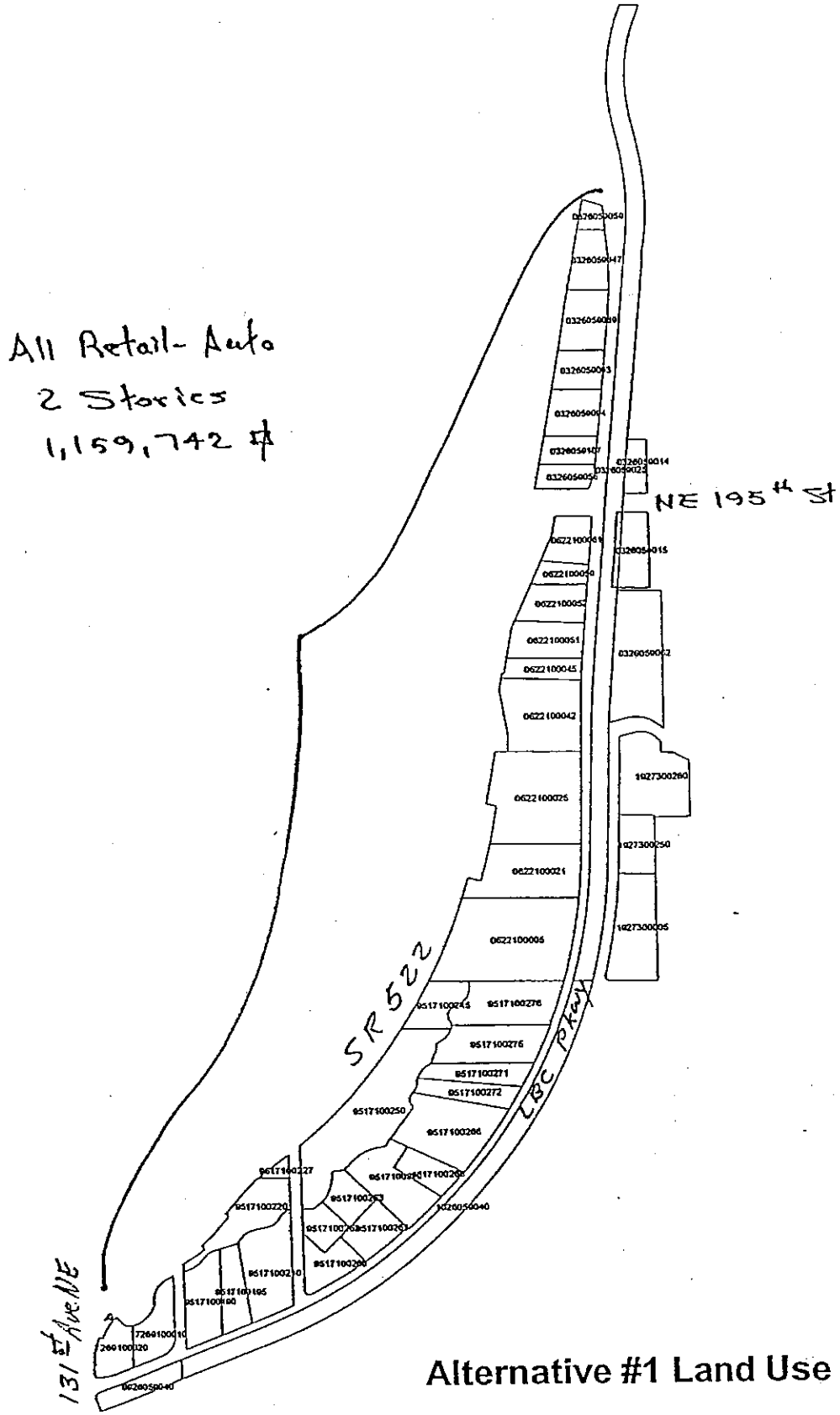
Alternative #3 Land Use Designations

Little Bear Creek Corridor Study Area



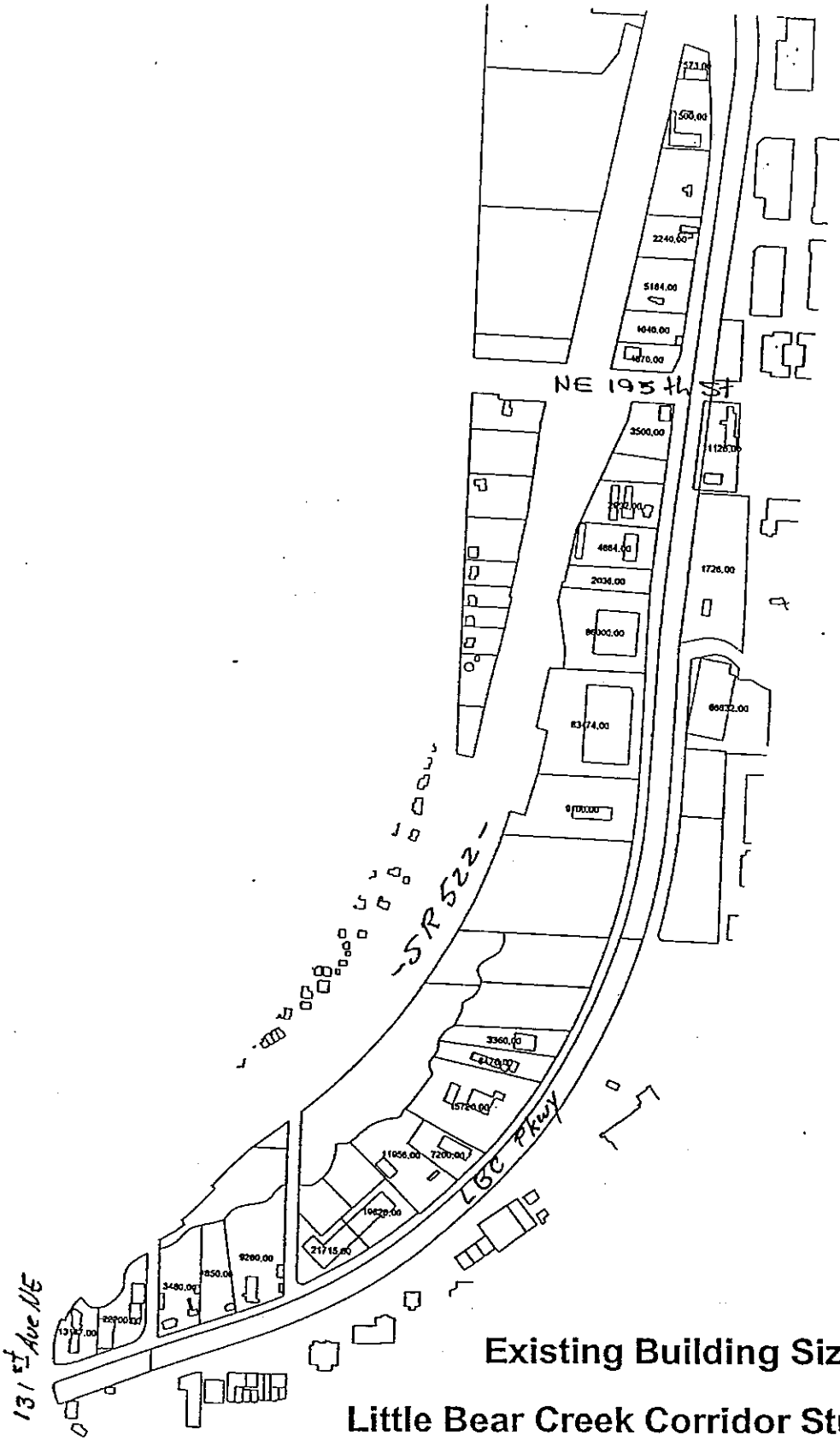
Alternative #2 Land Use Designations

Little Bear Creek Corridor Study Area



Alternative #1 Land Use Designations

Little Bear Creek Corridor Study Area



Existing Building Sizes in the Little Bear Creek Corridor Study Area

Trip Generation

Trip generation for existing and future conditions in the study area was calculated from land use data using trip rates found in Trip Generation, 6th edition (1998) published by the Institute of Transportation Engineers. The afternoon peak hour was evaluated, because that time period generally has the most congested traffic conditions.

The future land uses permitted under the City's proposed zoning classifications correspond to a wide range of example land use categories documented in the ITE reference. Since the future developments are not now known, an average trip rate was calculated for each zoning classification as follows, and the average rate was used uniformly throughout the study area.

Land Use Class	PM Peak Hour Trip Rate	Outbound Directional Split
General Retail :	4.5 trips / 1,000 sq. ft.	54% outbound
Auto Retail :	3.5 trips / 1,000 sq. ft.	54% outbound
Office :	1.4 trips / 1,000 sq. ft.	84% outbound
Warehouse, Utilities, and Industrial :	0.6 trips / 1,000 sq. ft.	66% outbound

The last category was used to represent existing developments in the baseline scenario, and is not part of the forecasting scenarios for the City's land use alternatives.

A table of the various ITE trip rates used to develop these average rates is in the appendix.

The study area includes 43 land parcels, for which the existing development is known, and the proposed future land use under each alternative is estimated on the assumption that all land parcels would eventually be developed or redeveloped to the maximum density provided for each land use zoning alternative. Full conversion and redevelopment may or may not occur on some existing parcels with substantial buildings of recent construction. Therefore, this planning analysis represents a "worst case" scenario that exceeds the amount of development likely to occur in the corridor in any short-range future time period. A brief description of the trip generation for each alternative follows.

Existing Conditions (Baseline)

Solely for purposes of establishing a baseline of reference and for calibrating the traffic model, the existing as-built condition of the corridor in 2001/2002 was documented from the City of Woodinville GIS inventory, and trip generation was modeled from that data, as detailed in tables found in the appendix. A summary description follows:

Total Land Use :	444,100 sq. ft.
Total Trip Generation :	688 trips (PM Peak Hour)

Alternative 1- Auto Retail

This alternative considers most land in the study corridor to be redeveloped as auto-oriented retail activity. The average development potential per acre of this type of activity was estimated from ITE source data to be approximately 15,000 square feet of building area per acre, or 33% land coverage on average. Trip generation was modeled from those assumptions, as detailed in tables found in the appendix. A summary description follows:

Total Land Use :	1,159,000 sq. ft.
Total Trip Generation :	4,089 trips (PM Peak Hour)

Alternative 2- Office and Less Retail

This alternative classifies the majority of the land in the study corridor as office buildings, with a small amount of general retail activity at each end of the corridor. The average development potential per acre of the office land use was prescribed by the City to be approximately 27,000 square feet of building area per acre, all as two-story buildings, with 30% land coverage on average. Trip generation was modeled from those assumptions, as detailed in tables found in the appendix. A summary description follows:

Total Land Use :	1,986,000 sq. ft.
Total Trip Generation :	3,504 trips (PM Peak Hour)

Alternative 3- Office and More Retail

This alternative classifies the majority of the land in the study corridor as office buildings, with a moderate amount of general retail activity at each end of the corridor. There is less office development and more retail development, compared to Alternative 2. The average development potential per acre of the office land use was prescribed by the City to be approximately 27,000 square feet of building area per acre, all as two-story buildings, with 30% land coverage on average. Trip generation was modeled from those assumptions, as detailed in tables found in the appendix. A summary description follows:

Total Land Use :	1,882,000 sq. ft.
Total Trip Generation :	3,520 trips (PM Peak Hour)