

**BEND CASE STUDY:
INDIRECT LAND USE AND GROWTH IMPACTS**

Interim Report

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16. Abstract To improve environmental analysis of indirect land use impacts of highway capacity improvements, this study analyzed the land use and growth patterns of 20 Oregon communities over 20 years. Using a Geographic Information System and aerial photos, growth patterns were categorized and mapped. Factors related to land use and transportation were evaluated for their relationships to resulting growth patterns. These relationships were further investigated in four in-depth case studies of development prior to, during, and after construction of a highway capacity improvement. Additional case studies are currently underway. The primary product of this research will be guidance for completing an assessment of the indirect impacts on land use and growth of a highway improvement. This assessment is required by environmental regulations, but tools and data for developing general land use forecasts is limited. The guidebook will include examples from the case studies, data types and possible sources, and guidance on using GIS tools for comparing alternative scenarios. Interim reports are available via the Research Internet web site. Additional case studies and a final report are scheduled to be published in the fall of 2000.			
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1.0 INTRODUCTION

1.1 PURPOSE OF THIS REPORT

This case study is part of a larger study sponsored by the Oregon Department of Transportation (ODOT) to quantify the impacts of its highway improvement projects on land use. Any significant highway improvement projects that ODOT undertakes will require Environmental Impact Statements (EISs), which in turn require an assessment of the improvements on land use. In addition to other environmental and socioeconomic impacts.

The larger study consists of three research components and a final report. The three research components are:

- *Literature Review.* Review of state and national studies to summarize empirical estimates of the relationship between highway and land use change, especially at the urban fringe.
- *20-Site Analysis.* Analysis of historical aerial photographs and highway maps to show the association between highway improvements and land use changes over 20 years in 20 Oregon cities.
- *Case Study Analysis.* More detailed analysis of highway projects in four Oregon cities to try to explain the reasons for the observed change in land use and highways. The case study cities are Albany, Bend, McMinnville, and Grants Pass.

This report is the case study analysis for the City of Bend only. It does not try to generalize to other situations, or to integrate this case study with the other research. The final report will do that and will include a summary of key findings of the literature review, the 20-site analysis, and all the case studies.

1.2 DESCRIPTION OF THE CASE STUDY HIGHWAY PROJECT

The Bend case study evaluates the land use impacts of improvements to a section of U.S. Highway 97 (The Dalles-California Highway) from milepost 132.6 on the North (about 0.5 miles north of the Smalley Road/US 97 intersection) to the Highway 97/Highway 20 Interchange at milepost 134.8. The project was called the Bend-Redmond South Unit. The project improved a 2.2 mile section from two to four lanes. The project was divided into two segments: the northerly segment (Segment N) extended from the Bend Urban Growth Boundary (UGB) at milepost

133.8 north to milepost 132.6. The southern segment (Segment S) extended from the Bend UGB at milepost 133.8 south to the Highway 97/Highway 20 Interchange at milepost 134.8.

The northerly segment expanded the existing two-lane facility to four lanes with a 4- to 14-foot at-grade median. The southerly segment expanded the existing two-lane facility with a 14-foot turning median to four lanes with retention of the 14-foot turning median. The project also built 10-foot paved shoulders in Segment N, 6-foot paved shoulders in Segment S, and a bikeway on the shoulder for both segments. Other proposed improvements included curbs in Segment S. Figure 1.1 shows location of the project.

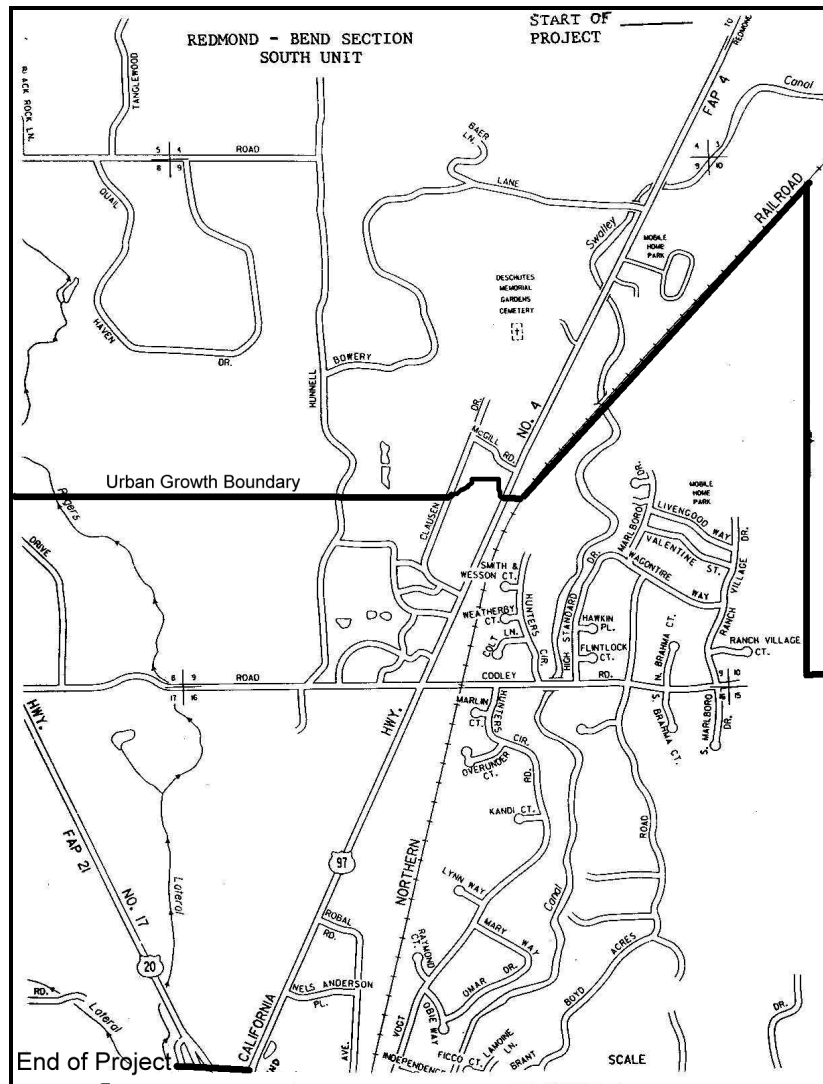


Figure 1.1: Project Location

Source: Bend-Redmond South Unit Environmental Assessment, 1987.

A full Environmental Impact Statement (EIS) was not completed for the Bend-Redmond South Project. An Environmental Assessment (EA) was completed for the project. The project was completed in 1991.

Two other highway projects influence land use in the area but are not the objects of this case study. The Bend-Redmond North widening was completed 1990, and construction of the northern section of the Bend Parkway was initiated in 1996 and completed in 1998. While it is too early to evaluate the impact of the Bend Parkway on the study area, the Parkway will improve access to commercial areas in the study area (as well as other areas in Bend). This case study discusses their potential influence, but does not evaluate them with the kind of detailed data collected for the study area.

According to the Environmental Assessment, the purpose of the project was to increase the capacity and level of service of the facility and to improve safety along this stretch of Highway 97. The EA explained that the need for the project resulted from operational problems due to heavy traffic volumes. The EA projected that traffic volumes in the project corridor would increase as much as 70% between 1987 and 2008. Table 1.1 shows average daily traffic for 1980, 1987, and 1998 in the project area. The data indicate that traffic volumes increased by between 20% and 52% in the project corridor between 1980 and 1987. By 1998, traffic volumes in the project area had exceeded the forecasts presented in the EA.

Table 1.1: Average Daily Traffic in the Project Area, 1980, 1987, 1998

Location	Average Daily Traffic			Percent Change 1980-1987	Percent Change 1980-1998
	1980	1987	1998		
0.05 mile north of Nels Anderson Place and entrance to Mt. View Mall	9,500	14,400	25,900	52%	173%
0.30 mile north of McKenzie-Bend Highway (US 20)	12,000	14,400	28,800	20%	140%
0.30 mile south of McKenzie-Bend Highway (US 20)	19,000	25,300	38,900	33%	105%

Source: Oregon Department of Transportation, *Traffic Volume Tables*.

The EA also stated the proposed project would support commercial development of the area zoned Commercial Highway by improving traffic capacity, flow, and safety. The EA stated that neighborhoods would be unaffected.

In sum, the project was deemed desirable because (1) past growth in traffic implied future growth and congestion; and (2) it would address concerns about highway safety. Note that this project was justified primarily not only on the basis of *existing* traffic problems, but on the basis of future problems that would occur at greater volumes.

1.3 METHODS

The analysis in this report is both quantitative and qualitative. To conduct the baseline analysis, we reviewed EA documents, land use plans, and capital improvement programs. Those sources are the basis for our description of existing conditions before the case study highway improvements.

As with most policy research, the intent of this case study is to be able to isolate the impacts (the effects) that are uniquely attributable to a change in public policy. Figure 1-2 illustrates the concept. The shaded box represents a world that does not exist, but one that an analyst must somehow describe. It is a world that *would have* existed but for the introduction of the new policy. As it relates to this case study, the improvement to Highway 97 is the policy. The case study can document, to the extent the data allow, what happened after that policy (box on bottom right). Describing what *would have happened* without the improvement (the shaded box) is more speculative. As applied to this case study, the method does not formally define a hypothetical world and compare it to an actual one. Rather, it relies on expert opinion about the contribution of the project to the changes observed between "Existing Conditions" (1987) and the "Actual World" (1999).

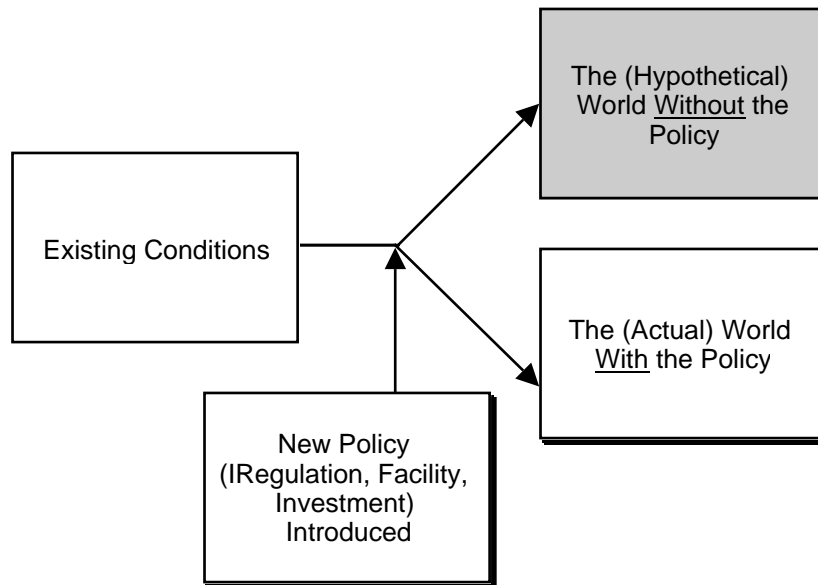


Figure 1.2: Case Study Method, in Concept

The intent of the case studies is to describe what happened inside and outside the Bend Urban Growth Boundary (UGB) after the highway improvement. As Figure 1.1 shows, however, the improvement extended 1.2 miles north of the Bend UGB. Thus, we describe land use changes that occurred outside the Bend UGB in unincorporated Deschutes County.

While the focus of the case study is on the Highway 97 corridor, citywide data was evaluated to provide a broader picture of where development occurred and when. Without that larger context,

it would be difficult to make judgments about whether the highway improvement associated with changes in development patterns. Figure 1.3 shows the study area boundaries.

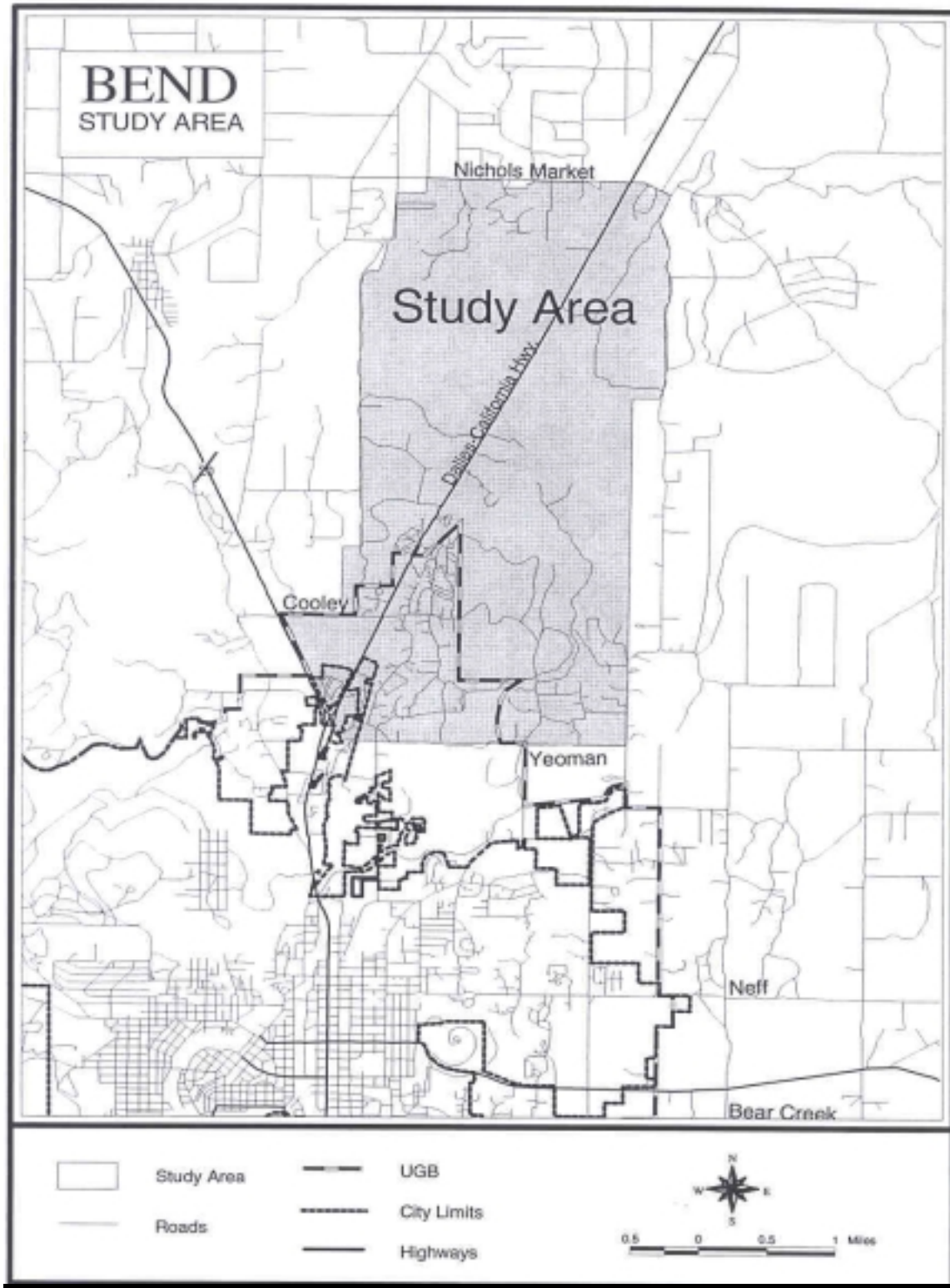


Figure 1.3: Study Area Boundaries

This report uses the following sources to describe changes in land use:

- Aerial photographs from 1980, 1990, and 1994 (Phase I of this project, the aerial photo analysis, was begun in 1998. At that time, 1994 was the latest date that aerial photos were available for all 20 cities included in the Phase I analysis.)
- County property tax assessment data that allowed Portland State University staff to plot development by year
- Capital improvement programs that identify the location and timing of water and sewer infrastructure.
- Geographic Information Systems (GIS) maps that show the location and timing of residential development and subdivisions.

A preliminary description of development patterns provided data for consideration by a focus group. The group consisted of Deschutes County staff, ODOT staff, and others with knowledge of development patterns in the Bend area. The purpose of the focus group session was to get comments on the preliminary conclusions made from review of secondary data sources, and to gain insights into the public policy decisions and market factors that contributed to the observed development patterns. Information gathered from the focus group was supplemented by interviews with City of Bend Staff.

1.4 ORGANIZATION

This report is organized as follows:

- **Chapter 2: Existing Conditions Before the Case Study Highway Project** describes socioeconomic, land use, and transportation patterns in Bend prior to completion of the highway project.
- **Chapter 3: Changes between 1987 and 1998** describes land use, infrastructure, and transportation changes in the Highway 97 corridor and other areas of Bend.
- **Chapter 4: Conclusions** presents conclusions about the impact of the highway project on land use based on the data reviewed in Chapters 2 and 3.

2.0 CONDITIONS BEFORE THE PROJECT (1980 TO 1997)

This chapter describes existing conditions in the case study area during the period between 1980-1987. The description of existing conditions primarily relies on data in the Environmental Assessment (EA) documents. Secondary sources include 1980 Census data the Bend Comprehensive Plan and Capitol Improvement Plan, and an Environmental Impact Statement prepared for the Bend Parkway. The requirements for completion of an Environmental Assessment (EA) are less stringent than those that govern Environmental Impact Statements (EIS). EIS's generally include technical reports that describe socioeconomic, land use, traffic, and other conditions before the project and impacts anticipated from the alternatives considered. The EA completed for the Bend-Redmond South Unit included only a cursory analysis of land use, right of way, and traffic impacts, and no analysis of socioeconomic impacts. Thus, the level of detail presented in this chapter is much less detailed than the other case studies.

2.1 SOCIOECONOMIC CONDITIONS

Table 2.1 shows population in Deschutes County, Bend, Redmond, and Sisters between 1970 and 1999. Deschutes County was among the fastest growing counties in Oregon between 1970 and 1990. During that period, the County experienced more growth outside of its urban areas than within them. Between 1970 and 1990, Deschutes County grew 146%; areas outside of the communities of Bend, Redmond, and Sisters grew by 273%.

Table 2.1: Population in Deschutes County, 1970, 1980, 1990, and 1998

Location	Population			% Change 70-90	Pop 1998	% Change 90-99
	1970	1980	1990			
Deschutes County	30,442	62,142	74,958	146%	106,700	42%
Bend	13,710	17,253	20,469	49%	50,650	147%
Redmond	3,721	6,452	7,163	93%	12,810	79%
Sisters	516	696	679	32%	840	24%
Rest of County	12,495	37,731	46,647	273%	42,400	-9%

Source: Center for Population Research and Census, Portland State University.

Note: Bend annexed all land within the Bend UGB in 1990, increasing population by about 15,000 between 1998 and 1999.

The EA did not include population or employment projections. The Oregon Office of Economic Analysis, however, projects that population in Deschutes County will increase by about 120% between 1990 and 2015, from about 76,000 to more than 167,000. According to the *Bend Parkway Draft Environmental Impact Statement*, the City of Bend expects its urban area to increase from between 51,000 and 139,000 in 2015.

Employment in Deschutes County increased nearly 50% between 1980 and 1990 from 21,780 in 1980 to 32,530 in 1990. The Office of Economic Analysis projects that employment in Deschutes County will increase by 142% between 1990 and 2015.

In addition to developing population and employment forecasts, the EA briefly discussed other socioeconomic impacts including commercial development, right-of-way, and fiscal impacts.

The EA concluded that the project would support commercial development in areas zoned Highway Commercial by improving traffic capacity.

Table 2.2 shows right-of-way impacts. Notably, right-of-way acquisition did not displace any residences and businesses. The project required 8.5 acres for right-of-way acquisition from portions of 26 parcels. The right-of-way acquisition impacted two of the Mountain View Mall’s parking lot roads and seven parking spaces, as well as removal of a sign and some on-site landscaping.

Table 2.2: Right-of-Way Structure Requirements and Total Costs

	Impact
Acres to be acquired	8.5
Number of affected parcels	
Residential	10
Mobile Home	2
Commercial	4
Unimproved	12

Source: Bend-Redmond South Unit EA, 1987.

2.2 LAND USE PATTERNS AND PLANS

2.2.1 Land Use Patterns

In 1987, existing land use in the project area consisted of a mix of agricultural, commercial, industrial, institutional, and residential uses. In the southern segment, uses west of Highway 97 were primarily commercial, including the Mountain View Mall which was completed in 1979. Land east of Highway 97 included light industrial, strip commercial, and residential. A few vacant parcels existed on both sides of the corridor.

Land uses in the northern segment included the Deschutes Memorial Garden Cemetery, residential, agricultural, surface mining, and scattered vacant land.

2.2.2 Land Use Designations

The project corridor was under two jurisdictions. The City of Bend had jurisdiction over the southern segment (from mile 134.8 to the Bend UGB at mile 133.8); Deschutes County had jurisdiction over the northern segment (the Bend UGB at mile 133.8 to mile 132.6).

The EA did not present information on comprehensive plan designations, but did include zoning for properties inside and outside of the Bend UGB. Figure 2.1 shows zoning designations in the project area. In the southern segment, zoning included: Suburban Low Density Residential (SR 2.5), Light Industrial (IL), Commercial Highway (CH), Standard Residential (SR), Urban Low Density Residential (RL), and Urban Area Reserve with 10 acre minimum lots (UAR-10). In the northern segment, zoning included: Multiple Use Agricultural with 10 acre minimum lots (MUA-10), Surface Mining Reserve (SMR), and Exclusive Farm Use with 20 acre minimum lots (EFU-20). Both the MUA and EFU zones had a combining zone called the Landscape Management (LM) zone. The LM zone extended one-quarter mile on each side of Highway 97 and was intended to maintain scenic and natural resources along the corridor.

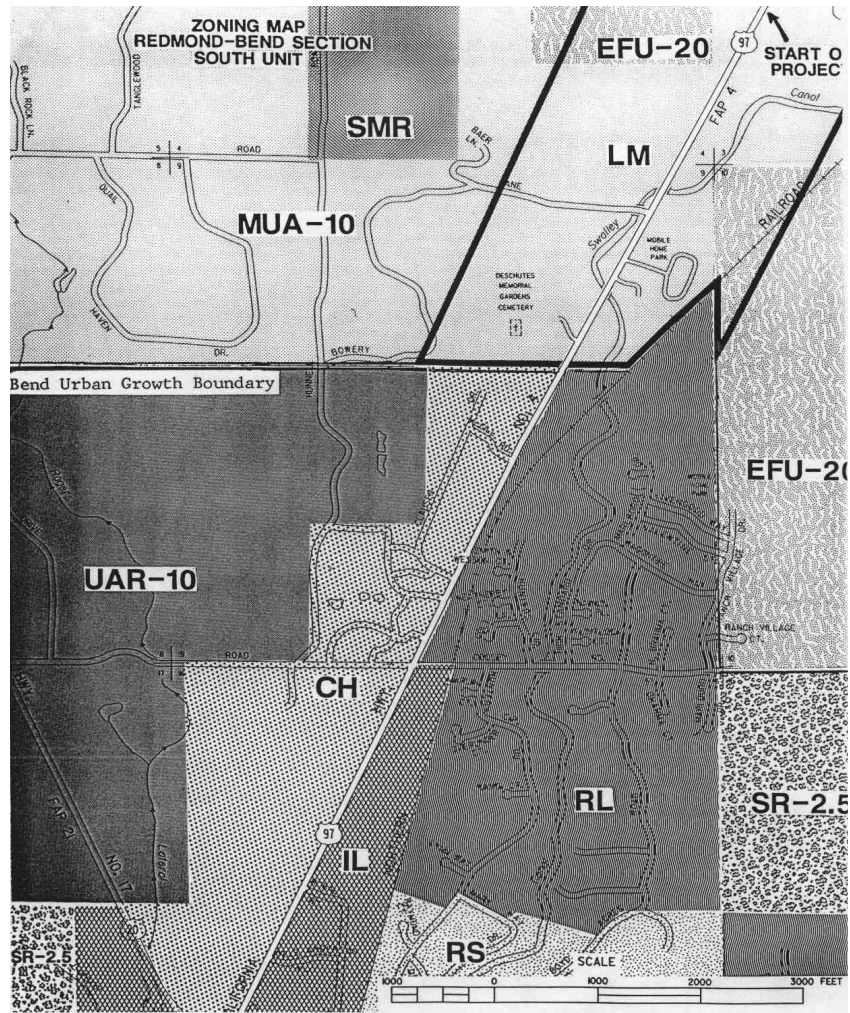


Figure 2.1: Zoning designations in the project corridor, 1987.
 Source: Bend-Redmond South Unit EA, 1987.

Developed land in the Light Industrial (LI) area east of Highway 97 was primarily in commercial use in 1987. According to a Planner with Deschutes County, commercial uses were allowed as conditional uses in the IL zone. Focus group participants indicated that new commercial uses began to appear in the IL zone after the Mountain View Mall was completed in 1979.

Development outside the Bend UGB included the Deschutes Memorial Garden Cemetery west of Highway 97, dispersed residential uses along both sides of the Highway, and a trailer park about one-quarter mile north of the Bend UGB on the east side of Highway 97.

The EA identified right-of-way acquisition as the primary land impact of the project. According to the EA, the build alternative required acquisition of 8.5 acres for the expanded highway right-of-way.

More germane to this analysis, however, is the analysis of secondary land-use impacts: land use impacts that result from the increased capacity and access provided by the highway improvement. Notably, the EA stated that “the project would not induce changes in land use that are inconsistent with proposed land use and zoning” (pg 6).

Finally, the EA stated that the project was not specifically identified as an improvement project in either the City or County comprehensive land use plans. Correspondence from the City of Bend and Deschutes County included with the EA indicated that the project was in compliance with both jurisdictions land use plans.

The City of Bend indicated in its correspondence that:

“ the Bend Area General Plan designates Highway 97 as a principal arterial and contemplates its widening to five lanes. Widening of Highway 97 between Bend and Redmond is a high priority within the Community” (Letter from John Hossick, Bend Planning Director to Rose Hayden, ODOT Assistant Project Manager, April 17, 1987).

The City of Bend further stated that the City had adopted arterial access policies that were intended to limit access directly to arterial streets as much as possible. The City indicated that Segment S had a number of parallel frontage roads proposed to provide access to the industrial and commercial properties. At the time the EA was completed, some of the frontage roads had already been completed including Clausen Drive and McGill Road.

The correspondence from Deschutes County indicated that the proposed widening project was compatible with the Deschutes County Year 2000 Comprehensive Plan but that the Comprehensive Plan did not specifically discuss the project. (Letter from Denyse McGriff, Deschutes County Senior Planner to Rose Hayden, ODOT Assistant Project Manager, April 21, 1987.) Deschutes County also indicated that the Transportation Element of the Comprehensive Plan stated that new accesses along principal arterials are not encouraged. Moreover, the County stated its site plan review process would encourage consolidation of existing access points. Finally, the County indicated that the Comprehensive Plan required bicycle routes to be on all principal arterials (including state highways).

2.3 TRANSPORTATION SYSTEM CHARACTERISTICS

Table 2.3 shows historical average daily traffic for selected locations in the project area. While the EA did not present detailed traffic volume data, the Oregon Department of Transportation, Transportation Systems Monitoring Unit collects data on traffic volumes at selected locations.

In the 10-year period between 1977 and 1987, the average daily traffic (ADT) volume on Highway 97 in the project area increased between 67% and 97% at specific locations. The largest increase was recorded just north of the entrance to the Mountain View Mall.

The EA estimated that traffic volumes would increase from 12,000 in 1987 to 22,000 in 2008, about 83%. The document does not indicate where in the project corridor the volumes were estimated, however, the data in Table 2.3 suggest it was in the southern segment, probably near the intersection of Highway 97 and Nels Anderson Place. The EA concluded that the increasing traffic volume would be accommodated by upgrading the facility to four travel lanes. The EA indicated that the segment was abutted by a 4-lane segment to the north and a 2-lane segment to the south which “creates bottlenecks with heavy congestion and increased accident potential” (pg. 8).

Table 2-3: Historical Average Daily Traffic, 1977-1987

Location	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	% Change
0.05 Mi N of Ent. to Mall	7,500	7,800	7,800	9,500	9,800	7,800	8,800	10,500	14,600	13,800	14,400	92%
0.30 Mi N of Hwy 17	8,600	9,600	10,600	12,000	12,300	11,300	12,000	14,300	14,600	13,800	14,400	67%
0.30 Mile S. of Mckenzie-Bend Hwy.	15,000	16,500	17,000	19,000	19,600	18,300	25,000	21,600	22,000	24,300	25,300	69%

Source: Oregon Department of Transportation, *Traffic Volume Tables*.

The EA also concluded that the improved traffic flow from the 4-lane build alternative would provide motorists with the opportunity to pass slower moving vehicles. The EA also stated that no change in current or projected traffic volumes would take place as a result of implementing the proposed improvement.

Finally, the EA indicated that future traffic impacts (in 2008) of the no-build alternative would result in a Level of Service F (forced flow) and unpredictable speeds, with stop-and-go conditions prevalent. The build alternative would provide a Level of Service B (stable flow) with an operating speed of 55 miles per hour.

2.4 PUBLIC SERVICES

In 1987, when the EA was completed, the extent of Bend’s public services into the project area was considerable. According to data provided by the City of Bend, water and sewer service extended along the Highway 97 corridor to the Mountain View Mall. According to a City of Bend Planner, water and sewer lines extended to the Mall were sized to accommodate full build-out of the areas designated for commercial use out to the UGB.

Residential areas to the east of the study area, however, did not have water or sewer services. All new residential development was expected to be accommodated by wells and septic systems.

The EA indicated that any power transmission line, telephone pole, or gas line within the cut or fill line would have to be relocated out towards the new right of way line. The EA did not address explicitly the relationship between secondary land use impacts and public facilities.

2.5 PUBLIC POLICY

The EA stated that the project was consistent with local comprehensive plans in 1987. While consistency with local comprehensive plans is important in justifying highway projects, it does not provide much information about desired future land use patterns in the affected area.

2.5.1 Bend

Land use designations are a primary determinant of the type and intensity of development that communities want to occur in an area. Areas east of Highway 97 to the railroad tracks were designated for light industrial uses. Areas east of the railroad tracks were designated for residential uses. Areas west of the highway were designated for highway commercial uses.

The Bend Area General Plan was acknowledged in 1981, and revised in 1988. The General Plan defined plan designations and policies for all lands within the Bend UGB. Following is a discussion of land use issues and policies for lands within the study area:

- Areas within the Bend UGB are generally characterized by shallow soils over lava rock. This condition increased the cost of installing underground utilities. Thus, the low density residential zone (RL) had a 20,000 sq. ft. minimum lot size intended to accommodate residential development without sewer services.
- The General Plan indicated that strip commercial development should be directed to areas where strip commercial development already exists. The Plan required careful consideration of expansion of existing commercial strips due to concerns about traffic and community appearance impacts.
- The General Plan intended for outlying commercial areas to provide for uses that generally don't locate in retail centers. These uses include auto dealers, motels, restaurants, and other uses. Moreover, the General Plan intended to apply access control, frontage roads, and landscaping to mitigate the impact of commercial uses locating on major highways.
- Light industrial areas were intended to provide for heavier commercial (e.g., auto and RV sales, etc.) and light industrial uses devoted to wholesaling, warehousing, light fabrication, and other related uses.

Capital improvement plans (CIPs) are also commonly used to guide development. Statewide planning Goal 11 requires communities to plan for public facilities. Bend was unable to provide copies of historic water or sewer plans. Focus group participants, however, indicated that water and sewer services existed to industrial and commercial uses up to Robal Road at the time the EA was completed. Residential areas east and west of the Highway had water services, but were not proposed to receive sewer services. The low-density residential zone intended wastewater disposal occur through septic systems.

2.6 DESCHUTES COUNTY

Most of the land in unincorporated portions of the study area was designated for Exclusive Farm Use with a 20-acre minimum lot size (EFU-20) or Multiple Use Agricultural with a 10-acre minimum lot size (MUA-10). Areas within one-quarter mile of Highway 97 had a Landscape Management (LM) overlay. The EFU designation limits land use to farming and related activities. Any development must support farming operations. These policies were consistent with state policies that restrict development on agricultural lands.

The landscape management overlay was intended to maintain scenic and natural resources along the corridor. The LM overlay provided Deschutes County with an additional degree of regulatory control and review of development proposals within the corridor.

3.0 CHANGES AFTER THE PROJECT(1988 TO PRESENT)

This chapter discusses changes in land use, and in the variables that influence those changes. Its organization is identical to that of Chapter 2: it begins with a discussion of socioeconomic conditions, then discusses land use patterns, transportation systems, capital improvements, and changes in public policy.

3.1 POPULATION CHANGE

Because the EA did not include a population forecast, it is not possible to compare population forecasts from the Environmental Analysis with actual recorded population. Table 3.1 shows actual population trends in Bend between 1980 and 1998. The data indicate that Bend added more than 15,000 residents between 1990 and 1998. Bend added another 15,000 residents in 1999 by annexing all land within the Bend UGB. According to the CPRC Bend's 1999 population was 50,650 persons. Specific figures are unavailable to determine how much of the growth between 1998 and 1999 was due to annexations, however, Bend grew by 1,895 persons between 1997 and 1999. Thus, the majority of population growth between 1998 and 1999 was probably due to annexations.

Table 3.1: Population Trends In Bend

Year	Population
1980	17,253
1990	20,469
1998	35,635
% Change 1980-1998	107%
Average Annual Growth Rate	4.1%

Source: CPRC

3.2 LAND USE PATTERNS

One of the key objectives of this analysis is to document land use changes in the study area (and more broadly, the City of Bend) between the time when the EA was completed and construction commenced, and since the project was completed in 1988. To determine changes in land use, we looked at a number of indicators including (1) annexations and UGB expansions, (2) zone and plan designation changes, (3) subdivision approvals, and (4) location of new development. Key conclusions are:

- *Annexations and UGB expansions.* We were unable to obtain a record of annexations that occurred in the study area between 1987 and 1998. In July of 1998, the City of Bend annexed all land within the UGB. According to Bend staff, this is a departure from previous policy where the City would annex development after it occurred. The change

was due to the passage of Ballot Measures 47 and 50, which allow cities to add new development to their tax bases.

According to focus group participants, few UGB expansions occurred in Bend between 1987 and 1999. One 40-acre UGB expansion occurred in Northeast Bend. The expansion brought a school site into the UGB and occurred around 1995.

- *Zone and plan designation changes.* According to focus group participants few, plan designation changes occurred in the study area between 1987 and 1999. One focus group participant indicated that the area designated Light Industrial (IL) on the east side of Highway 97 was under review for redesignation to Highway Commercial (HC). A subsequent interview with a Bend Planning Staff member indicated that the area was redesignated to Highway Commercial in March of 1998.

According to Bend Planning Staff, the redesignation of the light industrial land was primarily a “housekeeping” matter. While a considerable amount of vacant land existed in the area, the majority of development was more consistent with the highway commercial designation than the light industrial designation. In summary, focus group participants felt that the commercial uses were more appropriate for the site than light industrial uses due to the site’s locational attributes (access to a major highway, proximity to the Mountain View Mall and other commercial uses). Focus group participants suggested that while the highway improvements potentially made the site more desirable for commercial development, that the site was desirable for commercial development prior to the highway improvements. They pointed to other commercial uses that were located in the IL zone prior to the improvements as evidence.

- *Subdivision approvals.* Table 3.2 and Figure 3.1 summarizes residential subdivision activity within the Bend UGB by time period. The data indicate that subdivisions in the study area account for about 5% of all subdivisions and 4% of all tax lots in Bend. While some variation exists in the ratio of lots created citywide and in the study area for different time periods, the differences are relatively minor. For example, the study area accounted for 4.7% of all subdivisions created before 1987, 3.6% between 1987 and 1991, and 4.6% after 1991.

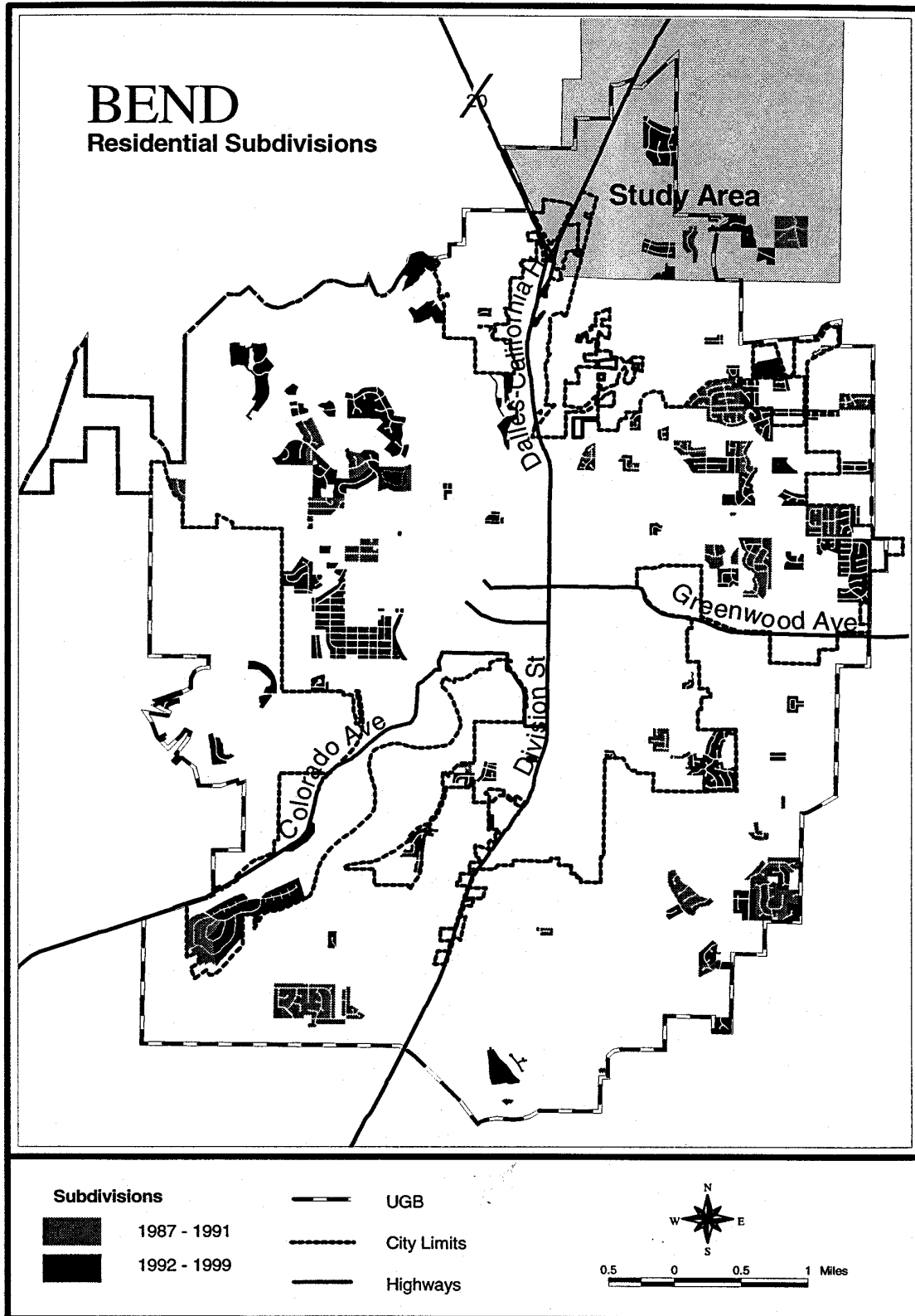


Figure 3.1: Residential Subdivisions Created in the Bend UGB, 1987-1991, 1992-1999

Table 3.2: Residential Subdivisions In Bend And The Highway 97 Study Area By Date

Date	Citywide (Inside UGB)				Study Area			
	Number of Sub-divisions	Tax Lots Created	Total Acres	Density (DU/Net Acre)	Number of Sub-divisions	Tax Lots Created	Total Acres	Density (DU/Net Acre)
No Date	221	5,525	2,414	2.3	12	240	92	2.6
<1987	193	7,308	2,621	2.8	9	220	156	1.4
1987-1991	56	1,489	548	2.7	2	35	46	0.8
>1991	145	3,779	1,118	3.4	7	202	92	2.2
Total	615	18,101	6,701	2.7	30	697	386	1.8

Source: Deschutes County Assessment Data, 1999

Notes: Study area includes areas outside of Bend UGB; date of subdivision is inferred from earliest year built for lots in the subdivision.

- *Year-built from assessment records.* The Deschutes County Assessor keeps records on the year improvements are recorded on tax lots. Our experience is that this data is not entirely reliable for all land uses, but is relatively reliable for residential uses. Year-built data combined with building permits provides a relatively accurate assessment of development trends. Figure 3-2 shows the location of residential lots by year built.

Figure 3.3 shows the number of single-family dwelling units built inside Bend UGB and the project study area by decade. Single family units were identified by land use codes. The data indicate that the project area accounted for approximately 4% of all single-family residences in Bend in 1999. Moreover, the assessment data indicate that very little development occurred in the study area until the 1970s.

Between 1970 and 1979, 233 dwelling units were built in the study area accounting for 5.5% of all residential development in Bend. Residential development in the study area accounted for slightly more than 3% of all residential development in Bend in the 1980s. Development between 1990 and 1998, however, accounted for 6.4% of all single-family residential development in Bend. The study area has about 6% of the residential land area in Bend; these figures roughly correspond with that ratio. The Deschutes County Assessment data does not include plan designation or zoning information for areas within the Bend City Limit. Thus, researches were unable to calculate more detailed ratios of land in the study area by designation. Further analysis of vacant land based on plan designation indicates that the study area contained about 6% of vacant residential land in Bend in 1999.

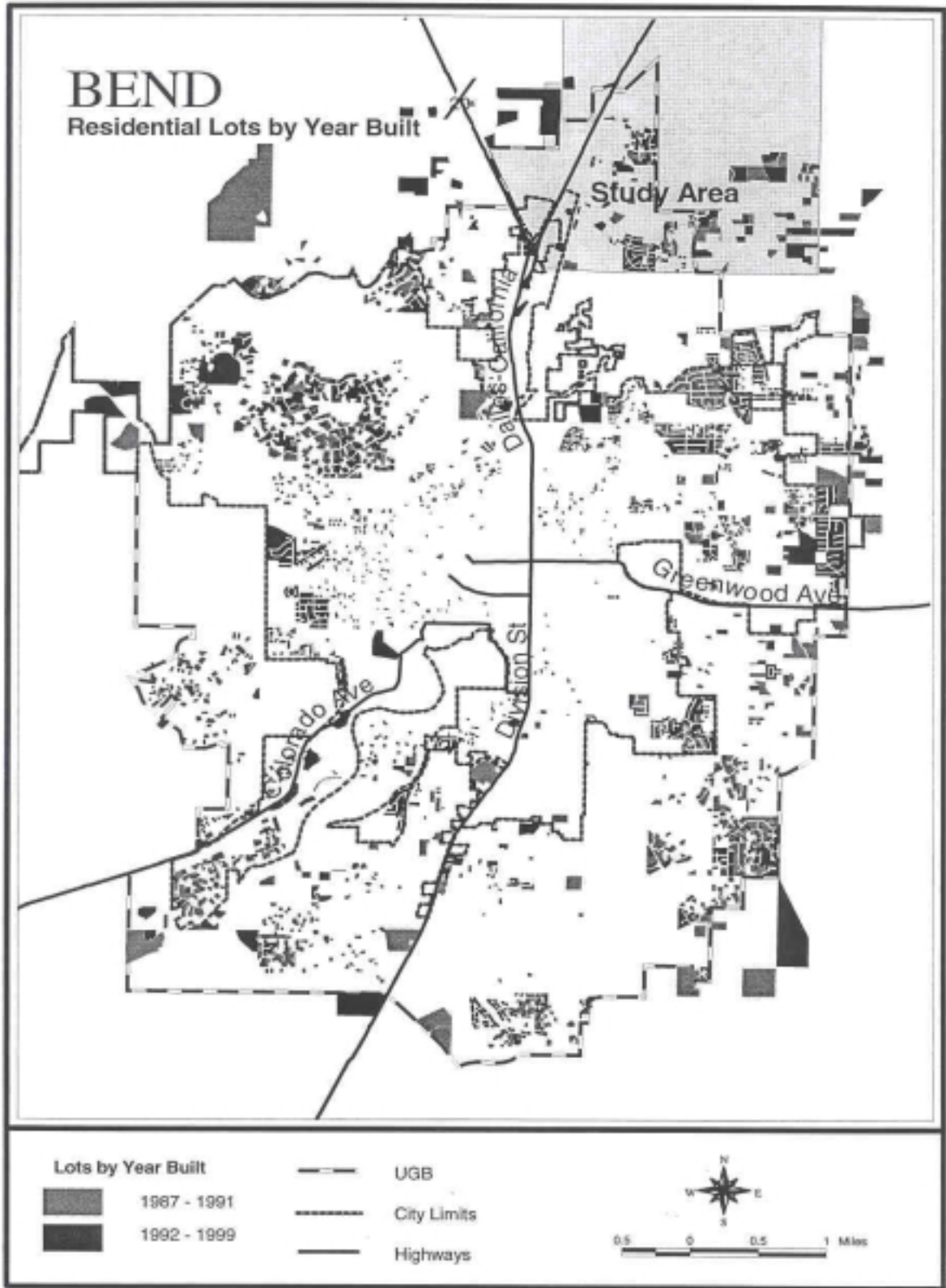


Figure 3.2: Residential Development by Year Built, 1987-1991, 1992-1999

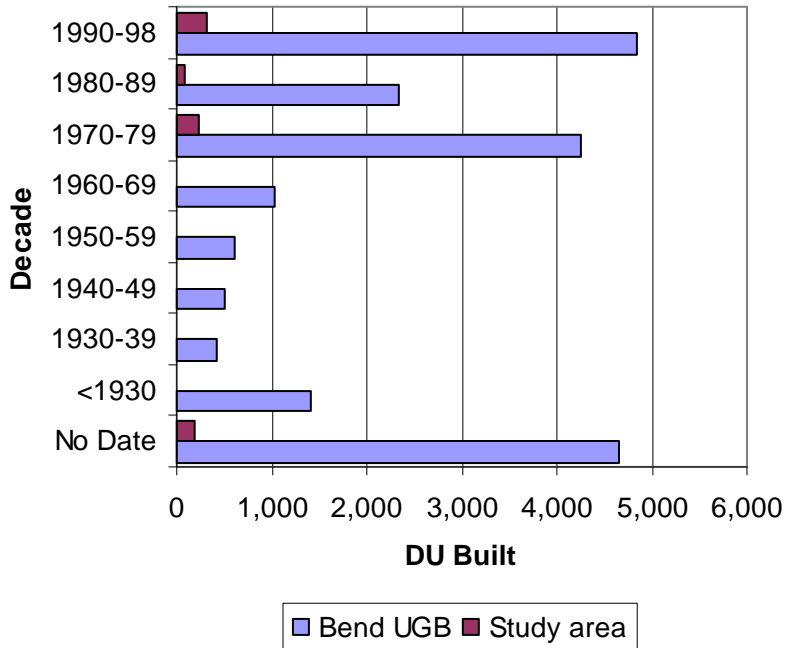


Figure 3.3: Single-family dwelling units by year built, Bend and corridor study area
 Source: Deschutes County Assessment Data, 1999.
 Note: Study area includes areas outside the Bend UGB

Table 3.3 shows development by year and use for the Bend UGB and the project study area based on tax lots identified as developed. While the ratios varied somewhat by year, development in the study area generally reflected citywide trends. The data show that 3% of single-family residential development in Bend before the EA was completed in 1987 was in the study area. Developed commercial and industrial tax lots in the study area accounted for about 3% of developed tax lots in Bend before 1987. The ratios did not change significantly after the EA was completed in 1987 and before the improvements were completed in 1991.

The data for development that occurred completion of the improvements in 1991 suggest that the improvements had little effect on the rate of development in the project study area. About 2% of Bend’s commercial development occurred in the study area between 1991 and 1997, while about 7% of the City’s residential tax lots were developed in the study area.

In 1999, the study area contained about 15% of vacant commercial land in Bend and about 3% of vacant industrial land. It is difficult to related the figures in Table 3.3 with vacant land base because the table shows number of tax lots developed rather than acres.

Table 3.3. Number of Developed Tax Lots, by Year Built, by Use, Bend UGB and Project Study Area, 1987-1997

Year	Residential		Commercial		Industrial	
	Bend UGB	Study Area	Bend UGB	Study Area	Bend UGB	Study Area
Before 1987	9,829	306	1200	26	303	9
EA Completed (1987)						
1987	199	5	10		4	
1988	325	6	19	1	11	
1989	523	12	17		26	1
1990	600	26	15	1	18	2
1991	281	13	14		17	
Subtotal	1,928	62	75	2	76	3
Project Completed (1991)						
1992	484	13	12		4	2
1993	568	14	15		16	
1994	653	41	18		24	
1995	683	64	28	2	26	
1996	654	35	16		12	1
1997	852	98	32	1	24	
Subtotal	3,894	266	121	3	106	3
Total	15,651	634	1,396	44	485	15

Source: Deschutes County Assessment Data, 1999

Note: Land uses were determined by Assessor's plan designation codes.

There are limitations to using year-built data to track commercial and industrial development. Year built only indicates the number of tax lots that were developed and lacks data about the area developed, floor area, and type of use. Table 3.4 shows acres developed by type of land use (as inferred by plan designation) in Bend between before the EA was completed, between the time the EA was completed and construction was completed, and after construction was completed.

The data underscore the fact that the number of tax lots provides only partial information on the extent of development. For example, prior to completion of the EA in 1987, commercial development in the study area accounted for less than 1% of all commercial tax lots in Bend, but more than 16% of the total commercial land (consistent with the location of the Mountain View Mall in the study area).

Based on field visits and comments from the focus group, the assessment data probably underestimates the amount of land developed for commercial use since 1991. Since that time, both Target and Home Depot have developed stores in the study area. Moreover, Holiday Inn and Econolodge both developed motels in the study area since 1991. Field

observations suggest that it is unlikely these developments consumed only six acres of land.

Table 3.4: Acres Developed by Type of Land Use, by Time Period

Land Use	Citywide		Study area		Ratio of Study area to city	
	Number of Tax Lots	Acres	Number of Tax Lots	Acres	Number of Tax Lots	Acres
Before 1987 (Pre-EA)						
Single Family Residential	9,542	7,054	303	545	3.2%	7.7%
Commercial	1,115	555	6	90	0.5%	16.3%
Industrial	252	396	25	50	9.9%	12.7%
1987-91 (Post-EA/Pre-Development)						
Single Family Residential	1,934	1,334	62	82	3.2%	6.1%
Commercial	77	99	4	10	5.2%	9.8%
Industrial	76	96	3	3	3.9%	3.0%
1992-1998 (Post development)						
Single Family Residential	3,967	1,800	274	193	6.9%	10.7%
Commercial	129	148	4	6	3.1%	4.1%
Industrial	113	125	3	6	2.7%	5.1%

Source: Deschutes County Assessment Data, 1999

Note: Land uses were determined by Assessor's property classification codes and acreages do not account for partially developed tax lots.

The data presented in the previous tables and figures indicate that industrial and residential development has not concentrated in the study area since the EA was completed in 1987.

The data suggest, however, that considerable commercial development has occurred in the study area. While all of the commercial development is consistent with the Bend General Plan, including commercial uses in the Light Industrial (IL) zone, it is notable that more commercial development occurred in the IL zone than industrial. Field observations and comments from focus group participants suggest that the rate of commercial development increased after the improvements were completed in 1991. Moreover, focus group participants suggested that some of the recent commercial development probably would not have occurred if the improvements were not made. According to focus group participants developers would have had to pay for the highway widening, and suggested the costs would have provided a major disincentive for further commercial development in the study area.

- *Value of land and improvements.* Table 3.5 shows the value of residential sales and land for Bend and the study area between 1991 and 1998.¹ The data show that the number of residential sales varies by year and that average sales prices increased significantly. It is notable that average sales prices in the study area were lower than the citywide average in 1991, and were consistently lower through 1998. Focus group participants suggested that the study area was not an area in Bend where more expensive housing tended to locate.

Table 3.5: Sales price of developed residential lots, 1991-98

Year	City Totals		Study Area	
	Number of Sales	Avg. Sales Price	Number of Sales	Avg. Sales Price
1991	671	\$97,022	27	\$86,128
1992	825	\$102,063	36	\$81,366
1993	1,043	\$118,666	16	\$75,322
1994	1,187	\$130,100	46	\$105,841
1995	1,203	\$126,342	71	\$99,913
1996	1,456	\$141,677	47	\$114,499
1997	1,762	\$142,228	90	\$125,207
1998	2,332	\$140,384	147	\$119,918

Source: Deschutes County Assessment Data, 1998

Note: Land uses were determined by Assessor's property classification codes.

- *Aerial photo analysis of development patterns.* Figure 3.4 shows development patterns for various periods in Bend based on aerial photo interpretation. The aerial photos show that development occurred in many areas of the city—not just the study area—before and after the project was completed.

¹ The data in Table 3.5 represent developed residential parcels. Analysis of assessment data identified only 16 vacant residential tax lots sold between 1990 and 1998.

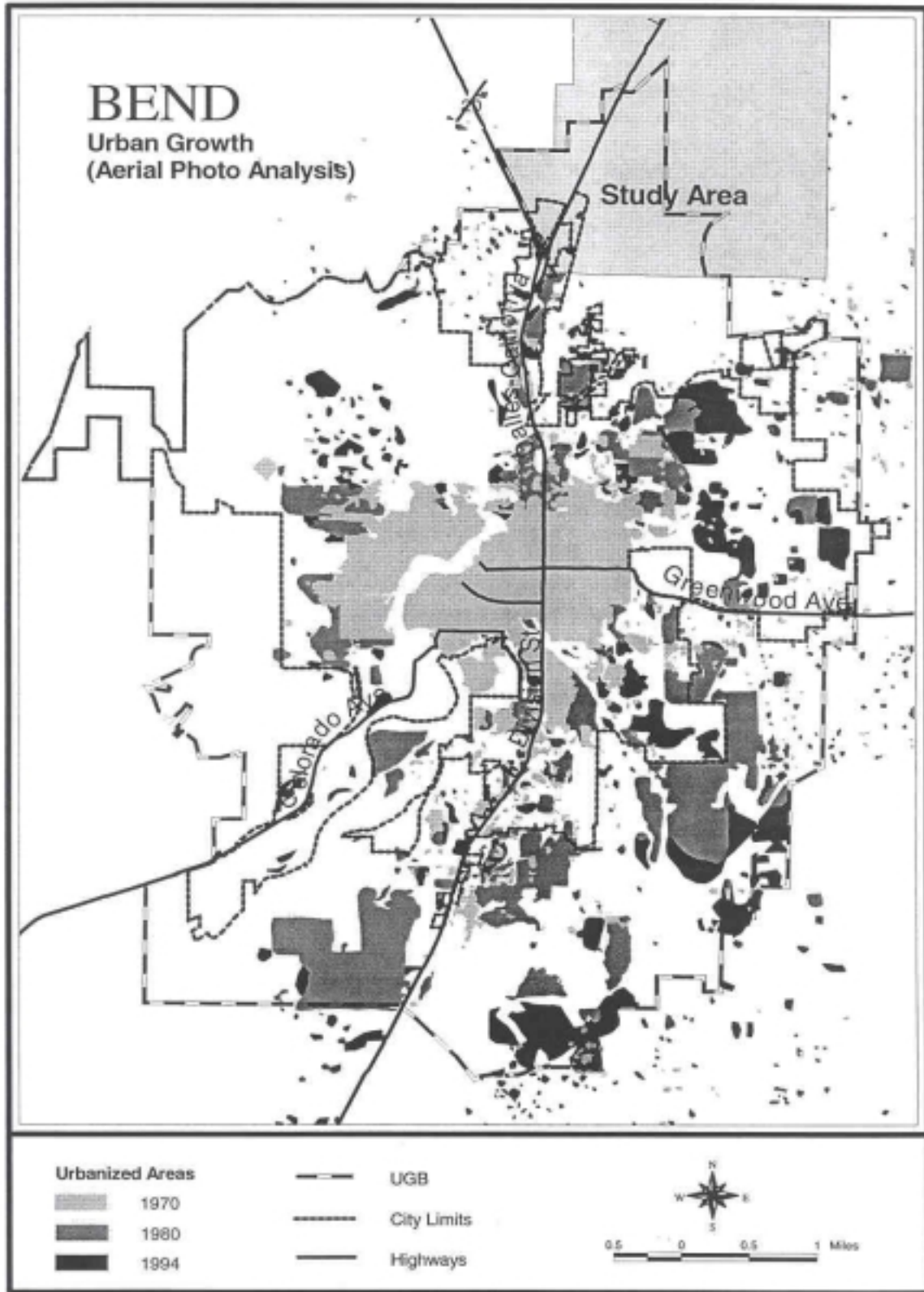


Figure 3.4: Development Patterns In Bend

3.3 TRANSPORTATION SYSTEM CHARACTERISTICS

Planned improvements to the local transportation system can affect land use patterns. Statewide planning Goal 12 requires all incorporated communities and counties with populations over 2,500 to complete a Transportation Systems Plan (TSP). A TSP identifies key transportation issues and transportation improvements to address those issues.

Table 3.5 shows average daily traffic volumes on US 97 between 1987 and 1997. The data show increases ranging from 46% to 89%, or average annual growth rates of between 4% and 7%. A comparison of traffic increases since the EA was completed to the forecast in the EA, indicates that traffic volume has increased faster than the EA anticipated. The EA projected an 83% increase in traffic volumes between 1987 and 2008 from 12,000 to 22,000. In fact, the data indicate that by 1997 the forecast of 22,000 was exceeded at all locations.

Table 3.5: Historical Average Daily Traffic, Highway 97 Study Area

Location	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	% Change
0.05 Mi N of Ent. to Mall	14,400	16,200	16,800	17,600	18,000	20,000	17,000	17,700	17,900	23,200	24,400	69%
0.30 Mi N of Hwy 17	14,400	17,100	17,800	19,800	20,200	24,000	23,000	23,900	24,100	25,900	27,200	89%
0.30 Mi S of McKenzie-Bend Hwy.	25,300	26,000	27,000	37,800	38,600	40,000	41,000	42,600	43,500	35,200	37,000	46%

Source: Traffic Volume Tables, Transportation Data Section, Oregon Department of Transportation, 1983-1997.

- Major local road improvements.* The need for local road improvements can also be affected by a major highway project. Discussions with city representatives indicate that the Bend-Redmond South Unit project did not create the need for additional improvements to city streets beyond those already identified in local planning documents. City documents identified the need for frontage roads and access control in the study area prior to the completion of the EA in 1987.
- Other improvements:* The Bend-Redmond South Unit improvements were preceded by the Bend-Redmond North Unit widening (from milepost 123.1 to milepost 132.6). The Bend-Redmond North Unit project probably had little impact on development in the study. The project was intended to provide additional capacity and decrease travel times between Bend and Redmond, but did not provide any access or locational advantages to lands in the Study area. The completion of the northern alignment of the Bend Parkway in 1998 is also a relevant improvement that provides better access to the commercial area from locations further south.

3.4 PUBLIC SERVICES

Little has changed with public services in the Bend UGB since 1987. In 1987, both water and sewer service were available along Highway 97 to development that existed in 1987. One key change that occurred was the extension of sewer lines up to the Holiday Inn/Econolodge motels in 1998. According to a City of Bend Staff Planner, the City adopted a Public Facilities Plan in 1990 that evaluated water and sewer capacity required to service development in areas north of the Mountain View Mall at full build out. The Plan also included policies that water and sewer extensions be built to accommodate expected future development. The improvements were financed, in part, by the developers.

3.5 PUBLIC POLICY

Changes in public policy can have a significant impact on the timing and location of development. Following are some key changes in state and local policy that occurred between 1987 and 1999:

- State policy changed since the project: Cities must have transportation systems plans (TSPs). While Bend has always had a transportation element in its comprehensive plan, the state requirements for TSPs—and Bend’s response to those requirements are more detailed than previous transportation policies in Bend.
- Several key policy changes in land use policy in the study area have occurred since 1987. The annexation of all land within the Bend UGB in 1998 was a key change in land use policy. Deschutes County had previously reviewed all development applications for areas outside the city limit, but inside the UGB. The City of Bend now reviews all development applications within the UGB.
- The redesignation and zone change of the Light Industrial area east of Highway 97 is the only zone change that occurred in the study area during the analysis period.² Focus group participants indicated that a commercial land use pattern existed prior to the highway improvement, much of the commercial development occurred after development of the Mountain View Mall in 1979. According to focus group participants, the location of the mall made commercial development east of Highway 97 more attractive. Moreover, the light industrial zoning designation allowed most commercial uses conditionally.

² Plan designation and zoning is identical on this site.

4.0 CONCLUSIONS

Chapter 2 describes the land use, transportation, other public facilities, and public policy at and before the time the Bend-Redmond South Unit improvement was completed. Chapter 3 describes the changes that occurred since the project was completed. As Chapter 1 notes, however, that the fact that changes occurred in the Highway 97 corridor does not necessarily mean that the ODOT improvements to Highway 97 caused or even contributed much to those changes. This chapter addresses that question: what role did the ODOT improvements to Highway 97 play in the land use changes that occurred in the Highway 97 corridor?

4.1 CONDITIONS: 1980 TO 1987

- In 1987, existing land use in the project area consisted of a mix of commercial, industrial, and residential uses. In the southern segment, uses west of Highway 97 were primarily commercial, including the Mountain View Mall which was completed in 1979. Land east of Highway 97 included light industrial, strip commercial, and residential. A few vacant parcels existed on both sides of the corridor.
- Developed land in the light industrial (IL) area east of Highway 97 was primarily in commercial use in 1987. According to Deschutes County Planning Staff, commercial uses were allowed as conditional uses in the IL zone. Focus group participants indicated that new commercial uses began to appear in the IL zone after the Mountain View Mall was completed in 1979.
- At the time the project was evaluated in 1987, public policy in Bend was aimed at accommodating continued high rates of growth in population and employment. Land along the Highway 97 corridor in the Bend UGB and was designated for industrial on the east side and commercial on the west side. Land farther from the corridor on both sides was generally designated for low-density residential use or urban reserve. Land outside the Bend UGB was generally designated for exclusive farm use. Lands within one-quarter mile of the Highway 97 corridor had a landscape management overlay.
- The highway project was intended to improve access and address anticipated traffic increases and safety concerns along the Highway 97 corridor. While the project was not specifically identified in either the Bend General Plan or the Deschutes County Comprehensive Plan, both jurisdictions indicated that the improvement was consistent with local policies.
- At the time the Environmental Assessment was completed in 1987, water and sewer services extended north to Robal Road. To serve the Mountain View Mall and existing development east of Highway 97. Areas inside the Bend UGB designated for residential use did not have water or sewer service at the time the EA was completed. Moreover, most of the residential area was designated RL with a 20,000 square foot minimum lot size, as the Bend General Plan indicated these areas would be serviced with wells and

septic tanks. No public water or sewer service existed outside the Bend UGB at the time the EA was completed.

- The EA forecast that traffic volume in the corridor would increase by 70% between 1987 and 2008 from 12,000 to 22,000 trips daily.
- The Environmental Assessment stated that “the project would not induce changes in land use that are inconsistent with proposed land use and zoning” (pg 6). The EA also stated that no change in current or projected traffic volumes would take place as a result of implementing the proposed improvement.

4.2 CHANGES: 1987 TO 1991

- The researchers were unable to obtain a record of annexations that occurred in the study area between 1987 and 1991. According to focus group participants, however, lands were annexed to Bend as development occurred. No UGB expansions occurred in the study area during this period.
- According to focus group participants, no plan designation or zone changes occurred in the study area during this period.
- Two subdivisions that created 35 lots on 46 acres were approved in the study area between 1987 and 1991. A total of 56 subdivisions were approved in Bend during this period, creating 1,489 new lots on 548 acres.
- As measured by the number of tax lots developed, new development in the study area between 1987 and 1991 accounted for about 3% of residential development citywide, 5% of commercial development, and 4% of industrial development. New development in the study area accounted for 6% of the residential acres, 10% of the commercial acres, and 3% of the industrial acres developed between 1987 and 1991.
- Traffic volume in the study area grew between 25% and 53% between 1987 and 1991. The largest increase was recorded just south of the Highway 20-Highway 97 interchange.
- No substantial infrastructure improvements were made in the study area between 1987 and 1991. Infrastructure improvements that did occur were consistent with existing policies and capital improvement programs.

4.3 CHANGES: 1991 TO PRESENT

- In July of 1998, the City of Bend annexed all land within the UGB. According to Bend staff, this was a departure from previous policy where the City would annex development after it occurred. According to focus group participants, few UGB expansions occurred in

Bend between 1987 and 1999. One 40-acre UGB expansion occurred in Northeast Bend, around 1995 to a school site into the UGB.

- According to focus group participants, few plan designation or zone changes occurred in the study area between 1991 and 1999. One major plan designation/zone change occurred, where the area designated light industrial (IL) on the east side of Highway 97 was redesignated to highway commercial (HC) in 1998. According to Bend Planning Staff, the redesignation was primarily a “housekeeping” matter. Focus group participants suggested that the land was incorrectly designated when the Bend General Plan was initially adopted. One focus group participant suggested that the Mountain View Mall changed the functionality of the land, making it more attractive for commercial uses than for industrial uses. While a considerable amount of vacant land existed in the area, the majority of development was more consistent with the highway commercial designation than the light industrial designation.
- Seven subdivisions were approved in the study area since 1991, creating 202 lots on 92 acres. This results in a net density of 2.2 dwelling units (DU) per acre—a density significantly higher than the 1.4 DU/acre for subdivisions created prior to 1987 and 0.8 DU/acre for subdivisions created between 1987 and 1991. The seven subdivisions accounted for about 5% of residential lots created in Bend since 1991.
- Single-family residential development in the study area in 1998 accounted for about 4% of all single-family residential development in Bend. Development in the study area has typically accounted for between 3% and 5% of total single family development in Bend each decade. Development between 1991 and 1997, however, accounted for 7% of all single-family residential development in Bend.
- The number of tax lots developed in the study area accounted for about 3% of all commercial tax lots developed in Bend between 1991 and 1997, and 4% of the land area. Residential development in the study area accounted for about 7% of all tax lots and 11% of the land area. The higher percentage of land area reflects the low-density plan designations in the study area.
- Average daily traffic (ADT) volume increased between about 35% at the temporary recorders north of the Mall entrance between 1991 and 1997. ADT decreased slightly at the temporary recorder just south of the Highway 20-Highway 97 interchange.
- A significant amount of commercial activity has occurred in the study area since 1995, including the Target and Home Depot stores at the Mountain View Mall. The Holiday Inn and Econolodge motels north of the mall required extension (but not expansion) of sewer services.

In summary, Bend planned for additional commercial development west of Highway 97. A lot of commercial development occurred after the highway improvements were completed in 1991. According to focus group participants, several factors contributed to commercial development in the area. A strong economy, coupled with rapid population growth made retail

establishments like Target and Home Depot economically feasible. Good highway visibility coupled with the improved highway access and capacity made vacant commercial lands in the study area attractive.

4.4 SUMMARY OF EVENTS

Table 4.1: shows a chronology of key public policy events, project-related events, and related changes in land use or development.

Table 4.1: Summary of Events

Event	Year
Mountain View Mall developed	1979
Bend General Plan Adopted	1981
Bend General Plan Revised	1986
Bend-Redmond South Unit Environmental Assessment Completed	1987
Construction initiated on Bend-Redmond South Unit Project	1990
Construction completed on Bend-Redmond South Unit Project	1991
40-acre UGB expansion for elementary school in study area	1994
Target retail store opened	1995
Bend annexes all land within UGB	1998
Plan designation on Light Industrial lands east of Highway 97 changed to Highway Commercial (HC)	1998
Extension of sewer lines to Holiday Inn/Econolodge at edge of UGB	1998
Home Depot opens	1999

4.5 INTERPRETATION

The Bend case study is an analysis of one project and its impacts. The narrow focus of the analysis, and the methods used to conduct the analysis, imply inherent limitations in the conclusions. The conclusions that we draw from this analysis are unique to Bend and the Bend-Redmond South Unit project, and should not be construed as universal—analysis of other highway projects in other communities would probably lead to a different set of conclusions.

The evidence is mixed that ODOT's improvement of Highway 97 induced land use changes in Bend, and more specifically, in the Highway 97 corridor. Development has certainly occurred in the corridor but (1) it has not accounted for a large amount of growth relative to the rest of Bend, and (2) it has been generally consistent with the types of development plans and policies called for.

While a commercial development pattern had begun to emerge on the east side of Highway 97 prior to completion of the EA, the redesignation of lands slated for light industrial use to highway

commercial use might be construed as an unanticipated induced land use impact. City planning staff suggested that the plan designation change was a “housekeeping” matter to get the plan designation consistent with existing uses. Focus group participants suggested that commercial use was the “highest and best” use of the land, and that the initial plan designation should have been commercial. Moreover, a considerable amount of vacant land exists east of the highway. Many factors affect the functionality of land in the corridor, including highway capacity, access, and visibility. Without the improvement congestion would have been greater. The highway improvements probably increased pressure to develop the area in commercial uses.³

Our research found several reasons for the development patterns we observed:

- Planning and public policy encouraged growth not only in the study area, but in other parts of Bend as well. On that basis alone, one should expect land use changes in the study area even in the absence of an ODOT improvement.
- The improvement to Highway 97 did not create new access: it improved safety, convenience, and travel by alternative modes, and kept congestion from increasing as quickly as it would have otherwise. Its impacts on travel times were probably small for all but the most congested summer peaks. Over the life of the project, however, travel times are expected to be less with the project than without it. Travel times in the project area depend, at least to some extent, on other highway improvements made elsewhere in the Bend area. It is beyond the scope of this project to sort through all the possible improvements, absence of improvements, and other factors that would influence travel times in the project area.
- Economic conditions and population growth impacted the rate of development in the corridor. Rapid population growth, coupled with a strong economy made Bend attractive to large discount retailers. Some of those retailers chose to locate in areas designated for commercial use in the Highway corridor.
- According to focus group participants, few large sites designated for commercial use that are suitable for large retail operations existed in Bend. The only other suitable sites were in the southern portions of Bend along the Highway 97 corridor. The study area, however, has significantly higher traffic volumes, thus provide a comparative advantage for community, regional, or highway-oriented commercial uses over other areas in Bend.
- The redesignation of land designated for light industrial (LI) to highway commercial was a logical continuation of a development pattern that was well-established before the highway improvements. While a considerable amount of commercial development existed before the EA was completed, and the LI zone accommodates certain types of intensive commercial uses, the area also has several sizable vacant parcels. The redesignation

³ Note that this statement does not comment on whether such changes were desirable or not. It would stretch credibility to assert that any change in a plan designation is a change for the worse. Thus, the improvement may have contributed to change, but that change may not have been bad: it may have been suitable for Bend as a growing urban area with an economy strongly influenced by second homes, recreation, and tourism.

implies that the land better functions as commercial land. While other factors certainly contribute to the functionality of land (proximity to the Mountain View Mall, for example), the capacity, access, and visibility provided by Highway 97 certainly played a role.

- Field observation and conversations with Deschutes County Planning staff indicate that little development has occurred in the Highway corridor outside the Bend UGB since 1987. This is consistent with the agricultural zoning that existed in the area in 1987 and still exists.