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Land-Use Efficiency

Implementing Transportation-Efficient Development: A Local Overview

Phase 1 of Integrating Land Use and Transportation Investment Decision-Making

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16. ABSTRACT

Transportation-efficient development is development that supports the use of alternative transportation modes while reducing the need to drive alone. The project assumed that transportation-efficient development is effective at changing people's travel behavior. To study implementation of transportation-efficient development, relationships between local regulations and approved project proposals were examined in 19 study areas along two major state highway corridors in the central Puget Sound region in Washington State. Within each study area, local planners filled out a survey that was used to inventory local land-use regulations. Development proposals within each study area were evaluated to document implementation. Interviews with local planners supplemented the survey responses and provided more detail on the types of programs, incentives, and other actions and processes used to encourage transportation-efficient development

Findings highlighted the importance of local land-use regulation in implementing transportation-efficient development. Largely, study areas that had zoned for transportation-efficient development were able to implement it, while those that did not have regulations in place that required of continued development did not have as much success in implementation. As a basic tool for guiding development, regulations work. In addition to regulations, a variety of other actions had been used to implement transportation-efficient development in the study areas. Design review programs had been particularly effective, and several study areas had used incentives successfully as well.

This research project is the first phase of a three-phase WSDOT process titled "Integrating Land Use and Transportation Investment Decision-Making." In Phase 2, findings from this research will be integrated into a resource guide, "Guide to Transportation-Efficient Land Use and Development Patterns." The findings from this work will also serve as the cornerstone for Phase 3, a project that will examine the inclusion of more detailed land-use criteria into WSDOT's corridor planning and programming processes.

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Study Context

This research project is the first phase of a three-phase WSDOT process titled "Integrating Land Use and Transportation Investment Decision-Making." In Phase 2, findings from this research will be integrated into a resource guide, "Guide to Transportation-Efficient Land Use and Development Patterns," being developed by University of Washington researchers for WSDOT. Finally, the findings from this work can serve as the cornerstone to Phase Three, a project that will examine the inclusion of more detailed land-use criteria into WSDOT's corridor planning and programming processes.

Integrating Land Use and Transportation Investment Decision-Making

Phase 1
Implementing Transportation-Efficient Development: A Local Overview

timeframe: 2001-2002

Phase 1 is a research project that examines the implementation of local land-use actions that encourage transportation-efficient development. Transportation-efficient development supports the use of alternative transportation modes, while reducing the need to drive alone.

This work takes a broad view of the effectiveness of local strategies to encourage transportation-efficient development, and helps to determine what local actions are best at actually producing transportation-efficient land use on the ground.

Phase 2
Guide to Transportation-Efficient Development

timeframe: 2001-2002

Phase 2 documents available resources and serves as guidance on how, where, and when to encourage transportation-efficient development. The guide includes the following elements:

- An inventory of regulatory tools, along with best practices information and information on relevant research.
- A review of financial incentives used in both the public and the private sectors.
- A review of local planning and programming decision-making processes that address land use and transportation.

PHASE 3: REFINEMENT OF LAND USE CRITERIA: GUIDELINES FOR WSDOT

timeframe: currently unfunded

Phase 3 will develop more detailed land-use criteria and transportation performance measures that WSDOT can use during the corridor planning and programming investment decision-making processes. The criteria and measures are intended to

- Provide a clear, thorough methodology that can be used at the **corridor planning level** for estimating indirect and cumulative impacts.
- Evaluate how well local jurisdictions' land-use strategies, programs, and practices support efficiency of the **transportation system** as defined by RTPO/MPO plans and regional growth strategies.
- Help WSDOT evaluate how local land-use decisions affect the performance of state transportation investments at the **programming level** (WSDOT's Mobility Prioritization Process).

Executive Summary

Transportation-efficient development is development that supports the use of alternative transportation modes while reducing the need to drive alone. Developments with transportation-efficient characteristics, when compared to typical suburban development, have been shown in research to increase people's use of transit or nonmotorized transportation modes while reducing the length and amount of vehicle trips. This project assumed as a given that transportation-efficient development is effective at changing people's travel behavior.

Transportation-efficient development, as defined in this project, is made up of six major characteristics:

1) Compact Development—development at transit-supportive densities
2) Mixed-Use Development—a variety of land-use types within walking distance of each other
3) Connectivity—a fine-grained street and nonmotorized network
4) Pedestrian Environment and Safety—a pleasant and safe walking environment
5) Parking—a limited parking supply that does not visually dominate the landscape
6) Affordable Housing —housing that is available to people of all income levels.

Largely in response to the Growth Management Act, but also to increase the viability of transit, relieve some of the congestion pressure on local roadways, and revitalize their urban neighborhoods, local jurisdictions have taken a variety of approaches to implementing transportation-efficient development. This work takes a

systematic look at the effectiveness of those actions in different urban and suburban environments.

In order to study actual implementation of transportation-efficient development, relationships between local regulations and approved project proposals were examined in 19 study areas along two major state highway corridors in the central Puget Sound region in Washington State. Within each study area, local jurisdiction planners filled out a survey that was used to inventory local land-use regulations. Washington State Department of Transportation (WSDOT) staff/University of Washington research assistants evaluated permitted development proposals within each study area to document implementation. Interviews with local planners supplemented the survey responses and provided more detail on the type of programs, incentives, and other actions and processes used to encourage transportation-efficient development.

By comparing the results of the survey of development regulations and interviews to the evaluations of permitted development proposals, it was possible to show which local regulations and other land-use actions have the most impact on implementing transportation-efficient development and to pinpoint regulations that are crucial in building transportation-efficient projects.

Overall, this research indicates that the study areas and jurisdictions examined have made significant gains in implementing development that is transportation-efficient and supportive of Growth Management. Many of the regulations in place, such as the prevalence of multi-family and mixed-use zones, indicated a trend toward transit-supportive densities and mixed-use development. Data also indicated the importance of relationships between the building, street, and parking lots in shaping transportation-

efficient development. These characteristics were present in all of those projects that were the most transportation-efficient, while remaining absent from those that were less transportation efficient.

This research highlighted the importance of local land-use regulation in implementing transportation-efficient development. Largely, study areas that had zoned for transportation-efficient development were able to implement it, while those that did not have regulations in place that required transportation-efficient development did not have as much success in implementation. As a basic tool for guiding development, regulations work. In addition to regulations, a wide variety of other actions have been used to implement transportation-efficient development in the study areas—design review programs have been particularly effective, and several study areas have used incentives successfully as well. Still, more work is needed in some areas—more could be done locally to encourage the development of affordable housing in the region. There is also room for improvement in single-family and single-use commercial areas.

Chapter I. Introduction

A. PURPOSE AND CONTEXT

The purpose of this study was to examine the implementation of land-use actions that encourage transportation-efficient development. Transportation-efficient development supports the use of alternative transportation modes while reducing the need to drive alone. (For a fuller description of the characteristics of transportation-efficient development, see page 3.) Developments with some or all of the characteristics identified in this report, when compared to standard suburban development, have been shown in previous research to increase people's use of transit or nonmotorized transportation modes while reducing the length and amount of vehicle trips. This study took as a given the assumption that transportation-efficient development is effective in changing people's travel behavior. (For those interested in more details on the research on the relationships between land use and travel behavior, a bibliography can be found at the end of the report.)

To encourage development that is transportation-efficient, local jurisdictions have used a great variety of strategies, from revising their land-use codes and other development regulations to using economic development strategies to spur infill development. However, other than specific case studies and best practices reports, no work has been done yet that takes a broad view of how effective these strategies have been in actual implementation.

This research project helps to determine what local actions are best at producing transportation-efficient land use on the ground, and also shows where disconnects or barriers inhibit implementation. At a minimum, which regulations should be in place to

assure quality development that encourages nonmotorized activity and transit use? Are processes such as design review useful in producing better projects?

By supporting mass transit and nonmotorized transportation modes, transportation-efficient development supports other Transportation Demand Management (TDM) actions and serves as a TDM strategy on its own. By helping to change the mode and nature of trips on the state and local roadway systems, transportation-efficient land use can help to make more efficient use of those systems. Furthermore, in the state of Washington, the Growth Management Act encourages development that makes efficient use of the land and supports the use of transit and nonmotorized modes.

Findings from this work are to be used in several ways. This study was the first phase of a three-phase process. In Phase 2, findings from this research are the focus of a resource guide, "Guide to Transportation-Efficient Development," being developed by University of Washington researchers for WSDOT. These findings can serve as the cornerstone to Phase 3, a project that will examine the inclusion of more detailed land-use criteria into WSDOT's corridor planning programs and/or Mobility Prioritization process.

Additionally, findings from this research can be applied to portions of the TDM and Land Use Case Studies being conducted along the Trans-Lake Washington (SR 520) corridor, which seek to refine estimates of TDM effectiveness in that corridor. In addition to the information from the TDM and Land Use Case Studies, the findings will serve as useful background information in the development of a corridor-wide, inter-local agreement for TDM and land use, and in the development of implementation plans in the Trans-Lake corridor. More recently, the TDM Resource Center received funding to

expand the above work to the I-405 corridor, and findings from this project are expected to benefit this upcoming work as well.

B. WHAT IS TRANSPORTATION-EFFICIENT DEVELOPMENT?

Transportation-efficient development supports the use of alternative transportation modes while reducing the need to drive alone.

For the sake of clarity, the elements of transportation-efficient development were broken down into six major categories. These categories are not mutually exclusive, nor are they the only way of grouping the different elements. However, making some general distinctions between the different element types aided this research and allowed observation of patterns across categories.

Compact Development

Development that is compact puts more people within walking distance of transit stops and other goods and services. This can be facilitated by allowing greater densities, encouraging a greater variety of housing types (especially within single-family zones), reducing minimum lot sizes in single-family zones, and allowing development to be built to the lot line (zero-lot line development).

Mixed-Use Development

The existence of residential, commercial, and office uses within walking distance will allow people to fulfill everyday needs without getting in a car. Uses can be mixed vertically (different uses in the same building) or horizontally (different uses within a certain radius—typically within a ½-mile walking distance).

Connectivity

A well-connected, fine-grained street and nonmotorized network can shorten both automobile and nonmotorized trips. The Connectivity category consists of the following subcategories:

Pedestrian Connectivity: A safe, well-connected sidewalk network and other supportive pedestrian facilities such as crosswalks and paths. This network should have safe and direct connections to transit stops and other practical destinations.

Street Connectivity: A well-connected street network, with small blocks and few dead end streets.

Bicycle Lanes and Trails: A well-connected bicycle lane network and trail system.

Pedestrian Environment and Safety

A walking environment that is safe, inviting, and aesthetically pleasing will encourage walking to destinations or to transit stops. The Pedestrian Environment and Safety category consists of three subcategories:

Street Environment: Streets that serve traffic volumes while keeping speeds low and minimizing pedestrian/vehicle conflicts.

Built Environment: Buildings that are of a pedestrian scale and designed to contribute to a streetscape that is visually interesting.

Building Orientation: Buildings whose entryways address the street and are not dominated by garages or parking.

Parking

A landscape that is not visually dominated by parking makes a more interesting and engaging walking environment, while a limited parking supply will encourage people

to carpool or use transit or nonmotorized modes. The parking category consists of three subcategories:

Alternative Mode Parking: Priority parking is provided for rideshare vehicles, and there is adequate bicycle parking that is safe and sheltered from the elements.

Parking Location: Parking is placed behind or underneath buildings so that it does not dominate the landscape.

Parking Supply: The amount of parking is constrained in order to encourage the use of transit or nonmotorized modes.

Affordable Housing

Housing that is affordable—near major activity centers and employment concentrations, in both cities and suburbs—allows people to live near their work, shopping, and recreation, in close-in locations or near transit if they choose. Many of the strategies listed above that encourage compact development also help to provide housing types that are more affordable and increase the overall supply of housing.

C. BACKGROUND: PUTTING DEVELOPMENT IN CONTEXT

There are three major points in the development process: 1) whether or not development happens at all, 2) where that development happens, and 3) once development happens, what the site/building design looks like. Development will be influenced by different forces at each stage throughout the process, and regulatory or economic tools put in place by local jurisdictions not only have an influence at the site level, but on the larger picture as well.

Before starting to look at the specifics of site designs it is important to understand the larger issues that shape urban and suburban development. Though this research

largely addresses site-specific features of proposals, it may also assist to some degree in determining some "big picture" implementation issues: how much multifamily housing is being built, whether mixed use projects are being built, or if a mix of single use projects within walking distance of each other are happening in a study area. For example, the simple finding that 41 percent of all project proposals sampled were multifamily or mixed-use projects is significant in itself, indicating that jurisdictions in this study have made significant gains in implementing more compact, mixed-use development.

Whether developers choose to build or not depends largely on local, regional, and national market conditions. In times of strong market conditions and high demand there is more building than in recessions. With the exception of public or public/private projects and development moratoria, local jurisdictions have little direct control over whether developers choose to build at all. They can, however, encourage building with the provision of economic incentives, streamlining the permitting process, or revising and simplifying their land-use codes. By putting incentives in place that influence the location and quality of development, a jurisdiction can better avoid being put in a position where it has to either deny development and lose the tax revenue, or make concessions as to the quality of development it accepts.

Lending institutions can be barriers to transportation-efficient development, sometimes hesitant to finance unproven or innovative styles of development (mixed-use or pedestrian oriented) or development in unproven or weaker markets. Furthermore, banks become even more conservative under weaker market conditions. In meetings, local jurisdictions described cases in which strong proposals were stopped by banks

unwilling to lend money to those projects. Additionally, often the marketing "clusters" and other tools used to determine market conditions for development have been documented to contain biases against urban or other redeveloping areas, creating artificially high risk factors against those locations.[1]

Where development takes place, within a jurisdiction as well as within a region, is greatly influenced by the market. In times of strong market conditions there is more overall building in a wider variety of places. When demand is slack, most of the building takes place in the less risky markets—undeveloped areas and major business centers.

At this point in the development process, location of development can be influenced by the timing/speed of the development process, locational desirability, supply of buildable or redevelopable land, willingness of banks to lend money to the project, and economic incentives given by jurisdictions (whether de facto or direct) that encourage location of new development.

Project site design is governed largely by local development regulations. Regulations are the bread and butter of land-use tools, and they can have a great influence on a project's site design. Local jurisdictions have also taken a variety of nonregulatory approaches to encourage transportation-efficient site design, including regulatory streamlining, economic incentives, and density bonuses or transfers of development rights. Some jurisdictions have prioritized nonregulatory actions over lengthy code updates/revisions with strong success rates, using minimal mandatory code requirements coupled with large incentives to bring about the type of develoment they want. Others

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[1] Pawasarat, John and Lois M. Quinn. "Exposing Urban Legends: The Real Purchasing Power of Central City Neighborhoods." Prepared for the Brookings Institution Center on Urban and Metropolitan Policy. June 2001.

stick with a more regulatory approach, preferring to codify their desired characteristics of development.

Once a project gets to the site design stage, its design and feasibility will be influenced by market conditions and desirability of the location, environmental constraints (slopes, wetlands), and zoning constraints. A project's land use and density is determined by local policies, zoning and any environmental constraints. The site characteristics will be influenced by environmental constraints and zoning requirements. At all stages in the process, economic development actions, incentives in place by jurisdictions or other, defacto economic incentives/disincentives that exist for the developer will influence the location and appearance of the project.

Chapter II. Methodology

A. STUDY AREA SELECTION

Nineteen study areas in eight jurisdictions (see list at right) along the I-405 and Trans-Lake (SR 520) corridors formed the basis of this research. Figure 1 shows the location of the 19 study areas within the region, and Appendix A provides more detailed maps of each study area.

Several criteria governed the selection of case study areas. The study focused on the Trans-Lake and I-405 corridors, both of which are the focus of current planning efforts to determine the course of future transportation improvements. Areas that are highly populated, fast growing, or otherwise have high trip generation/attraction rates along these two corridors were primary candidates.

A variety of study area types were included in this research—not only downtowns and central business districts, but residential neighborhoods, retail centers, and suburban employment centers. To coordinate with other regional land-use research efforts, several study areas have been designated by the Puget Sound Regional

The Study Areas

Bellevue
Downtown[UC,SA]

Bothell
Downtown

Kirkland
Downtown[SA]
Totem Lake[SC, SA]
Juanita[SC]

Redmond
Downtown[UC, SA]
Northeast
Overlake
Willows
Southeast

Renton
Downtown[UC]
Highlands

Seattle
Northgate[UC]
South Lake Union
University District[UV]
Wallingford[UV]

King County
(unincorporated areas)
Petrovitsky Road Area
West Hill

Snohomish County
(unincorporated areas)
Thrashers Corner[SC]

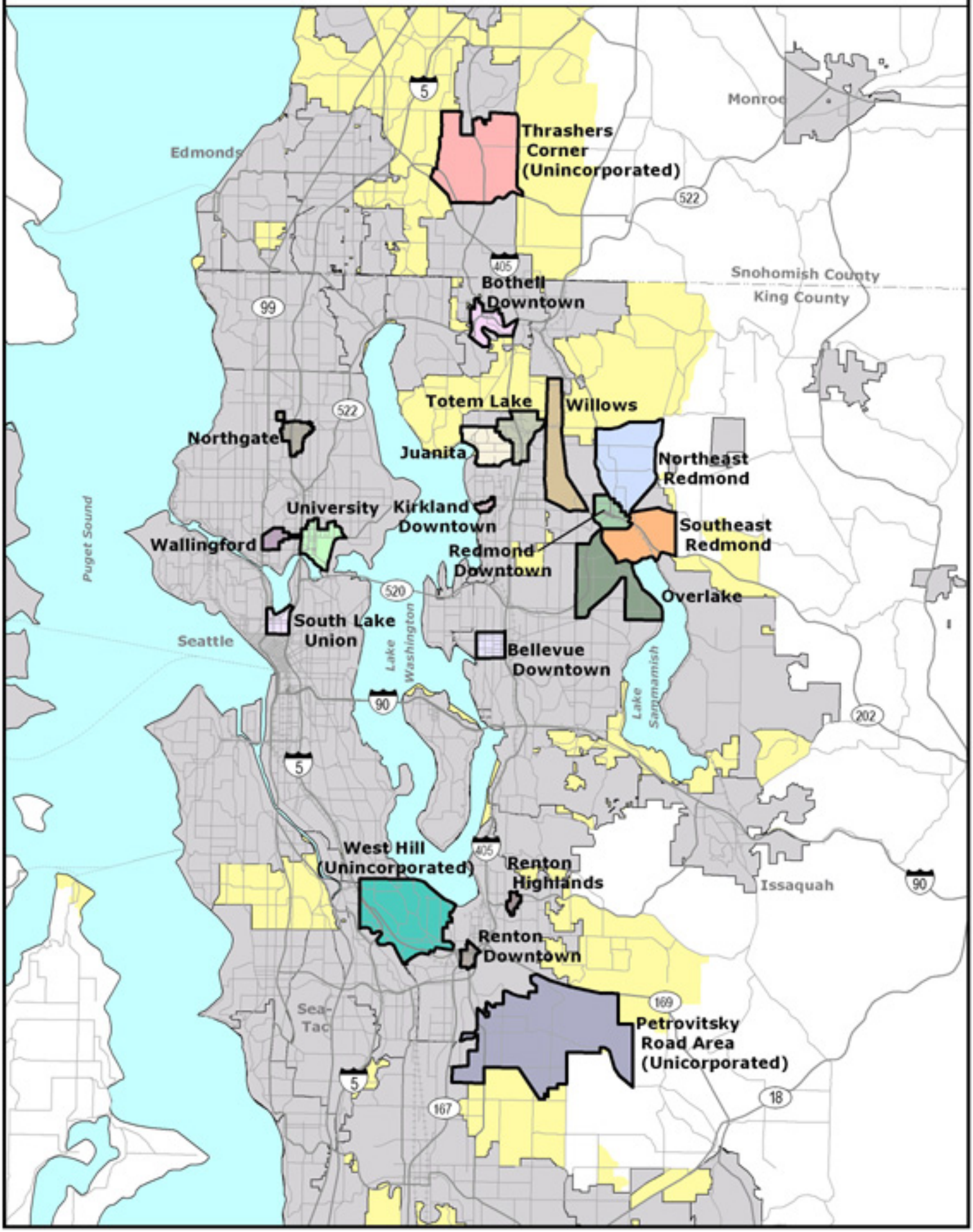
UC=Urban center as designated by PSRC
SA=station area as designated in VISION2020
SC = suburban cluster as designated by University of Washington
UV = Urban Village as designated by City of Seattle

Council (PSRC) as urban centers or station area/transit hubs, and others have been identified by University of Washington professor Anne Vernez-Moudon as "suburban clusters."

Local interest also played a large role in study area selection. Study areas were linked to neighborhoods or subareas in which the local jurisdictions had an interest, or where planning efforts were currently under way. The amount of time that each jurisdiction was able to participate in this project also influenced the number of case studies selected. In most cases, local subarea or neighborhood planning boundaries were used as the boundaries of the study areas.

Note that the results of this study are concentrated in urban and suburban areas, and it is unlikely that the results can be generalized to rural areas. Because of market strength along the I-405 and SR 520 corridors, it is unclear whether the results can even be applicable elsewhere in the Puget Sound or to other urban or suburban markets. Ideally, to draw broader conclusions, the geographic areas covered by this research should be expanded to include a larger variation in area types, rural areas, smaller urban areas, and markets that are less strong than those examined in this research.

Figure 1: Study Areas



B. SELECTION OF DEVELOPMENT PROPOSALS

Permitted development proposals were used in order to gauge implementation—which regulations and programs were having the most influence on what was actually getting built on the ground. Approximately ten proposals in each study area were selected. However, the limited amount of development that occurred in some study areas limited the number of proposals chosen, so in some cases the actual number of proposals was less than ten. This also made it impossible to have large enough sample sizes to establish a high degree of statistical significance among any of the study areas or land-use types.

Permit proposals were selected on the basis of the criteria in the text box at right—land-use type, date, and size of project. In all, 166 permitted development proposals were sampled: 65 commercial projects (39 percent), 36 mixed-use projects (22 percent), 32 multifamily residential projects (19 percent), 27 single-family residential projects (16 percent), and 6 other uses (4 percent). Again, the amount and type of development were limiting factors, making statistically valid random sampling impossible.

Development Proposal Selection Criteria

Land-Use Type

Permits were obtained for each major land use type within each study area. Again, in some cases, the amount of development limited the number of land uses represented in the evaluations.

Date

Permits were obtained within the time frame 1995-2001. 1995 was the date when jurisdictions in the study had adopted Comprehensive Plans and development regulations consistent with the Growth Management Act.

Size of Project

The size of the projects evaluated was limited to projects that were new buildings (i.e., no remodels or deck additions), and within those parameters there was a distribution of project sizes. Generally, though, since most of the study areas were in already urbanized areas, projects were smaller than the large, master planned communities that might be found in undeveloped areas.

Table 1 outlines the number of projects sampled by land use in each study area. Individual study maps in Appendix A show the location and land-use type of the proposals sampled.

Table 1. Summary of Permitted Projects Sampled In Study Areas

	Total Sampled	Commercial	Mixed-use	Multifamily Residential	Single Family Residential	Other
Downtown Bellevue	10	2	8	0	0	0
Downtown Bothell	7	4	0	3	0	0
Downtown Kirkland	8	2	3	3	0	0
Juanita	11	1	2	1	7	0
Totem Lake	5	4	0	0	0	1
Downtown Redmond	10	5	4	1	0	0
Northeast Redmond	7	2	0	4	1	0
Overlake	10	6	1	0	3	0
Southeast Redmond	9	3	1	2	0	3
Willows Corridor	6	4	0	0	2	0
Downtown Renton	8	2	3	2	0	1
Renton Highlands	11	4	0	3	4	0
Northgate	9	7	0	2	0	0
South Lake Union	8	3	3	2	0	0
University District	11	4	6	1	0	0
Wallingford	7	1	5	1	0	0
Thrashers Corner	8	3	0	4	1	0
Petrovitsky Road Area	10	4	0	2	4	0
West Hill	8	2	0	0	5	1
TOTAL	**163**	**63 (39%)**	**36 (22%)**	**31 (19%)**	**27(17%)**	**6 (3%)**

C. DATA COLLECTION

This project considered all of the land-use actions applied locally by participating jurisdictions to promote transportation-efficient development in the selected study areas. This meant understanding each jurisdiction's development regulations, permitting and development review processes, and any other incentives or programs that might be used to promote transportation-efficient development.

The analysis was based on two major data collection components: 1) a survey of local development regulations, and 2) evaluations of permitted development proposals. Interviews with land-use planners supplemented the survey responses and provided more detail on the type of programs, incentives, and other actions and processes used to encourage transportation-efficient development. A review of local comprehensive plans in the Trans-Lake and I-405 corridors gave background information on each jurisdiction's general policy and geographic focus.

C-1. Survey of Development Regulations

The survey of development regulations was designed to show how jurisdictions promote transportation-efficient land use through regulations. For each of the 19 study areas, local land-use planners filled out an on-line questionnaire. Since development regulations are the major tool for implementing comprehensive plan policy, the survey was quite extensive. Appendix B shows a sample survey question format, as well as the entire list of survey questions. The survey asked how local regulations addressed about 50 different elements of transportation-efficient development that are, theoretically, influential in creating transportation-efficient urban form.

In the survey, planners chose whether each element was mandatory (required or prohibited), encouraged or discouraged, allowed, or not addressed. These elements were grouped by the six major categories of transportation-efficient development (see page 3). Since regulations also vary substantially depending on the land use, the questionnaire was broken down into four basic land-use types: 1) single-family residential, [1] 2) multi-

[1] Single-family residential development: Detached residential housing.

family residential,[1] 3) commercial retail and 4) commercial office. [1] Jurisdictions were also able to use an "other" category for specific zones—such as industrial zones—that did not fit into any of the four land-use categories. Respondents were encouraged to add details or comments to their answers, and to provide any other relevant information about what the jurisdictions were doing to support growth management goals.

The contributions of local planning staff were crucial to this study. Support was provided to the local planners to answer questions and facilitate the survey's completion in whichever format was easiest for the respondent (some respondents preferred filling out hard copies of the survey, while others found it more convenient to fill out on-line). Follow-up interviews were used to clarify survey answers and get more information about local programs and policies. Because of time constraints in some cases, WSDOT staff had to research local land-use regulations and fill in the surveys. The accuracy of those surveys was confirmed in follow-up interviews.

C-2. Evaluations of Permitted Development Proposals

In order to study implementation of regulations, development proposals were evaluated for their transportation-efficient characteristics. Only projects that were permitted by the city's building or planning department were evaluated. It was assumed in all cases that what was permitted was built, or would be built in the future. (There were a few cases in which projects were still under construction or had not begun construction.) Limited site checks confirmed that development requirements in the study areas were generally adhered to by developers.

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[1] Multi-family residential development: Attached housing, such as apartments, flats, condos or townhomes.

Project records were used to evaluate development proposals. Typically, project records included the initial application, site plans and other drawings, project statistics, the history of hearings and appeals (if any), environmental findings, and conditions of approval.

Proposals were evaluated by comparing them to a checklist of almost 50 transportation-efficient land-use site characteristics (found in Appendix C) that are hypothesized to be influential in creating transportation-efficient urban form. The checklist was set up in a "yes-no" format—if an element was specified in the project conditions or site plan, it was scored with a "yes." If an element was not specified in the project requirements or the site plan, it was assumed to be not addressed and, therefore, not implemented.

C-3. Interviews with Local Planners

Interviews with local planners provided information on other nonregulatory aspects of the permitting process that affect the kind of development that is built. For example, the length and complexity of the permitting process, design review, impact fees, mitigation, Transportation Management Plan (TMP) requirements, and concurrency requirements all influence the amount and type of development that is approved. Other incentives and economic development actions used to encourage transportation-efficient land use were also documented.

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[1] Although commercial retail and commercial office regulations are very similar, and are lumped together through most of this report, in some cases there are slight differences in regulations between the two categories. These differences, when they occur, are discussed in the text.

Interviews typically took place with a senior planner in the current planning section and lasted about an hour. In some cases interviews were conducted via phone or email. The questions used for the interview can be found in Appendix D.

D. ANALYSIS

D-1. Individual Evaluation of Data Sources

First, the two main data sources—the survey of development regulations and the evaluation of permitted development proposals—were evaluated individually. Each data source was aggregated within each transportation-efficient category, land use, and study area.

In the evaluation of the regulatory survey, the tables showed the elements in the survey and showed, by land use, the number and percentage of study areas that addressed each element. Tables in the development proposal evaluation showed the number and percentage of projects that addressed each element.

One of the main goals of this project was to find characteristics that could serve as indicators of transportation-efficient development. This was done by first looking at the best overall projects (those that addressed over 70 percent of applicable transportation-efficient elements) and noting which elements were present (and absent) from those projects. Then the projects that addressed under 50 percent of applicable elements were examined, noting again which were present (and absent).

In this way, it was possible to find basic correlations between specific elements and permitted developments that were transportation-efficient as a whole. It was hypothesized that characteristics important in producing projects that were most transportation-efficient *overall* would consistently show up in the highest-scoring

projects, while remaining absent from the low-scoring projects. Because of the small sample sizes, it was not possible to establish formal, mathematical correlations with statistical significance. However, certain elements still did appear to be clearly connected to transportation-efficient development.

D-2. Comparison of Data Sources

The results of the individual evaluations were then looked at together. The survey of development regulations was compared to the evaluation of development proposals, thus connecting regulation to implementation. Again, the two data sources were compared across each land use, transportation-efficient category, and study area.

Elements in the regulatory survey did not always match up exactly with the elements in the evaluation of development proposals. In some instances, what was being regulated was not mirrored exactly in implementation. Occasionally, the elements being regulated did not show up in development permit applications or other documentation about the projects, so different elements were used in the proposal evaluations as proxies.[1] Sometimes two regulatory elements had only one corresponding element from the proposal evaluations, or vice versa—there is more than one way to regulate certain characteristics of the built environment. For instance, a jurisdiction can either require street grids to be connected, or prohibit dead-end streets, or both.

Cases in which both data sources had high scores were indicative of regulations that were working to implement transportation-efficient development. Cases in which there was a gap—where the development proposals addressed many more elements than

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[1] As an example, the presence of ground floor retail was used in the site plan evaulations as a proxy for the existence of ground floor windows, which are rarely documented in project records. This was not necessarily a reliable proxy, however—for more discussion, see p. 40.

they would if they had been guided by regulations alone—signified the influence of other nonregulatory actions (such as incentives, design review or permit streamlining) on implementing transportation-efficient development.

D-3. Implementation of Indicator Elements

After the elements of transportation-efficient development that could be potential indicators of overall transportation-efficient development had been determined, it was then possible to go back to the regulatory survey and see how those elements were being implemented. Was it through the regulations, design review, mitigation requirements, or combinations of these and other strategies? Which approaches seemed to work best in different settings—say, in the context of weaker markets, suburban development patterns, or single-family development? This discussion can be found in Section C of Chapter III.

Chapter III. Findings

This chapter presents the findings from the survey of development regulations and the evaluation of development proposals. Findings are broken down by land-use type and by each of the six transportation-efficient categories: Compact Development, Mixed-Use Development, Connectivity, Pedestrian Environment and Safety, Parking, and Affordable Housing. The two main data sources—the survey of development regulations and the development proposal evaluation—are used to draw conclusions about the relationships between regulation, implementation, and other local nonregulatory land-use programs, processes, or actions.

It is important to be aware that there was insufficient development of any land-use type or in any one study area for these findings to have formal statistical significance. In many cases, conclusions are supported by interviews or other qualitative information. Sections A2-A7 and B2-B7, which discuss findings by transportation-efficient category, are broken down thematically into subcategories where appropriate to aid in presentation.

A. ANALYSIS OF REGULATIONS

The analysis of regulations looked primarily at mandatory regulations. Since transportation-efficient development is often implemented in other nonproscriptive or nonregulatory ways—such as through a design review process or an incentive program—fewer mandatory regulations do not *necessarily* mean a lack of effort to implement transportation-efficient development, but they do highlight the differing local approaches in the region. Some study areas or jurisdictions are more highly regulatory, mandating many characteristics of development. Others choose to put in place only a few basic

regulations and use other programs to encourage or require transportation-efficient design.

In evaluating the regulations, elements that only applied to a portion of a study area (e.g. along a street, rather than a zone) were not shown to apply to the study area. As a result, those developments that were governed by an overlay zone or special street designation stood out as scoring higher than the base regulations would indicate. This allowed staff to pinpoint the overlay zone or the street designation as the tool that improved the development.

Table 2, on the following pages, summarizes the responses from the study areas by land use and transportation-efficient category. Responses are sorted in order of frequency of regulation. Tables in sections A-2 through A-7, which discuss the findings by each transportation-efficient category, describe the findings in detail, breaking down the number of study areas that mandated each of the elements. Each element is also broken down by land use, since regulations vary by land-use zone. Eighteen of the 19 study areas had commercial zones, 19 had multi-family residential zones, and 13 had single-family residential zones.

Table 2. Regulation of Transportation-Efficient Elements in the Survey of Development Regulations (In Order of Frequency)

Element in Regulatory Survey	Category	Land Use	Percent of Study Areas with Element
Allow accessory uses (home-based businesses, live/work studios)	MU	MFR	100%
Allow accessory uses (home-based businesses, live/work studios)	MU	SFR	100%
Allow shared parking	PKG	C	100%
Require sidewalks	CONN	MFR	95%
Require sidewalks	CONN	C	94%
Allow accessory dwelling units	CD	SFR	92%
Allow duplexes/townhomes	CD	MFR	89%
Require articulated facades	PED ENV	MFR	84%
Require sidewalks	CONN	SFR	79%
Require bike parking	PKG	C	78%
Require bike parking	PKG	MFR	74%
Require on-site pedestrian circulation	CONN	MFR	74%
Allow shared parking	PKG	MFR	74%
Require on-site pedestrian circulation	CONN	C	72%
Allow zero lot line development	CD	C	72%
Use General mixed-use zone (or allow mixed-use projects in commercial zones)	MU		68%
Limit Curb cuts/ driveways	PED ENV	MFR	68%
Allow cottage homes	CD	MFR	68%
Limit Curb cuts/ driveways	PED ENV	C	67%
Require building entry to addresses or front the street	PED ENV	MFR	63%
Have minimum density requirements	CD	SFR	62%
Have recently increased maximum density requirements	CD	SFR	62%
Allow cluster development	CD	SFR	62%
Have recently increased maximum density requirements	CD	C	61%
Setbacks have recently been reduced or eliminated	PED ENV	C	61%
Use flexible parking standards	PKG	C	61%
Setbacks have recently been reduced or eliminated	PED ENV	MFR	58%
Use Neighborhood Commercial zone	MU		58%
Have recently increased maximum density requirements	CD	MFR	58%
Have minimum density requirements	CD	C	56%
Require building entry to addresses or front the street	PED ENV	C	56%
Allow zero lot line development	CD	SFR	54%
Allow cottage homes	CD	SFR	54%
Setbacks have recently been reduced or eliminated	PED ENV	SFR	54%
Have minimum density requirements	CD	MFR	53%
Allow zero lot line development	CD	MFR	53%
Allow accessory uses (home-based businesses, live/work studios)	MU	C	50%
Use maximum parking requirements	PKG	C	50%

Table 2 continued. Regulation of Transportation-Efficient Elements in the Survey of Development Regulations (In Order of Frequency)			
Element in Regulatory Survey	**Category**	**Land Use**	**Percent of Study Areas with Element**
Use flexible parking standards	PKG	MFR	47%
Use maximum parking requirements	PKG	MFR	47%
Require weather shelter	PED ENV	C	44%
Require amenities or public/private open spaces	PED ENV	C	44%
Use Pedestrian-Oriented zone	MU		42%
Allow use of in-lieu-of parking fee	PKG	MFR	42%
Require weather shelter	PED ENV	MFR	42%
Require amenities or public/private open spaces	PED ENV	MFR	42%
Allow cluster development	CD	MFR	42%
Require connections to transit	CONN	MFR	42%
Allow use of in-lieu-of parking fee	PKG	C	39%
Require priority rideshare parking	PKG	C	39%
Require connections to transit	CONN	C	39%
Require ground floor windows/limit blank facades	PED ENV	C	39%
Require articulated facades	PED ENV	C	39%
Require on-site pedestrian circulation	CONN	SFR	38%
Limit Curb cuts/ driveways	PED ENV	SFR	38%
Require amenities or public/private open spaces	PED ENV	SFR	38%
Require parking to be behind or under buildings	PKG	C	33%
Require parking to be behind or under buildings	PKG	MFR	32%
Allow accessory dwelling units	CD	MFR	32%
Allow duplexes/townhomes	CD	SFR	31%
Require allowances for future development	CD	SFR	31%
Have recently reduced minimum lot size	CD	SFR	31%
Allow redevelopment of unused parking area	PKG	C	28%
Allow reduction of parking requirements below minimum	PKG	C	28%
Require pedestrian connections/prohibit pedestrian barriers between developments	CONN	C	28%
Require pedestrian connections/prohibit pedestrian barriers between developments	CONN	MFR	26%
Allow redevelopment of unused parking area	PKG	MFR	26%
Allow reduction of parking requirements below minimum	PKG	MFR	26%

Table 2 continued. Regulation of Transportation-Efficient Elements in the Survey of Development Regulations (In Order of Frequency)			
Element in Regulatory Survey	**Category**	**Land Use**	**Percent of Study Areas with Element**
Require bike lanes	CONN	SFR	23%
Have recently lowered minimum parking requirements	PKG	SFR	23%
Require access management	PED ENV	SFR	23%
Established maximum street side garage width	PED ENV	SFR	23%
Have recently lowered minimum parking requirements	PKG	C	22%
Have recently reduced street width standards	PED ENV	C	22%
Allow cluster development	CD	C	22%
Require bike lanes	CONN	C	22%
Require access management	PED ENV	C	22%
Have recently lowered minimum parking requirements	PKG	MFR	21%
Require access management	PED ENV	MFR	21%
Have recently reduced street width standards	PED ENV	MFR	21%
Require allowances for future development	CD	C	17%
Require bike lanes	CONN	MFR	16%
Require bike lanes	CONN	MFR	16%
Establish maximum block size/perimeter	CONN	SFR	15%
Require pedestrian connections/prohibit pedestrian barriers between developments	CONN	SFR	15%
Have recently reduced street width standards	PED ENV	SFR	15%
Require connections to transit	CONN	SFR	15%
Establish maximum block size/perimeter	CONN	C	11%
Require allowances for future development	CD	MFR	11%
Prohibit auto-oriented uses	MU	C	11%
Establish maximum block size/perimeter	CONN	MFR	10%
Allow on-street parking to meet parking requirements	PKG	MFR	10%
Prohibit cul-de-sacs or dead end streets	CONN	C	5%
Prohibit cul-de-sacs or dead end streets	CONN	MFR	5%
Use Station Area zone	MU	n/a	5%
Percent affordable housing required	AFF HOS	MFR	5%
Require nonmotorized paths or trails	CONN	C	0%
Require nonmotorized paths or trails	CONN	MFR	0%
Require nonmotorized paths or trails	CONN	SFR	0%
Percent affordable housing required	AFF HOS	SFR	0%
Allow on-street parking to meet parking requirements	PKG	C	0%
Prohibit cul-de-sacs or dead end streets	CONN	SFR	0%

A-1. Findings by Land-Use Type

Throughout the discussion in the following sections, the type and stringency of the regulations in place vary depending on land-use type. This section addresses these general variations in the findings.

All but one of the study areas (18) contained either commercial office, commercial retail, or general commercial zones. In general, although commercial office and commercial retail zones are very similar (and in some cases part of the same general commercial zone) there are some slight differences in the two. The Pedestrian Environment category, which includes elements such as ground floor windows, weather shelter, or building articulation, is slightly more highly regulated in retail commercial than in office commercial zones. In contrast, office developments are more likely to be required to put parking elements in place, typically commute trip reduction (CTR) type strategies such as carpool or bicycle parking.

Regulations in mixed-use commercial zones focus more on creating pedestrian-friendly environments than in other standard commercial zones. Standard commercial zones may allow for higher densities or contain a mix of commercial and residential uses. However, they may not contain requirements found in mixed-use zones, such as those that create pedestrian-friendly walking environments (ground floor windows, building articulation, and weather shelter) and building orientation regulations that require the building entry to address the sidewalk or that require parking to be behind or under the building.

Thirteen of the study areas had at least some area devoted to single-family zoning. Single-family uses have the fewest mandatory regulations of all of the six categories of transportation-efficiency. In some cases, this is understandable—for example, stringent parking requirements mean little in single-family zones since each house will come with its own garage, or at least a driveway. In other cases, however, having requirements in these zones may be even more important because single-family housing developments

will use a much larger area of land and are often structured around disconnected street networks. For instance, focused, small-scale neighborhood commercial development in isolated single-family areas could have a great marginal benefit for those areas.

All of the 19 study areas surveyed had multifamily residential zoning. Multifamily uses do not contain as many mandatory requirements as mixed-use zones, but more than commercial or single-family zones.

The downtown study areas generally had more mandatory regulations, particularly in the Pedestrian Environment and Compact Development categories. The downtowns also had more design review programs and other incentive programs that encourage transportation-efficient development there. Because of their economic importance to the cities and their role in a shaping a city's identity, cities tend to prioritize the management of downtown development.

A-2. Findings by Transportation-Efficient Category: Compact Development

In order to effectively provide transit as well as to reduce walking distances to common destinations, it is necessary to encourage compact, infill development. Compact development also allows for more efficient provision of urban services and can conserve open space and farmland by allowing more people to live in a smaller area. Encouraging compact development in urban areas is one of the cornerstones of the Growth Management Act. Compact Development elements are shown in Table 3.

The study areas included in this research project had done a great deal to encourage compact development in their regulations. Largely this involved upzoning (zoning for higher densities and/or more intensive types of development). Multi-family housing was allowed in all of the study areas. Six study areas had no single-family zoning, commenting in their surveys that those study areas were too dense to have single-family housing. Height and/or density limits for multifamily and commercial zones had been increased in 11 of the study areas. Ten study areas used minimum density thresholds to prevent development at lower densities than was intended.

Table 3. Compact Development Elements: Regulation

Element	Land Use	Number of Study Areas with Element
Have minimum density requirements	C MFR SFR	10 of 18 (56%) 10 of 19 (53%) 8 of 13 (62%)
Have recently increased maximum density requirements	C MFR SFR	11 of 18 (61%) 11 of 19 (58%) 8 of 13 (62%)
Have recently reduced minimum lot size	C MFR SFR	n/a n/a 4 of 13 (31%)
Allow cluster development	C MFR SFR	4 of 18 (22%) 8 of 19 (42%) 8 of 13 (62%)
Allow cottage homes	C MFR SFR	n/a 13 of 19 (68%) 7 of 13 (54%)
Allow duplexes/townhomes	C MFR SFR	n/a 17 of 19 (89%) 4 of 13 (31%)
Allow accessory dwelling units	C MFR SFR	n/a 6 of 19 (32%) 12 of 13 (92%)
Allow zero lot line development	C MFR SFR	13 of 18, plus 1 study area where it is required (72%) 10 of 19 (53%) 7 of 13 (54%)
Require allowances for future development	C MFR SFR	3 of 18 (17%) 2 of 19 (11%) 4 of 13 (31%)

Generally, there are few mandatory regulations in this category since the tools to increase densities are often optional. However, there is an inherent economic incentive to be able to build more on the existing land, so developers will frequently build to the maximum height limits where feasible.

A-3. Findings by Transportation-Efficient Category: Mixed-Use Development

A mix of residential, retail, and office land uses has long been regarded as one of the land-use actions that can best facilitate the use of alternative transportation modes in urban and suburban areas. Workers or residents can go to lunch, pick up groceries, or drop off their child at daycare without getting in their car. In this research, only three study areas did not have provisions for some type of mixed-use—most of them had allowances for a mix of uses within their study area, some limited neighborhood commercial uses in residential areas, or a vertical mix of uses within projects. Often the local general commercial zones allowed mixed-use projects as well. These elements are shown in Table 4.

Table 4. Mixed Use Elements: Regulation

Element	Land Use	Number of Study Areas with Element
Allow accessory uses (home-based businesses, live/work studios)	C MFR SFR	9 of 18 (50%) 19 of 19 (100%) 13 of 13 (100%)
Prohibit auto-oriented uses	C MFR SFR	2 of 18 (11%) n/a n/a
Use the following mixed-use zone designations:		
General mixed-use (or allow mixed-use projects in commercial zones)		13 of 19 (68%)
Neighborhood Commercial		11 of 19 (58%)
Station Area		1 of 19 (5%)
Pedestrian-Oriented		8 of 19 (42%)

A number of study areas used additional zoning overlays, such as station area or pedestrian-oriented zones. These overlays were mostly being used to maintain and enhance the mix of uses and walking environments in older neighborhoods and suburban downtowns. Auto-oriented uses were prohibited in many of those same areas, either as part of the overlay zoning or as part of the basic code requirements.

A-4. Findings by Transportation-Efficient Category: Connectivity

Generally, the Connectivity category (in addition to the Pedestrian Environment category) had more mandatory regulations, in all the study areas and land uses, than any of the other transportation-efficient categories. This indicates that recognition of connectivity issues are high throughout the region, and jurisdictions are attempting to use a regulatory approach in order to improve street and nonmotorized connectivity.

Nine out of the 19 study areas (47 percent) had well-connected street grids with complete sidewalk networks. Generally, these were older areas—older downtowns and the Seattle neighborhoods. This was reflected in regulations in those study areas, which addressed connectivity issues minimally if at all. Since these areas had infrastructure that was already supportive of nonmotorized travel and transit access, they had less of a need to address connectivity issues in their regulations. Conversely, streets in the rest of the study areas had disconnected street layouts, containing superblocks and fewer sidewalk connections. These areas had higher proportions of mandatory regulations.

A-4.1 Pedestrian Connectivity

Table 5. Pedestrian Connectivity Elements: Regulation

Element	Land Use	Number of Study Areas with Element
Require sidewalks	C	17 of 18 (94%)
	MFR	18 of 19 (95%)
	SFR	10 of 13 (79%)
Require on-site pedestrian circulation	C	13 of 18 (72%)
	MFR	14 of 19 (74%)
	SFR	5 of 13 (38%)
Require connections to transit	C	7 of 18 (39%)
	MFR	8 of 19 (42%)
	SFR	2 of 13 (15%)

Pedestrian connectivity refers to the sidewalks, on-site circulation systems and the provision of connections to transit from the project site. These elements are shown in Table 5. The study areas in this research frequently required all of these elements. Sidewalks were one of the most commonly required elements of all the

transportation-efficient categories, throughout the study areas and the land-use types.

Requiring on-site pedestrian circulation was also common. Most of the study areas required developments to address on-site pedestrian circulation, especially in commercial and office development. Frequently this meant requiring nonmotorized circulation in parking lots and from the street to the building entry. Nonmotorized connections to transit was required in regulations less often than general on-site circulation.

A-4.2 Bike Lanes and Trails

Bike lanes and trail elements are shown in Table 6. These elements are frequently determined by the local transportation department and installed as part of Transportation Improvement Plan / Capitol Improvement Plan projects. They were thus rarely found in the regulatory surveys.

Table 6. Bike Lanes and Trails Elements: Regulation

Element	Land Use	Number of Study Areas with Element
Require bike lanes	C MFR SFR	4 of 18 (22%) 3 of 19 (16%) 3 of 13 (23%)
Require nonmotorized paths or trails	C MFR SFR	0 (0%) 0 (0%) 0 (0%)

A-4.3 Street Connectivity

Street connectivity refers to those elements that result in a more connected street grid for both vehicles and pedestrians, such as a lack of dead-end streets and smaller blocks. These elements are shown in Table 7.

Table 7. Street Connectivity Elements: Regulation

Element	Land Use	Number of Study Areas with Element
Prohibit cul-de-sacs or dead end streets	C MFR SFR	1 of 18 (5%) 1 of 19 (5%) 0 of 13 (0%)
Require pedestrian connections/prohibit pedestrian barriers between developments	C MFR SFR	5 of 18 (28%) 5 of 19 (26%) 2 of 13 (15%)
Establish maximum block size/perimeter	C MFR SFR	2 of 18 (11%) 2 of 19 (10%) 2 of 13 (15%)

These elements were addressed much more infrequently than those in the previous section. Only Downtown Bellevue prohibited cul-de-sacs or dead-end streets. Only five study areas (26 percent) prohibited pedestrian barriers between adjacent developments—for instance, between commercial and multi-family residential or single-family residential uses. Other study areas allowed disconnected site designs outright, and others discouraged them but did not prohibit them entirely. The rest already had fine-grained street networks and so did not address these issues.

King County and Kirkland both addressed the issue of block size in their regulations. King County required any block side longer than 660 feet to have midblock crosswalks. Kirkland set a 500-foot maximum block side in its subdivision ordinance. Developments that were building adjacent to existing streets might also be required to provide midblock crosswalks to all vehicular through streets if existing block sides were over 750 feet long. Some other study areas that did not have existing fine-grained street networks encouraged smaller block sizes throughout the city when possible, but this was not codified.

A-5. Findings by Transportation-Efficient Category: Pedestrian Environment and Safety

The Pedestrian Environment and Safety category (along with the Connectivity category) contained more mandatory regulations than the other categories of transportation-efficient development. Those jurisdictions that had addressed the pedestrian environment at all tended to do it completely, addressing many of the elements. Generally, many of these elements were not addressed in single-family zones, and were less stringent in office zones and outside of the downtowns and the Seattle study areas.

A-5.1 The Street Environment

Regulations that reduce conflicts between vehicles and pedestrians, such as access management requirements, limits on curb cuts, and narrower street widths to slow traffic speeds make for a safer street environment. These elements are shown in Table 8. Access management was required in four study areas (22 percent). Curb cuts were limited by almost 70 percent of study areas in commercial and multifamily residential zones, and less in single-family zones (in five study areas, or 38 percent).

Table 8. Street Environment Elements: Regulation

Element	Land Use	Number of Study Areas with Element
Require access management	C MFR SFR	4 of 18 (22%) 4 of 19 (21%) 3 of 13 (23%)
Limit Curb cuts/ driveways	C MFR SFR	12 of 18 (67%) 13 of 19 (68%) 5 of 13 (38%)
Have recently reduced street width standards	C MFR SFR	4 of 18 (22%) 4 of 19 (21%) 2 of 13 (15%)

Four out of the 19 study areas (21 percent) had recently reduced their street width requirements, although a number of other jurisdictions indicated they were considering doing so. Where they had been implemented, street width reductions were part of an overall scheme of retrofit strategies intended to make suburban areas more pedestrian-friendly.

A-5.2 The Built Environment

This set of elements, shown in Table 9—ground floor windows, facade articulation, weather shelter, and open space/other amenities—contributes to an interesting, pedestrian-friendly streetscape. Although these elements can be difficult to regulate because of their varied, qualitative nature, the majority of the study areas surveyed had found one way or another to encourage or require their provision. About half the study areas used a regulatory approach to do so, but most of the rest of the other study areas used a variety of other nonregulatory strategies in combination with or in

place of these regulations. Given the variety of approaches, maintaining or creating a streetscape that attracts pedestrian activity seemed to be a priority for the jurisdictions included in this study.

Table 9. Built Environment Elements: Regulation

Element	Land Use	Number of Study Areas with Element
Require ground floor windows/limit blank facades	C MFR SFR	7 of 18 (39%) n/a n/a
Require articulated facades	C MFR SFR	7 of 18 (39%) 16 of 19 (84%) n/a
Require weather shelter	C MFR SFR	8 of 18 (44%) 8 of 19 (42%) n/a
Require amenities or public/private open spaces	C MFR SFR	8 of 18 (44%) 8 of 19 (42%) 5 of 13 (38%)

Most of these elements do not apply to single-family projects. Seven study areas out of 18 (39 percent) required ground floor windows in their commercial zones. Seven study areas (39 percent) required articulated facades in their commercial zones, and 16 study areas (84 percent) required them in multifamily zones. Eight study areas required weather shelter in multi-family and commercial buildings. Eight study areas required multi-family and commercial developments to provide some sort of open space, plaza, or other amenity. Five study areas with single-family zones required single-family developments to do the same.

A-5.3 Building Orientation

Table 10 shows those elements that have to do with building placement. Buildings whose entryways address the sidewalk, rather than parking lots, as well as those that are located close to the front lot line, make for a more visually engaging walking environment than one where pedestrians walk by and through multiple parking lots and blank walls.

Almost 60 percent of the study areas in commercial and multifamily zones required building entries to front the street. Maximum street side garage widths in single-family zones, which have been implemented in other cities such as Portland, were required in three study areas. Many of the jurisdictions that required pedestrian-friendly building orientation also required the other facade treatments and street safety improvements discussed in the two previous sections. Eleven study areas in five jurisdictions indicated that they had recently reduced setback requirements in commercial and multifamily zones, and seven jurisdictions had done so in single-family zones.

Table 10. Building Orientation Elements: Regulation

Element	Land Use	Number of Study Areas with Element
Require building entry to address or front the street	C MFR SFR	10 of 18 (56%) 12 of 19 (63%) n/a
Established maximum street side garage width	C MFR SFR	n/a n/a 3 of 13 (23%)
Setbacks have recently been reduced or eliminated	C MFR SFR	11 of 18 (61%) 11 of 19 (58%) 7 of 13 (54%)

A-6. Findings by Transportation-Efficient Category: Parking

Parking is among the least regulated of the six transportation-efficient elements. This is largely because outside of actual parking ratios, not a lot can be mandated in the land-use codes. Though all of the study areas did encourage the use of a variety of parking strategies that indirectly reduce the total parking ratio, most of these elements were optional. Developers could use the various strategies (such as shared parking or contributing to a city parking fund in lieu of building parking) if they chose to, but most of them could only be applied on a case-by-case basis, if such a reduction worked for the city and the developer.

A-6.1 Alternative Mode Parking

Providing priority parking for alternative mode users—carpoolers, vanpoolers, or cyclists—can encourage use of these modes, especially in areas where parking is at a premium.

Table 11 shows the alternative mode parking elements in the survey of development regulations. Commercial and office zones often require rideshare and bicycle parking. Seven out of 18 study areas with commercial zones required the provision of priority rideshare parking in commercial zones. Priority rideshare parking was also often required as part of mitigation—through a Transportation Management Plan (TMP) or State Environmental Policy Act (SEPA) conditions for larger office or commercial developments.

Table 11. Alternative Mode Parking Elements: Regulation

Element	Land Use	Number of Study Areas with Element
Require priority rideshare parking	C	7 of 18 (39%)
	MFR	n/a
	SFR	n/a
Require bike parking	C	14 of 18 (78%)
	MFR	14 of 19 (74%)
	SFR	n/a

There was little difference in rideshare parking requirements between office and retail uses. Although priority rideshare parking can be effective in encouraging commuters to carpool or vanpool—and therefore makes sense for office developments—it is generally not regarded as useful in retail developments. Shoppers often ride together anyway, and there is no system for making sure that those who use the spaces are actually carpooling. Priority spaces for retail employees can often sit vacant, reflecting badly on the overall credibility of such requirements.

Fourteen out of the 19 study areas surveyed required or encouraged bicycle racks or other bicycle parking in both commercial and multifamily residential zones. Some study areas had other supportive codes that governed the distance from the bicycle

parking to the building entry and the type and/or quality of bike parking (for instance, bike parking must be covered). One jurisdiction had requirements for bicycle lockers and showers in commercial and office zones.

A-6.2 Parking Location

This element, shown in Table 12, refers to requirements that parking be located behind or under buildings and is closely related to the building orientation elements in the Pedestrian Environment category. There were some slight differences in application, however. Parking located behind or under the building was only required in six of the study areas with commercial and multifamily zones, while the building orientation requirements were more frequent (see A-5.3). Sometimes parking location was regulated on the basis of the street designation or overlay zone, rather than a basic zoning requirement. In other cases, street level garages were required to be "wrapped" by commercial space. Even those study areas with no requirements at all indicated that they encouraged developers to put parking behind their buildings.

Table 12. Parking Location Elements: Regulation

Element	Land Use	Number of Study Areas with Element
Require parking to be behind or under buildings	C	6 of 18 (33%)
	MFR	6 of 19 (32%)
	SFR	n/a

A-6.3 Parking Supply

Reducing parking supply can have a real influence on whether people carpool, vanpool, or take transit to work. Free, unlimited parking can reduce effectiveness of even the most aggressive TDM efforts. Parking supply can be reduced directly—by lowering parking requirements or setting maximum parking ratios—or indirectly, by allowing complementary land uses to share parking or allowing developers to contribute to a fund

that is then used to build consolidated parking facilities. Elements that can be used to reduce parking supply are in Table 13.

There are indications that many of the jurisdictions surveyed in this research had put significant thought and effort into revising their parking requirements. Slightly over half of the study areas had established maximum ratios. Usually this means a high-low range from which the developer can choose an appropriate ratio. Eight study areas—the two unincorporated King County study areas, Overlake and Willows in Redmond, and all of the Seattle study areas—would go a little further, allowing some degree of departure from minimum parking requirements. In most of these cases, some sort of TDM actions were necessary—such as the provision of transit passes or transit and rideshare information. Throughout Seattle, parking requirements were waived for most nonresidential development under 2500 square feet to encourage the provision of neighborhood commercial development. Four other study areas—Downtown Redmond, both Renton study areas, and the Northgate study area in Seattle—indicated that they had recently reduced their minimum parking limits.

Table 13. Parking Supply Elements: Regulation

Element	Land Use	Number of Study Areas
Allow shared parking	C MFR SFR	18 of 18 (100%) 14 of 19 (74%) n/a
Allow on-street parking to meet parking requirements	C MFR SFR	0 of 18 (0%) 2 of 19 (10%) n/a
Allow use of in-lieu-of parking fee	C MFR SFR	7 of 18 (39%) 8 of 19 (42%) n/a
Allow redevelopment of unused parking area	C MR SFR	5 of 18 (28%) 5 of 19 (26%) n/a
Use flexible parking standards	C MFR SFR	11 of 18 (61%) 9 of 19 (47%) n/a
Allow reduction of parking requirements below minimum	C MFR SFR	5 of 18 (28%) 5 of 19 (26%) n/a
Use maximum parking requirements	C MFR SFR	9 of 18 (50%) 9 of 19 (47%) n/a
Have recently lowered minimum parking requirements	C MFR SFR	4 of 18 (22%) 4 of 19 (21%) 3 of 13 (23%)

All of the study areas used one or more of the strategies that can indirectly reduce parking supply. These are optional strategies, not all of which can be utilized. Shared parking was allowed in all the study areas. Only two study areas indicated that they allowed on-street parking spaces to apply to parking requirements in multifamily zones, and none allowed this in commercial or single-family zones. Some jurisdictions noted that this practice is explicitly not allowed because they already had spillover parking problems in neighborhoods. Allowing a developer to bank land that could be used in the future for parking (rather than developing all the required parking at once) was only found in the Renton study areas. Renton planners said that this was an older ordinance that had never been used, and it would be difficult to implement because there were no requirements to record any sort of covenant on the property. Likewise, though planners in a few study areas indicated that developers might be allowed to redevelop unused parking areas, such tactics would be difficult to implement—and had never been used.

A-7. Findings by Transportation-Efficient Category: Affordable Housing

Affordable housing is included in this study for several reasons that make it a transportation issue. Affordable housing within urban areas enables more people to live and work in the same area, making commuting by transit or nonmotorized modes easier, or at least shortening the auto commute. It can also keep people from leaving close-in areas for cheaper housing in rural areas, thereby slowing sprawling housing development outside the growth boundary.

Affordable housing regulation is shown in Table 14. Affordable housing was by far the least regulated and least implemented of the six transportation-efficient elements.

Table 14. Affordable Housing Elements: Regulation

Element	Land Use	Number of Study Areas
Percent affordable housing required	C (18) MFR (19) SFR (13)	n/a 1 (5%) 0 (0%)

With the exception of downtown Redmond, there were no requirements for affordable housing in any of the study areas. Incentives for affordable housing had been established in a few other cases. The City of Redmond required that 10 percent of all units, for any development with over 10 dwelling units, be affordable at an 80 percent of minimum income threshold. The City then allowed a 10 percent density bonus, which could be used for market rate units.

In the fast-growing Puget Sound Region, it will become more important to address the issue of affordable housing in the future and to strengthen incentives that do exist. Additionally, many other code requirements and programs that increase densities, mix of uses, and pedestrian friendliness will indirectly increase the supply of affordable housing simply by encouraging more multifamily housing and a wider variety of housing types and lot sizes, and by putting more housing near transit, making it easier to live without a car.

B. ANALYSIS OF IMPLEMENTATION

Evaluations of permitted development proposals were based on the *percentage of elements that were addressed in the site plans*.[1] If an element was not specified in the conditions of permit approval or visible on the site plan, it was assumed that it was not addressed and therefore not implemented. Table 15 shows the rate of inclusion of all the

[1] Since mixed-use projects were covered by commercial regulations in most cases, mixed-use projects were classified as commercial. Those that were mixed-use also included housing.

Table 15. Implementation of Transportation-Efficient Elements in Development Proposal Evaluations (in Order of Frequency of Application)

Element Description	Category	Percent of Applicable Projects with Element
Street widths appropriate for anticipated traffic volumes	PED ENV	89.2%
Sidewalks on streets within the development	CONN	83.7%
Infill or brownfield development	CD	82.2%
Building facades articulated & modulated	PED ENV	80.6%
Parking placed behind or under building	PKG	72.9%
Direct, convenient access to transit from building entry	CONN	72.4%
Internal non-motorized routes/access points	CONN	69.3%
Access points reduce pedestrian/vehicle conflicts	PED ENV	65.6%
Buildings provide awnings/weather shelter	PED ENV	62.2%
Multiple vehicle access points to the site	CONN	60.1%
Street system well connected	CONN	57.1%
Design review/guidelines used in review process	O	56.5%
Front setbacks close to the street	PED ENV	56.3%
Building entrance addresses the street	PED ENV	55.9%
Attached housing	CD	55.9%
Free of auto oriented uses	MU	52.8%
Attempt to reduce pedestrian barriers to adjacent developments	CONN	52.1%
Coverage of available lot area maximized	CD	51.6%
Non-motorized paths well connected	CONN	51.4%
Nonmotorized connections through dead end streets	CONN	50.0%
Variety of uses within walking distance	MU	49.7%
Units available for rental	AFF HOS	44.2%
Ground floor commercial/retail	PED ENV	44.0%
Overall project average		**44.0%**
Streets designed to slow traffic speeds	PED ENV	40.5%
Spaces for public or recreational uses	PED ENV	40.5%
Garages set back from the street	PED ENV	39.5%
Bicycle parking	PKG	38.1%
Nonmotorized paths or trails (other than sidewalks)	CONN	35.1%
Diversity of lot sizes within the development	AFF HOS	31.0%
Vertically mixed-use project	MU	26.4%
Easement required for path or street connection?	CONN	23.3%
Mix of uses within larger project	MU	19.6%
Priority parking for carpools/vanpools	PKG	18.4%
Shared parking	PKG	15.3%
TMP required	PKG	13.6%
Variety of housing types	AFF HOS	12.0%
Affordable housing	AFF HOS	11.6%
Program to encourage transit use	O	9.9%
Incentives given for open space	O	6.8%
Incentives given for other amenities	O	5.6%
Accessory units	AFF HOS	4.2%
Incentives given for affordable housing	O	3.4%
On-street parking used for parking requirements	PKG	2.5%

Categories:
CD = Compact Development
MU = Mixed-Use Development
CONN = Connectivity
PED ENV = Pedestrian Environment
PKG = Parking
AFF HOS = Affordable Housing
O = Other (process, incentive, program)

elements evaluated, from highest to lowest. In many cases, an element did not apply to all of the projects—for instance, the "attached housing" element only applied to those developments that contained housing, and the "sidewalks" element only applied to developments that were required to build streets as part of the development. The table also includes the overall average of all the elements addressed in all the projects (44 percent). In the following sections, tables show the proportion of projects that addressed each of the elements.

In order to find which elements were potential indicators of transportation-efficient development, the projects that were most transportation-efficient *overall* (those that addressed over 70 percent of applicable elements in the evaluation) were examined for elements that were present (or absent). Then the projects that addressed under 50 percent of the applicable elements were examined, noting again which elements were present (or absent). The assumption was that the characteristics most important in producing projects that were most transportation-efficient as a whole would consistently show up in the most transportation-efficient projects, while remaining absent from the less transportation-efficient projects. Because of the small sample sizes, it was not possible to establish formal, mathematical correlations with statistical significance. However, certain elements still appeared to be clearly connected to transportation-efficient development.

Inherent in the process of looking for indicators was the assumption that it is important to address all of the categories—to have one without the others can undermine the potential transportation-efficiency of any development. There is no "magic bullet" approach to producing land use that supports alternative mode use. For instance,

compact development without a mix of uses or a well-connected transportation network leaves a large population of people with no convenient access to transit, no place to walk if they wanted, and so no way to get around but to drive—thereby actually exacerbating congestion. Housing that is affordable but physically disconnected from the larger community can leave residents no choice but to continue to drive, negating any financial benefits that might otherwise be gained from moving to less expensive housing.

Although each transportation-efficient category is discussed here separately, there is a good deal of overlap in indicator elements among the categories—frequently the Pedestrian Environment and Parking categories blur together, as do the Compact Development and Affordable Housing categories. Table 28 at the end of the chapter shows all of the recommended indicator elements as a whole package.

B-1. Findings by Land Use Type

The most and best implementation of transportation-efficient land use, as seen in the evaluations of project proposals, was happening in the downtowns, Seattle study areas, and mixed-use and multifamily land uses. Most improvement was needed in single-family areas and single-use commercial (office as well as retail) development.

These findings directly parallel the findings from the regulatory survey, showing that largely, study areas that had zoned for transportation-efficient development were able to implement it, with only a couple of exceptions. Conversely, places that did not have regulations that required transportation-efficient development in place did not generally produce transportation-efficient development. This indicates that as a basic tool for guiding development, regulations work.

B-2. Findings by Transportation-Efficient Category: Compact Development

The study areas included in this research project have had a great deal of success implementing compact development, as shown in Table 16. Average density was the primary measure of implementation in the Compact Development category. Density can be measured in two ways: a project's floor area ratio (F.A.R.), [1] used for primarily commercial projects, and dwelling units per acre (du/ac), typically used for residential projects. [2] Though these two measurements do not match up exactly, densities above 1 F.A.R. and 12 dwelling units/acre can be generally regarded as high enough to be transit-supportive, whereas densites below 0.5 F.A.R. and 4 to 5 dwelling units/acre are typical of lower-density "sprawl" development.

Table 16. Compact Development Elements: Implementation

Element	Number of Applicable Projects	Number of Projects with Element
Development maximizes available lot coverage	159	82 (52%)
Attached housing development (residential or mixed use projects only)	102	57 (56%)
Development is located in an already developed area - infill or brownfield development	163	134 (82%)

Average residential densities of the projects evaluated in each of the study areas ranged from 5.53 dwelling units/gross acre to 144 dwelling units/gross acre, with an overall average of 54 dwelling units/ gross acre. Commercial densities ranged from 0.2 F.A.R. to 4.2 F.A.R, with an overall average of 1.4 F.A.R. In both cases, the overall average was

[1] F.A.R.: Floor area ratio, a measure of the relationship between the site coverage, building height and lot size. This measurement is calculated by dividing the total square footage of the building by the total square footage of the site.

[2] Both measures were calculated in the project evaluation wherever possible, although in some cases project records did not contain enough information to calculate one measure or the other. In the calculation of average densities, dwelling units/acre was used as the measure for residential and mixed-use projects while F.A.R. was used as the measure for commercial projects.

skewed upwards significantly by several very high-density projects—the median density was 25 dwelling units/gross acre and 0.9 F.A.R.

Thirteen out of the 19 study areas had average overall densities above either 12 dwelling units/gross acre or 1 F.A.R., densities generally regarded as transit-supportive. Most of the projects with densities too low to be transit-supportive were found in fast developing suburban areas—in both newer and redeveloping areas.

The development proposals found with lower densities tended to be exclusively residential projects or suburban-style office projects. Single-use commercial projects averaged 0.87 F.A.R., and single-family projects averaged 5.4 dwelling units/gross acre, while multifamily projects had average densities of 58 dwelling units/gross acre and mixed-use projects averaged 85 dwelling units/gross acre.

Although density requirements are important, other aspects of compact development may be just as influential to the built environment. Implementing projects that maximize their coverage of the available lot area—in the context of a building's surroundings—seems to be somewhat connected to projects that are highly transportation-efficient overall. Maximizing lot area can be done by reducing setback requirements or allowing zero lot line development, allowing and reducing barriers to ADU (accessory dwelling unit) construction, and reducing minimum lot size, in addition to increasing density requirements. Whether a minimum density requirement is in place tends to matter less than what the actual density requirements are. Those study areas that had implemented minimum density alone had not necessarily had success in implementing denser, more transportation-efficient projects.

Eighty-two percent of all projects evaluated were located in an already developed area. This is mostly indicative of the structure of the study, which examined already developed areas. The majority of development was redevelopment, but a few projects were proposed on vacant lots surrounded by development. Most of the time those lots had environmental constraints—hills or wetlands—that made them low priority to develop until the boom in the housing market and limits on the supply of urban land after the passage of the Growth Management Act.

Fifty-two percent of the 163 projects had maximized their lot coverage. This question ended up being an important one, and it often correlated to projects that had very high overall scores. Generally, a project that maximized lot coverage was defined as one that used the land efficiently *within the same built environment context* as the surrounding area. This meant building scales and heights roughly consistent with the surrounding development, no large parking lots around the development, setbacks that were close to the lot lines, and a reasonable allocation of open space for the proposed land use. Maximizing lot coverage did not necessarily mean maximizing lot coverage according to zoning requirements, since some zoning requirements allowed very low lot coverages.

Fifty-seven percent of all residential housing projects were attached housing—either within mixed-use projects or as exclusively multifamily housing projects. This element does not correlate well with overall transportation-efficiency; although attached housing is often found in highly transportation-efficient projects, attached housing projects are often missing some other crucial elements of transportation-efficient development, such as a good pedestrian network or mix of uses.

B-3. Findings by Transportation-Efficient Category: Mixed-Use Development

Table 17 shows the Mixed-Use Development elements. The project evaluations illustrate the challenges of implementing mixed-use development. Out of 163 projects evaluated, only 43 (just over 25 percent) were mixed-use projects. Although this amounted to a surprisingly high proportion of the total projects, almost all (39 of 43) mixed-use projects were concentrated in just one-third of the study areas—downtown Bellevue, downtown Kirkland, downtown Redmond, downtown Renton, South Lake Union, the University District, and Wallingford. The four remaining projects were found in Juanita and Overlake. The remaining seven study areas had no mixed-use development, and three of those had made no zoning provisions for it. In study areas with little or no mixed-use development, more aggressive approaches—in addition to regulation allowing mixed use—may be more effective in implementation. Generally, single-use commercial development is easier and cheaper to build, and in newer markets for mixed-use development, single-use development is much more likely to get financing from lenders.

Table 17. Mixed Use Elements: Implementation

Element	Number of Applicable Projects	Number of Projects with Element
Is the project free of auto-oriented uses (commercial projects only)?	108	57 (53%)
Is the project a mixed-use project?	163	43 (26%)
Is there a horizontal mix of uses within larger (those where lot size is over 2 acres) projects?	51	7 (14%)
Is the project located in an area with a variety of other uses within walking distance (1/2 mile)?	163	83 (50%)

The study areas that had been successful in implementing mixed-use projects can offer some valuable lessons. Some simply required a mix of uses in all or part of the study area. The study areas that did so had been careful to limit the mixed-use

requirements to areas in which the market could handle it. Much was learned from past local experiences where implementing blanket ground floor commercial requirements resulted in a lot of vacant commercial space.

Other study areas relied instead on height limits and incentives to encourage the provision of housing above commercial development. Downtown Bellevue allowed single-use commercial development but gave substantial density bonuses for those that included housing. This approach makes it worthwhile for developers to provide housing along with commercial development.

A mix of uses can also be implemented horizontally, with a number of single-use buildings of different uses within walking distance. Roughly half of the projects that were evaluated were built in areas that contained a mixture of office, commercial, and residential uses. However, this estimate should be viewed with caution. It was difficult to measure whether single-use projects were happening within areas that contained a horizontal mix of uses—and if they were, it wasn't always clear whether the street/sidewalk network made it possible to get from one use to another. Additionally, development proposals that were on larger sites (over two acres in area) were checked to see whether a horizontal mix of uses was proposed within the larger development. Those proposals that contained a horizontal mix of uses were mostly large, master-planned, 10- to 20-acre developments.

Within the project evaluation data, there were no clear patterns that might show which mixed-use elements are most important to have in place. There was some connection between the existence of ground floor retail/vertically mixed-use development and overall transportation efficiency, however. Additionally, evidence from this

research—along with discussions with local planners—does indicate that implementation of incentives may be necessary to bring housing to a downtown core or some small scale corner stores to residential neighborhoods.

B-4. Findings by Transportation-Efficient Category: Connectivity

Not only does the Connectivity category have the highest overall rate of mandatory regulation, but the evaluation of development proposals also shows the highest rate of implementation, throughout study areas and uses. However, the development proposal evaluations illustrate the difficulties of retrofitting suburban street patterns through regulation alone.

While an above-average rate of mandatory regulation indicated that jurisdictions have tried to regulate in order to improve street and nonmotorized connectivity, projects that addressed many connectivity elements were not the ones that were transportation-efficient *overall.* This indicates that the elements of regulations and proposals used in this study to measure connectivity might, in fact, be superficial.

Furthermore, the Seattle study areas and the downtowns had less of a need to address connectivity issues, so implementation of connectivity elements in these areas was often lower than in disconnected suburban areas, despite the fact that in the urban areas connectivity is in reality quite high. Conversely, even though projects in the suburban areas addressed many of the connectivity elements, rarely were those projects transportation-efficient overall. Projects that stood out overall in the suburban study areas were the ones where jurisdictions had made a focused effort to require easements for through streets or pedestrian connections to make a finer grained transportation network.

Meaningful implementation of connectivity, therefore, may not be easy to attain. The key determinant of connectivity in an area is the existing street grid, something not easily changed. Breaking up suburban superblocks takes more than blanket regulation—it takes a careful eye for opportunity and advance planning. The incremental nature of real estate development makes breaking up the street network project-by-project a lengthy process. Where demand is high, there will be more projects in the area, allowing changes to happen more quickly, but even in those cases it will take a while to see results.

Despite these obstacles, a couple of study areas had some visible success in increasing the connectivity of their street networks. Although downtown Bellevue's street grid is now well-connected and the downtown attracts significant amounts of pedestrian activity, as recently as ten years ago this was not the case. Since the completion of its 1993 Comprehensive Plan, the City of Bellevue has worked actively and successfully to break up superblocks and add sidewalks and other features to make the downtown better connected and safer for nonmotorized users. Some of the connectivity strategies used by the City of Bellevue included requiring midblock connections as a condition of development, as well as retrofitting the downtown with sidewalks as part of transportation improvements. Because of the vast amount of redevelopment in the downtown, the city was able to see results in a relatively short amount of time.

A couple of cities and study areas had used similar strategies. In Redmond and Kirkland, the comprehensive plan or the codes identify blocks that need to be broken up with through streets or blocks that need additional pedestrian connections through them.

Then, when proposals come along that affect these parcels, requirements are in place that increase connectivity in that area.

B-4.1 Pedestrian Connectivity

Pedestrian Connectivity elements are shown in Table 18. In the survey of development regulations, sidewalks were overall one of the most commonly and consistently required elements. Sidewalks were also one of the most frequently addressed elements in development proposals—found in 83 percent of applicable permitted proposals. Sidewalk requirements increase the quality of the pedestrian environment significantly, and most of the study areas surveyed not only had sidewalk requirements in place but had been quite successful in implementing them in the projects.

On-site pedestrian circulation is also commonly implemented. Most of the study areas required developments to address on-site pedestrian circulation, especially in commercial and office development. Frequently this meant requiring nonmotorized circulation in parking lots and from the street to the building entry. This was addressed in the development proposal evaluation by the element "multiple internal nonmotorized routes and access points," which was addressed in 69 percent of 163 projects. Nonmotorized connections to transit were required in regulations

Table 18. Pedestrian Connectivity Elements: Implementation

Element	Number Applicable Projects	Number of Projects with Element
Sidewalks on streets within the development *This element only applies to developments that had street systems or were built out to the street—not to internal (on-site) circulation systems.*	43	36 (83%)
Internal non-motorized routes and access points	163	113 (69%)
Direct, convenient access to transit stops from the building entry	163	118 (73%)

less often than general on-site circulation, but were seen implemented much more often - in 73 percent of the projects.

B-4.2 Bike Lanes and Trails

Bike lane and trail elements are shown in Table 19. These elements are frequently determined by the local transportation department and installed as part of Transportation Improvement Plan/Capitol Improvement Plan projects, so they were rarely found in the regulatory survey. They were slightly more common in the evaluation of development proposals. Usually larger projects were required to include bike lanes, and in some other cases developments that faced onto an existing street were required to include bike lanes as part of the required street improvements. Often efforts were made to link up required trails to a larger trail system if other local trails were located nearby.

Table 19. Bike Lanes and Trails Elements: Implementation

Element	Number Applicable Projects	Number of Projects with Element
Nonmotorized paths or trails (other than sidewalks)	74	25 (35%)
Nonmotorized paths or trails link up with a larger path/trail system (if applicable)	37	19 (51%)

B-4.3 Street Connectivity

As important as they may be, sidewalks and other nonmotorized facilities only address one side of the connectivity equation. Those facilities also have to provide a direct, convenient connection to somewhere—the store, the office or a transit stop, for instance.

This means that one of two things must occur: Either a connection must be provided with a path, gate, or break in the hedges from one site to adjacent sites, or a fine-grained street network must provide a variety of direct route choices.

Several elements in the evaluation of development proposals addressed street connectivity: whether or not jurisdictions had attempted to reduce pedestrian barriers, whether the street system was well connected, whether there were pedestrian connections through dead-end streets, and whether an easement was required for a street or path connection. These elements are shown in Table 20.

The first three of the above elements were addressed in around 50 to 60 percent of the projects. The last element, whether an easement was required for a street or path connection, was addressed in only 23 percent of the projects. While not every development will be a candidate for new street or pedestrian connections, this is one indication of where more effort may be needed.

Table 20. Street Connectivity Elements: Implementation

Element	Number Applicable Projects	Number of Projects with Element
Well-connected street system (no dead-end streets/cul-de-sacs) This element only applies to those developments in which new streets were part of the development. Exceptions were made for dead-ends necessitated by topography.	42	42 (57%)
Multiple vehicle access points to the site	163	98 (60%)
Attempt to reduce pedestrian barriers (such as fences and hedges) to adjacent developments	163	85 (52%)
Nonmotorized connections through any dead end streets/cul-de-sacs (if applicable)	24	12 (50%)
Easement required for a through street or pathway	163	38 (23%)

The development proposals evaluated showed no real patterns regarding the application of easements or street connections. Rather than relying on blanket requirements, jurisdictions are more likely to have a general

policy of requiring easements for new streets or pathways as the opportunity arises. As one example, in the Juanita neighborhood in Kirkland, the Juanita Village development was required to add public streets that broke up the 11-acre parcel into four smaller blocks.

In regard to actual block size, even though no jurisdictions have codified any sort of maximum block size requirement, it would have been valuable to look at block size in the project evaluations. However, block size was not typically required in project applications and could often not be calculated with measurements given on site plans. In addition, many projects only make up a portion of a block, making block size irrelevant.

B-5. Findings by Transportation-Efficient Category: Pedestrian Environment

The built project evaluations showed high degrees of implementation of elements within the Pedestrian Environment Category, paralleling the high proportions of regulation found in the regulatory survey. This is similar to the Connectivity Category, which also tended to have high proportions of mandatory regulations and high degrees of implementation. However, unlike the Connectivity Category, projects that included a large percentage of Pedestrian Environment elements also tended to be quite transportation-efficient *overall*. Several of the Pedestrian Environment Elements not only seem to serve as indicators of overall transportation-efficiency, but there is also a clear linear relationship between regulation and implementation. Those elements that are required get implemented. Those that are not required are not implemented.

Generally, most of these elements are not addressed in single-family zones and are less stringent in office zones and outside of the downtowns.

B-5.1 The Street Environment

For this set of elements, the evaluations of the permitted development proposals showed rates of implementation that were greater than the rate of regulation. This may be because rather than having general requirements for traffic flow, jurisdictions chose to require such actions on a case-by-case basis, after traffic studies had taken place. Study areas tended to have either very high or very low rates of implementation—those areas that had made a safer street environment a priority seemed to have been able to implement it quite successfully.

Table 21 shows the Street Environment elements. The first element, access points designed to minimize pedestrian/vehicle conflicts, evaluated whether pedestrians had crosswalks marked at driveways, whether intersections were designed with good sight lines, and if sidewalks/curbs were convenient and accessible at access points. Sixty-six percent of projects met this criteria.

Those four study areas that indicated in the regulatory survey that they had recently reduced their street width requirements were having a very high degree of success with those new standards, as the project evaluations showed—in those development proposals that required new streets as part of the development, 89 percent of the proposals showed streets that were narrower than standard suburban street widths and

Table 21. Street Environment Elements: Implementation

Element	Number Applicable Projects	Number of Projects with Element
Access points into the development designed to minimize pedestrian/vehicle conflicts	163	107 (66%)
Street widths appropriate for anticipated traffic volumes (only applies to developments that built their own street system)	37	33 (89%)
Streets designed to slow traffic speeds (only applies to developments that built their own street system)	37	15 (41%)

appropriate for local traffic volumes. Streets designed specifically to slow traffic speeds—ones that included traffic calming strategies in tandem with narrower street widths—were implemented less frequently, but still in 41 percent of applicable projects.

B-5.2 The Built Environment

About half the study areas currently used a regulatory approach to encourage a varied, pleasant walking environment that maintains neighborhood character. In some of the other study areas, a variety of other strategies were being used in combination with or in place of these regulations—design review processes, SEPA review, or designated pedestrian corridors, "green streets," or overlay zones. In one study area, developers were required to pick a minimum number of facade treatments from a list of options. The Planned Unit Development (PUD) process[1] was also frequently used to require better design. Still other study areas gave density bonuses for facade treatments. Given the number of approaches, maintaining or creating a streetscape that attracts pedestrian activity seemed to be a priority for the jurisdictions included in this study.

Table 22 shows the Built Environment elements. Since ground floor windows are rarely seen on site plans, the existence of ground floor retail was used as a proxy for windows. Ground floor retail is not always an accurate indicator of ground floor windows, however. Malls and big-box retail buildings typically do not have windows—and even if they are explicitly required to have windows in the building, those windows may not actually enhance the pedestrian environment. If a building is surrounded by

[1] The PUD (Planned Unit Development) process is a special review process typically required for larger subdivisions which looks at the development as a whole. The developer is allowed to deviate from minor code requirements in exchange for better design or other mitigation actions requested by the local jurisdiction.

parking lots, or the windows are obstructed by advertisements, windows have little benefit. The 41 percent figure in Table 22 is thus probably higher than actual number of projects with ground floor windows, and should be viewed with caution.

Articulated facades also had high rates of implementation, present in 80 percent of applicable development proposals. Sixty-two percent of proposals contained specifications for weather shelter. Open space was found in 41 percent of development proposals. Six percent of development proposals were given incentives (usually density bonuses) for that open space.

Table 22. Built Environment Elements: Implementation

Element	Number of Applicable Projects	Number of Projects with Element
Ground floor commercial/retail in development (used as proxy for ground floor windows)	134	59 (41%)
Building facades articulated and modulated (not blank facades)	134	109 (80%)
Buildings provide awnings or other weather shelter	135	85 (62%)
Maintains or creates open spaces for public or recreational uses	163	66 (41%)

These rates of implementation closely followed the rates of regulation. In study areas and zones where the elements in this section were required, they were implemented. In those study areas that had supplemental processes—design review or incentives available for those actions—rates of implementation were even higher. Generally, mixed-use projects had the highest scores in these areas, with single-use multifamily and commercial retail projects scoring slightly lower, and commercial office projects scoring lower still. Most of these elements did not apply to single-family projects.

B-5.3 Building Orientation

The three elements in this section were implemented in around half of the applicable projects, as seen in Table 23. There was a clear connection between the projects that were highly transportation-efficient and front setbacks that were close to the street and requirements for the building entry to be oriented toward the street/sidewalk. Those projects that were not transportation-efficient overall did not (except in rare instances) include these elements.

Table 23. Building Orientation Elements: Implementation

Element	Number of Applicable Projects	Number of Projects with Element
Building entrances address the street	136	76 (56%)
Garages set back from street (single-family development only)	43	17 (40%)
Front setbacks close to the street	160	90 (56%)

Implementation of the elements in this section closely mirrored their regulation—those study areas that regulated building orientation were the ones having success in implementing it. Unlike some of the aesthetic elements that govern the streetscape, those that address building orientation are fairly straightforward and could easily be implemented through land-use codes.

B-6. Findings by Transportation-Efficient Category: Parking

B-6.1 Alternative Mode Parking

Looking at the permitted development proposals, shown in Table 24, implementation of rideshare parking spaces seemed much lower than the regulatory survey would indicate, appearing in only 18 percent of all commercial or mixed-use projects while being regulated in 39 percent of commercial zones in the study areas. This is one of the only cases in this research where rates of implementation were lower than

the rates of regulation. One reason for this may be because rideshare parking requirements were not shown in site plans, and unless they were spelled out in the conditions of approval, remained undocumented.

The Overlake study area was the only area where rideshare parking requirements were consistently documented as being implemented in all commercial projects. Three of the Seattle study areas—Wallingford, South Lake Union, and the University District—also had high rates of rideshare parking implementation. However, in Seattle, rideshare parking was implemented as mitigation through SEPA (those projects predicted to generate a significant number of vehicle trips might be required to mitigate), but not through the land use code, so implementation was less consistent than in Overlake.

Table 24. Alternative Mode Parking Elements: Implementation

Element	Number of Applicable Projects	Number of Projects with Element
Priority parking for rideshare vehicles (commercial uses only)	103	19 (18%)
Bicycle parking	134	51 (38%)

As for the provision of bicycle parking, the rate of implementation was again less than might be expected from the regulations—bike racks were only found in 37 percent of approved projects, as compared to being required in about 75 percent of the study areas. Again, this may be due to the fact that bike racks were rarely documented on site plans. Also, bike lanes may be more likely to be implemented on a case-by-case basis, depending on whether a project is on or near a bike route.

B-6.2 Parking Location

This element—whether parking is placed behind or underneath the building—is closely related to the building orientation elements in the Pedestrian Environment category. Implementation of this element, as shown in Table 25, was quite high—almost

70 percent of commercial and multifamily projects had parking that was either underground or behind the building. This is a much higher rate than might be expected, since only about 30 percent of the study areas required parking to be placed behind the building. Design review was sometimes helpful in changing parking location. In other study areas, setback or other regulations might effectively prohibit parking from remaining between the building and the street.

Although design review and incentives may have been influential, there were still cases where parking was placed in front of the building. The projects that were found with parking in front of the building were largely found in commercial projects, in study areas that did not govern its placement. Despite encouragement, many retailers—especially big-box retailers and supermarkets—given the choice, will opt to put their parking front and center so that it is visible to customers driving by.

Table 25. Parking Location Elements: Implementation

Element	Number of Applicable Projects	Number of Projects with Element
Parking is placed behind or underneath buildings	133	97 (73%)

As in the Pedestrian Environment category, there was a clear and unmistakable connection between the building/parking lot/street relationship and whether a project was highly transportation-efficient. Projects where parking was located behind buildings or underground were likely to score very highly overall, and those projects that had parking between the building and the street had low overall scores. Furthermore, those developments that had parking located behind the building were most often located in study areas that required them to do so, drawing a clear connection between regulation, implementation, and correlation to other transportation-efficient characteristics.

The Seattle and downtown Bellevue study areas were the exception to this trend, with high rates of underground/behind building parking despite the fact that it is not required in the land-use code. This is likely due to high land values (and height/density limits) in those study areas that made underground parking financially feasible. Additionally, however, Seattle used a variety of overlay zones and special street designations with additional parking location requirements that influenced many of the sampled projects. In downtown Bellevue, the F.A.R. incentive system gave substantial density bonuses for placing parking underneath the building.

B-6.3 Parking Supply

Table 26 shows implementation of Parking Supply elements. In implementation, the final parking ratio is the bottom line measure of how much space is devoted to parking. All of the parking requirements and programs to reduce parking requirements within a study area or jurisdiction influence the final parking ratio of a project. Rarely did project records discuss how the parking ratio was established, however, and which (if any) programs to reduce parking ratios were actually used.

Table 26. Parking Supply Elements: Implementation

Elements	Number of Applicable Projects	Number of Projects with Element
Shared parking arrangements with other developments	137	21 (15%)
On-street parking available & used to fulfill requirements	163	4 (2.5%)

As to actual parking requirements, the relationship is less clear—whether a parking maximum is in place matters only if that maximum actually works to constrain the supply of parking. Still, those jurisdictions and study areas that had implemented maximums had more success implementing projects with lower parking ratios than the others.

Average project parking ratios in each of the study areas ranged from .93 to 6.75 spaces per 1000 gross leasable square feet, with a relatively low overall average of 2.7 spaces/1000 gross leasable square feet. Exclusively commercial projects had substantially higher parking ratios, on average, than either multifamily or mixed-use projects. The average parking ratio for commercial projects was 3.5 spaces/1000 gross leasable square feet, while mixed-use projects averaged 2 spaces/1000 gross leasable square feet and multifamily projects averaged 1.9 spaces/1000 gross leasable square feet. While these differences between ratios are partially indicative of differences in nature between land uses, they also illustrate the practice of over-providing parking in single-use commercial zones. Local land-use authorities can get into a chicken-and-egg type relationship whereby more parking is provided for large commercial developments because those uses legitimately have a need for more parking—yet those high parking ratios further induce the type of travel behavior that requires more parking.

B-7. Findings by Transportation-Efficient Category: Affordable Housing

Along with being the least regulated element, affordable housing was also by far the least implemented of the six transportation-efficient elements. Although many study areas encouraged its provision—incentives for affordable housing had been established in a few cases—such provisions were rarely used by developers. Only a few of the development proposals (10 out of the 88 that contained housing, or 11 percent) evaluated in this project had specific provisions for affordable housing, as shown in Table 27.

Affordable housing can also be provided indirectly, by facilitating a variety of housing types and lot sizes, as well as providing rental housing and accessory dwelling units. This research, in evaluating the project proposals, looked at these indirect provisions of affordable housing as well as whether affordable housing had actually been required by the land-use code. Still, even with these criteria, implementation was quite low. Downtown Redmond, downtown Bellevue, and the University District had some limited success implementing affordable housing.

Table 27. Affordable Housing Elements: Implementation

Element	Number of Applicable Elements	Number of Projects with Element
Affordable housing specifically part of the project	88	10 (11%)
Units available for rental	88	38 (43%)
Diversity of lot sizes within the development (single-family developments only)	29	9 (31%)
Variety of housing types within development (single-family detached, multifamily apartment buildings and condos)?	88	10 (11%)
Accessory units (for dwelling or home based businesses)	88	3 (3%)

There has been so little implementation of affordable housing in the study areas that it is difficult to point to any single strategy as being indicative of overall transportation-efficient development. However, there is some indication that a variety of housing types might be connected to overall transportation-efficiency. To some extent, providing housing that is affordable means addressing a short supply of housing, and the more housing built the better. Many places overzone for commercial development, which brings in more tax dollars and makes fewer demands on services than housing. Any zoning measure, regulation, or program that attempts to rectify this imbalance will help to facilitate affordable housing.

B-8. Indicator Elements Summary

Table 28 summarizes the indicators of overall transportation-efficient land use found in this research and summarizes applications. Degree of importance was determined by 1) the strength of the connection between the individual elements and overall transportation-efficient development, and 2) the amount of regulation currently in place (those elements that were being regulated consistently were not considered as important). Because of the overlap between the transportation-efficient categories, the indicators are not broken out into categories.

Table 28. Indicator Elements Summary

Element	Applications
Building orientation requirements: building must be placed close to street/address street	Very important in all zones and area types except single-family zones
Parking location requirements: Parking must be behind building or underground	Very important in all zones and area types except single-family zones
Require percentage of affordable housing	Very important in all zones and area types, especially multi-family and mixed-use zones
Mixed-use development	Very important in all zones and area types, especially in single-use and single-family zones
Require pedestrian connections or prohibit pedestrian barriers	Important in all zones, more important in areas with disconnected street networks
Prohibit dead end streets and cul-de-sacs OR set maximum block size	Important in all zones, more important in areas with disconnected street networks
Reduced setback requirements	Important in all zones and area types
Allow zero lot line development	Important in all zones and area types except single-family zones
Variety of housing types	Important in residential zones, in all area types
Weather shelter	Somewhat important in commercial, mixed-use and multi-family zones. Largely already being regulated/implemented.
Sidewalk requirements	Important in all zones and area types, especially single-family/newly developing areas. Largely already being regulated/ implemented

C. BEYOND REGULATIONS—OTHER LOCAL STRATEGIES, PROGRAMS AND PROCESSES

After determining which elements could serve as potential indicators of overall transportation-efficient development, it was then possible to go back to the regulatory survey and see how those characteristics were being implemented. Was it through the regulations, design review, mitigation requirements, or combinations of these and other strategies? Which approaches seem to work best in different settings—say, in the context of weaker markets, suburban development patterns, or single-family development? Do combinations of elements in different transportation-efficient categories have more influence than targeting isolated categories?

A large amount of variation was found in the strategies the different cities have used to implement transportation-efficient land use. The cities of Kirkland and Redmond, especially in the downtown study areas, tended to take a more regulatory approach, with many mandatory requirements. Design review was used in both cities to supplement the regulations and look at the big picture of the aesthetic issues raised by the projects. Both these cities have had a good deal of success implementing transportation-efficient development, largely in the downtown areas.

Instead of relying on citywide requirements, the City of Seattle relied on special zoning and street designations and overlay zones to govern how a development's site design would fit into the fabric of the city. Though these designations were tremendously complex, they allowed the city to tailor regulations to maintain the character and scale of the city's many neighborhoods. Seattle also used a design review process across the city for larger projects, and several different neighborhoods had developed their own design

guidelines to give additional guidance to developers. Considering how difficult encouraging infill development can be, the Seattle study areas had been quite successful at bringing in development that was more compact and transportation-efficient, yet also fits with the scale and character of its surroundings.

One of the most important findings in this study is that regulations do work to implement a transportation-efficient urban form. No matter whether jurisdictions take a highly regulatory or a more incentive-based approach, there is a need to define the basic parameters to which development must adhere. In weaker markets and suburban land-use patterns, regulations are important in giving direction to developers who might otherwise be inclined to stick with standard suburban site designs.

Downtown Renton and downtown Bellevue tended to be less regulatory in their approach. In Renton, the planning department had taken a very aggressive and effective economic development approach to bring redevelopment into the downtown.

When comparing the evaluations of development proposals to the regulations, downtown Bellevue frequently bucked the trend. Although downtown Bellevue was above and beyond all of the other study areas in implementing transportation-efficient development, the City of Bellevue's regulations were minimal. Development proposals were almost always found with a high number of transportation-efficient characteristics not required by the city. The reason behind this is Bellevue's F.A.R. incentive system. Instead of making developers comply with a long list of code requirements, the City of Bellevue decided to let the market do the work.

In strong markets it will not be as necessary to encourage development, but it will be necessary to influence its location and quality. Jurisdictions will need to direct growth

into appropriate areas while maintaining the attractiveness of that development and encouraging the development of affordable housing. In strong markets, however, the leverage will be with the jurisdiction—proposals that are turned down are more likely to be replaced by others. In interviews, local planners mentioned several times that instead of letting reviews and revisions drag on for years to try and get a developer to come up with an acceptable proposal, proposals not up to standards were now simply turned down.

Useful approaches for encouraging transportation-efficient development in strong markets include a good design review process, affordable housing incentives, and disincentives for building in outer areas combined with incentives for building in target/infill areas.

In weaker markets, there will be a need to reduce barriers to development while maintaining its quality. This will entail an aggressive approach of economic development-type actions combined with good planning principles, which could include tax incentives, aggressive density bonuses, transfers of development rights, and public/private partnerships. In these cases it is important that regulations provide a good base of guidelines for quality development. Alternatively, a design review process can also help to ensure attractive development that is appropriate for its proposed setting.

C-1. Streamlined Development Review Processes

All of the jurisdictions in this study indicated they had made adjustments to streamline the development review process in one way or another, although some had been more successful than others. Most of the streamlining efforts can be traced back to GMA requirements, which required a 120-day permit time. However, this is difficult to achieve in many cases, especially in those cases where the developer is unresponsive. Most of the jurisdictions indicated that their permit times had improved substantially in

the last seven years. On average, it took 10 months for permits sampled in this study to go from complete application to approval. This average represented a range from two days to almost three years.

The Renton and Kirkland study areas had the fastest average permit times. Sampled projects averaged 2.2 months and 4.73 months, respectively, in those two jurisdictions. In the cases of the downtowns of both cities, the fastest permit times correlated clearly with the highest-scoring projects. In the other study areas outside of the downtowns (in both jurisdictions) the relationship was less clear. In those study areas, new redevelopment efforts could mean that transportation-efficient projects—especially ones that were substantially different than what had been done in the past—would take longer to get through the process.

A couple of actions to streamline the permitting process were mentioned frequently by the local jurisdictions—downgrading the permitting process to make more decisions administrative and making pre-application meetings part of the process. Kirkland, King County, and Redmond had all downgraded their permit process. Kirkland also used an administrative design review process, rather than a design review board, for smaller projects in downtown and Juanita.

Kirkland, Redmond, and Renton all encouraged or required "pre-app" meetings with planning staff and other relevant departments. By working through a concept with the developers from the initial concept, by the time the application had been submitted, it was pretty close to what the city wanted.

Another interesting approach to streamlining had been used by the City of Bothell, which set up a web-based system for many aspects of the permit process.

Currently applicants can download applications on-line, and the City is upgrading its website so applications can be submitted over the web as well. This makes the process significantly quicker than it was 10 years ago.

King County had streamlined its permit process by completing its transportation concurrency analysis up front. A map shows which areas of unincorporated King County can accept development, so developers do not have to go through a lengthy application process only to find out at the end that levels of service will not allow more building.

None of the jurisdictions in this study allowed developers a separate, prioritized development review process if certain conditions were met. Only Snohomish County had priority permit processing for low income housing projects. Streamlined review will be more effective in jurisdictions where the market is not as strong, as it gives jurisdictions a real competitive advantage over those with lengthy or extremely complex development review processes. Cities could even use streamlined development review as an incentive to develop in certain places or in ways that are transportation-efficient.

C-2. Design Review

Many of the areas in this study used design review in one way or another. The interviews and evaluations of development proposals suggested that this is another process found to be highly effective in producing transportation-efficient development. Design review teams can engage the community in a dialogue with the developer and articulate those quantitative characteristics that might be difficult to regulate, or be implemented in a cookie-cutter fashion. The danger to regulating everything is that after a couple of developers find the formula that works, the rest of development in that neighborhood will follow a predictable pattern. Design review helps to prevent this and can allow for departures from code requirements to accommodate innovative projects.

All but one of the study areas, and all of the jurisdictions in the study, had used design review. Over half (57 percent) of the 166 projects evaluated were involved in some type of design review process, including every project that scored highly. There were, of course, quite a few lower-scoring projects that went through design review as well, but those with the very lowest scores were not involved in design reviews.

Jurisdictions in this study had used a wide variety of approaches to the design review process. In Kirkland, a design review process was in place for Juanita and downtown. Larger projects (over 1 story/greater than 10,000 sq. ft.) were reviewed by the design review board. Smaller projects went through administrative design review. Redmond's design review board reviewed all projects but single-family. In Renton, overlay zones included design guidelines in downtown Renton and the Renton Highlands. Design review and guidelines were used in Snohomish County's Planned Residential Development and Urban Centers Demonstration Project Ordinances.

In Seattle, design review was required of new development in multi-family, neighborhood commercial, and downtown zones, and commercial zones in urban villages when the proposed development would exceed SEPA thresholds. There were seven design review boards throughout the city. Additionally, neighborhoods within Seattle had started developing their own sets of design guidelines for their specific goals and needs. For smaller projects, an administrative design review process encourages applicants of smaller multifamily and commercial projects to opt for the design review process when it is not required.

C-3. Impact Fee Reductions

Impact fee reduction in exchange for Transportation Management Programs (TMPs) or Transportation Demand Management (TDM) programs were used in King

County, Renton and Redmond but need to be a larger part of development review process in all jurisdictions. Only in a few cases were TDM or TMP programs emphasized as a tool by the local jurisdictions. Where they are used, their existence needs to be promoted and enhanced to increase their effectiveness and appeal to developers, and consistent monitoring programs should be in place.

Snohomish County's transportation impact fees were higher outside of urban growth areas.

Similarly, in King County, transportation impact fees were based on Growth Management Act goals and were tied to the comprehensive plan. Impact fees were lower in already developed areas, giving developers an indirect incentive to build there.

C-4. Incentives

As mentioned above, the City of Bellevue had excellent success implementing transportation-efficient development in downtown Bellevue. Using an F.A.R. incentive system, the City gave bonuses for everything from housing in commercial developments to facade treatments to TDM actions. Although many study areas offered some sort of incentives or density bonuses, the reason downtown Bellevue's program was so effective and so frequently utilized was because the density bonuses were generous and substantial. Although offering large bonuses was easier for the City of Bellevue because its downtown was prioritized for very high-density development, other places can still offer incentives.

In markets where there is high demand for real estate, such incentives will probably be sufficient to bring about the type of compact, infill development desired by the city. In weaker markets, however, additional indirect incentives may be used to both

encourage redevelopment as well as transportation-efficient land use, such as infrastructure upgrades and parcel assembly.

Renton and King County had both used infrastructure upgrades as an indirect incentive to development. King County had completed infrastructure upgrades in a few older urban areas in King County, such as the West Hill study area. In most cases, the upgrades included safety improvements along streets, sidewalk upgrades, and additional lighting. Renton had done substantial infrastructure upgrades in its downtown, and was looking to do the same in the Renton Highlands. In the downtown, the City was investing in gateway features, a central gathering place or piazza, and numerous infrastructure improvements as part of this redevelopment effort. The City of Renton had made investments in improvements along Logan Avenue, a major downtown street, a gateway and piazza, and water main upgrades.

Parcel assembly is also effective in cases where the real estate market is not as strong, although it may be used in select cases in higher demand markets. Renton had been very active in parcel assembly downtown. In the case of the Renton Park & Ride/T.O.D., the City of Renton partnered with King County to redevelop the Renton Transit Center. The City of Renton was then able to move an auto dealership on the adjacent parcel out of the downtown by creating a special automall zone adjacent to Grady Way along I-405. The city then waived the street vacation fees for alleys in the auto mall area, which reduced the cost of parcel assembly for the downtown auto dealerships and allowed them to move out of downtown. Then the city purchased the land downtown from the auto dealers and re-sold it to a developer to develop what is now a four-story mixed-use development and Park & Ride.

IV. Recommendations

One of the most important findings in this study is that regulations do work to implement transportation-efficient development. No matter whether jurisdictions take a highly regulatory or an incentive-based approach, there will always be a need to define the basic parameters development must adhere to. In weaker markets and suburban areas, regulations can be even more important in giving direction to developers who might otherwise be inclined to stick with standard suburban site designs.

One of the elements of transportation-efficiency found to be important to require as a basic condition of development was the relationship between the building, street, and parking lots: buildings placed close to the street with parking underneath of or behind them were found to be the best potential indicators of transportation-efficient development. Furthermore, there was a clear relationship between regulation and implementation of such building placements. If a study area required parking to be placed behind or underneath the building, the projects followed these requirements. If such site designs were merely encouraged, they were often not implemented. Other elements of transportation-efficiency found to be indicators of overall transportation-efficient development were pedestrian connection requirements, reduced setback requirements, and mixed-use development. Affordable housing requirements are also important areas for focus, since there is such a need for affordable housing regionally and so much room for improvement in implementation.

In the implementation of the above elements, a wide variety of actions have been used successfully in the study areas—design review has been particularly effective in producing development that is transportation-efficient and compatible with existing

neighborhoods. Incentives—whether direct or indirect—can also be highly effective in exchange for the inclusion of transportation-efficient elements in development proposals, as illustrated by the examples of downtown Renton and downtown Bellevue. Still, to create incentives that will actually be utilized, it is necessary to design a program that will actually be used by developers. If there is capacity for additional density in a downtown, then substantial density bonuses will be effective. If development is already being built to maximum heights, then it may be necessary to look at other incentives—allowing reductions in parking ratios, increasing infrastructure capacity, or implementing a streamlined review process or reducing impact fees in target areas.

On the whole, the jurisdictions in this study have taken a wide variety of approaches to implementing transportation-efficient development. These actions have been very effective in producing transportation-efficient projects in every land use type. Local success in implementing transportation-efficient development is evidenced primarily by the simple fact every study area included in this research allowed for multifamily projects, and half of the study areas had approved one or more mixed-use development proposals.

Still, more work is needed in some areas. While some areas are having marked success with mixed-use development, the rest could either use regulation or additional incentives to encourage the provision of mixed-use development in places where the land uses are still separated. The region is in need of more affordable housing, and more could be done locally to encourage its development. Regulations that could measurably increase the connectivity of the street network—maximum block size regulations,

requirements for through streets, and prohibitions on cul-de-sacs or dead end streets—could all be more widely used locally.

There is also room for improvement (in all six of the transportation-efficient categories) in single-family and single-use commercial areas, and areas outside the downtowns. Regulations that help to break up large blocks, create a finer-grained mix of uses, and create a more visually engaging walking environment will probably be most effective in increasing the transportation efficiency of those areas.

This study is the first phase of a three-phase process, and findings are the cornerstone of the next two phases. Phase 2 will incorporate the findings into a resource guide, "Guide to Transportation-Efficient Development," being developed by University of Washington researchers for WSDOT. Phase Three will examine the inclusion of more detailed land-use criteria into WSDOT's corridor planning programs and/or Mobility Prioritization process, based on the results from this work.

Additionally, findings from this research can be applied to projects going on in the Trans-Lake Washington (SR 520) corridor, which includes portions of the TDM and Land Use Case Studies, the development of a corridor-wide, inter-local agreement for TDM and land use, and the development of TDM implementation plans for the corridor.

It is recommended that this research be expanded to include a wider variety of study areas—areas more rural in nature, with weaker market conditions, and other areas outside the I-405 and SR 520 corridors. This would result in findings that could be more easily generalized for statewide transportation planning.

Acknowledgment

Special thanks to the local planners in each of the study areas whose participation, patience, and excellent feedback made this research possible.

Appendix A. Individual Study Areas

This section contains descriptions and maps of all 19 study areas used in this project. The maps show major streets within the study areas, as well as the locations and land use type of each of the projects evaluated within the study area.

Figure 2. Downtown Bellevue

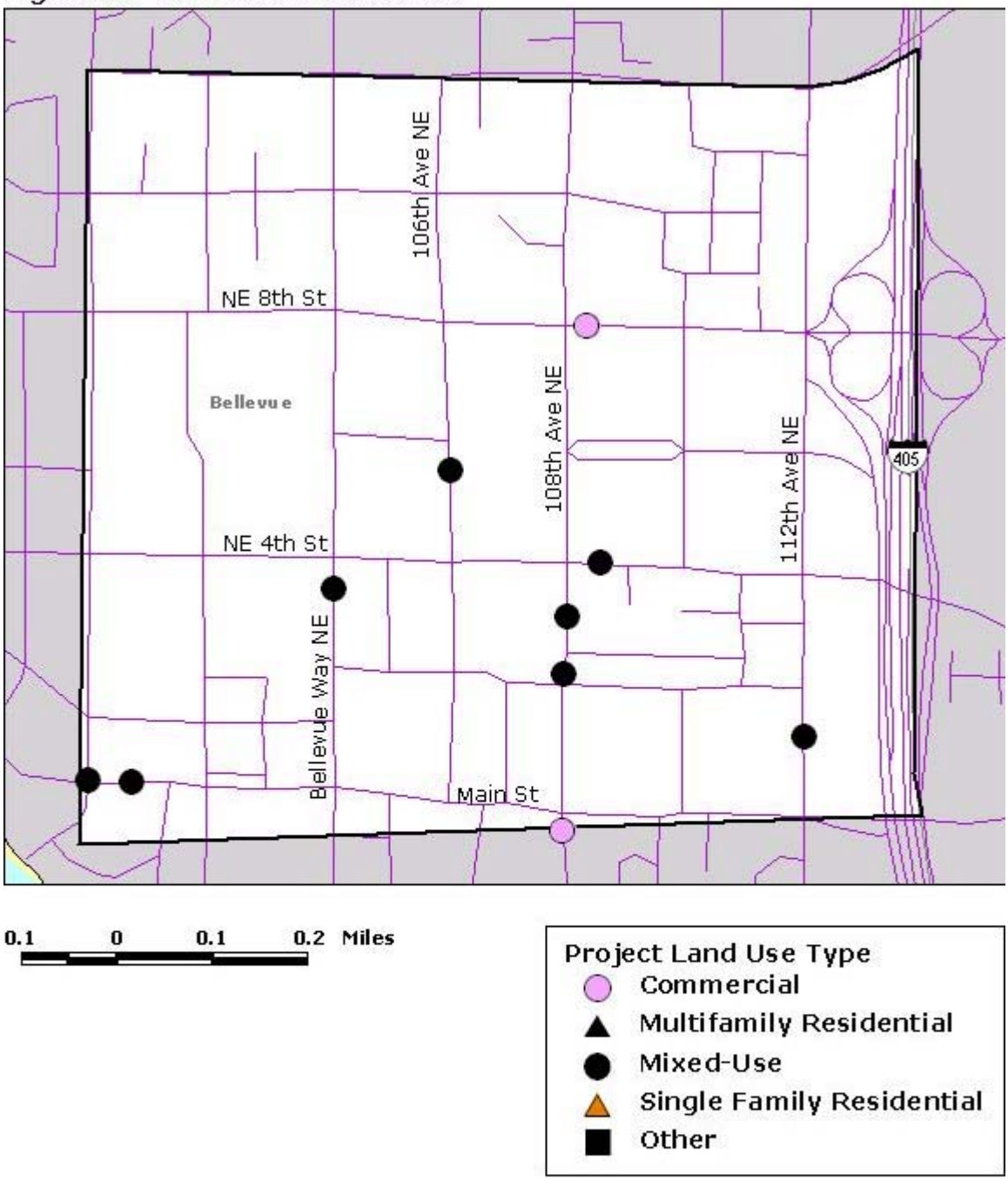
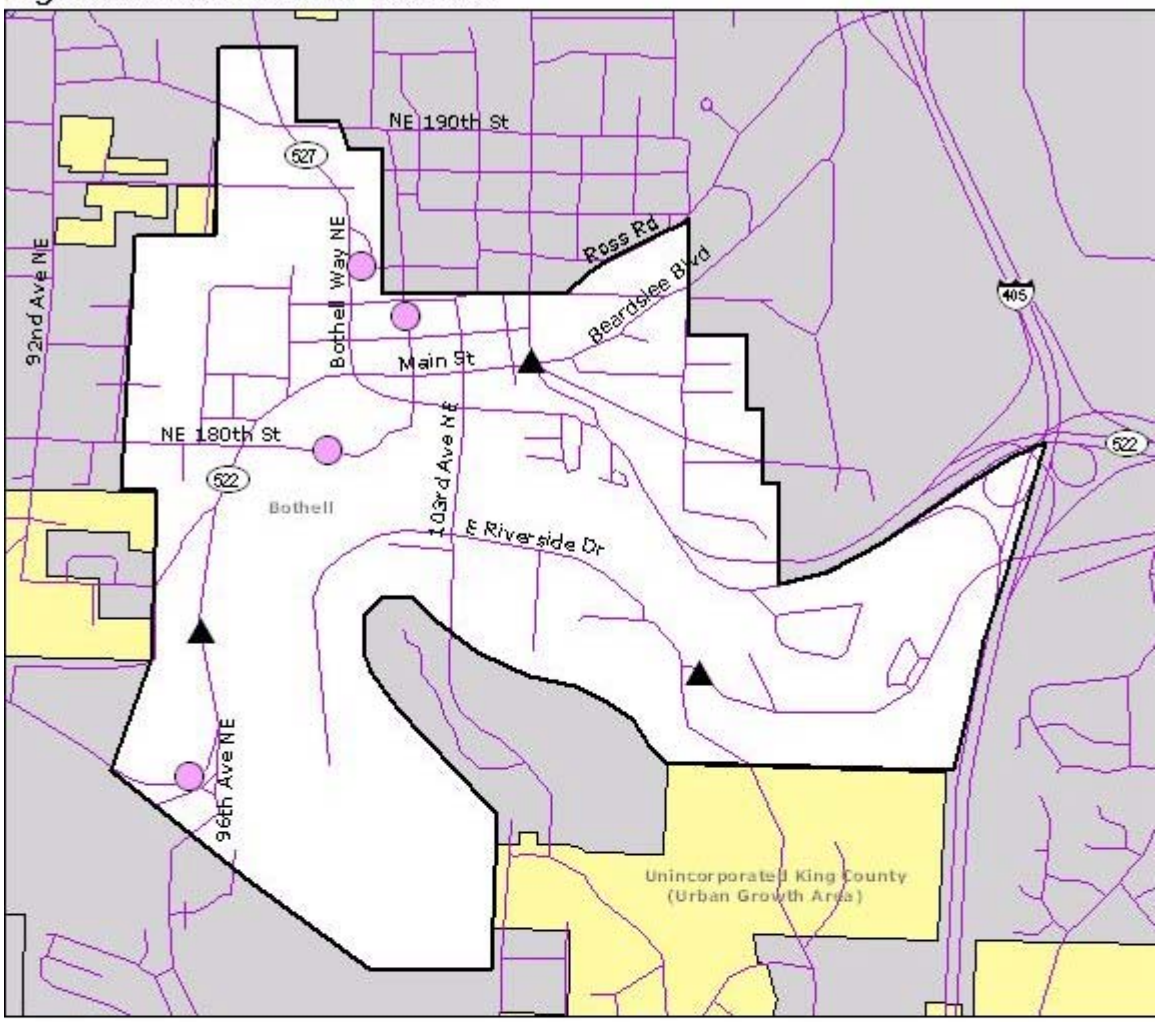


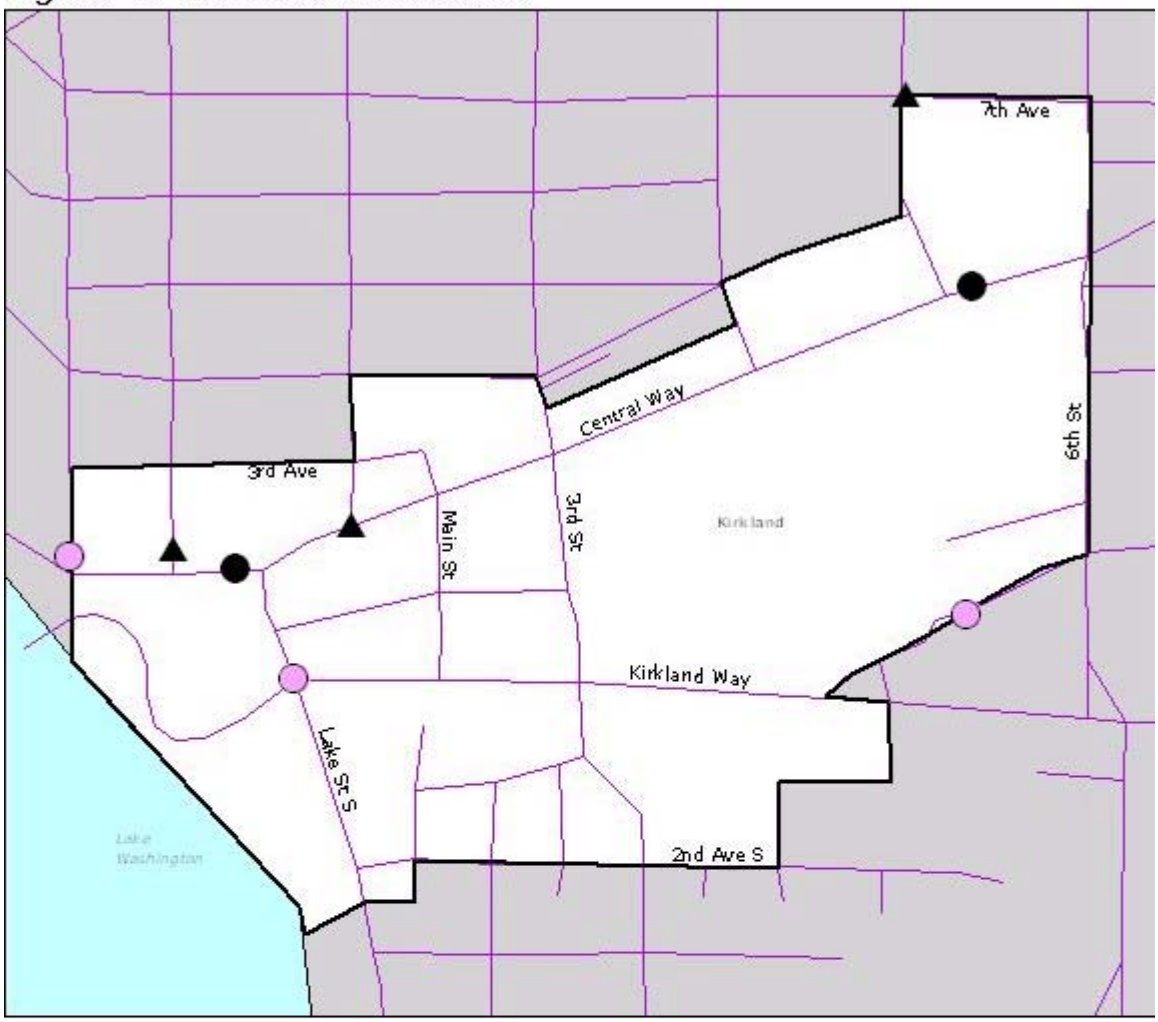
Figure 3. Downtown Bothell



0.2 0 0.2 0.4 Miles

Project Land Use Type
- Commercial
- Multifamily Residential
- Mixed-Use
- Single Family Residential
- Other

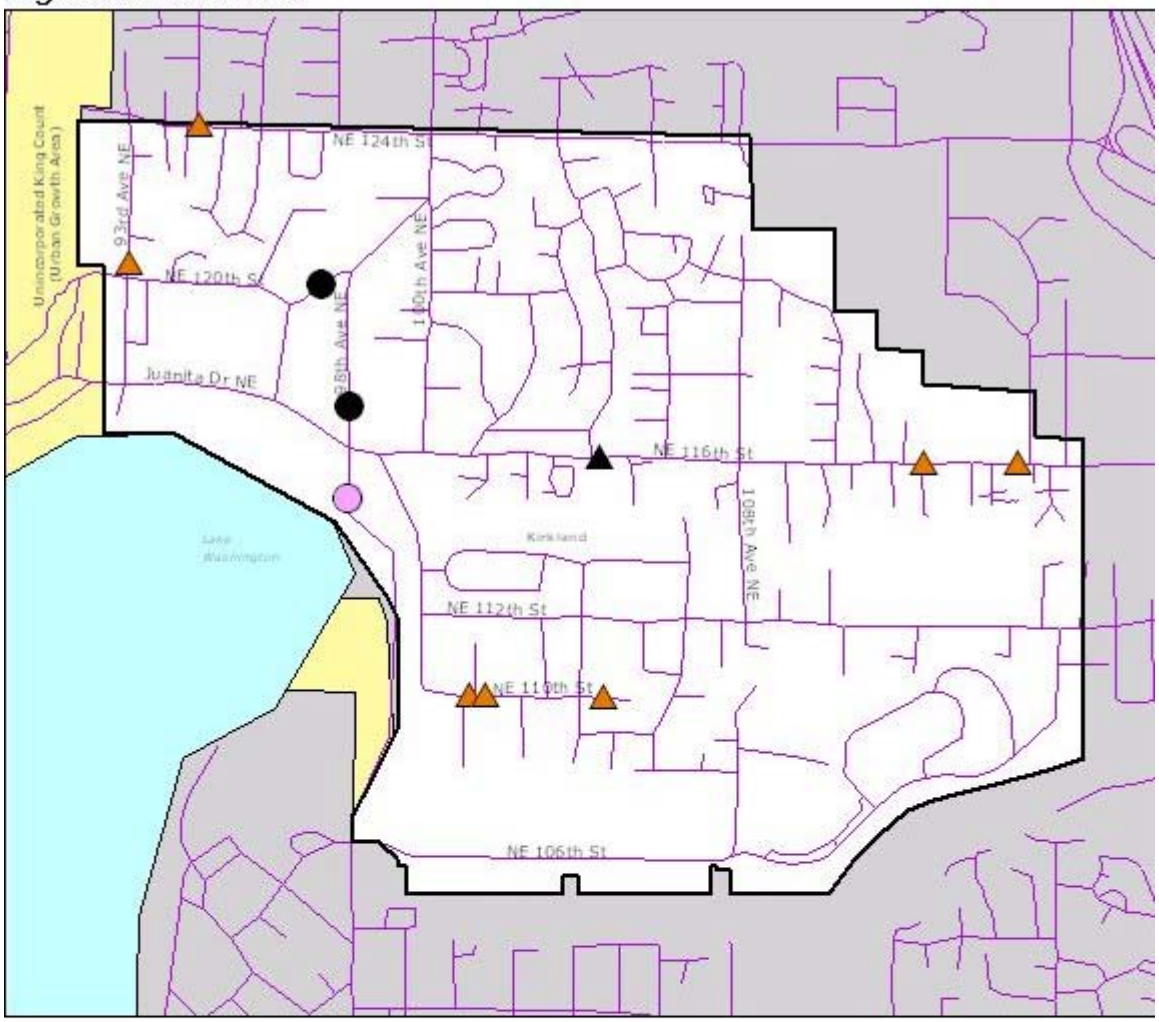
Figure 4. Downtown Kirkland



0.1 0 0.1 Miles

Project Land Use Type
- Commercial
- Multifamily Residential
- Mixed-Use
- Single Family Residential
- Other

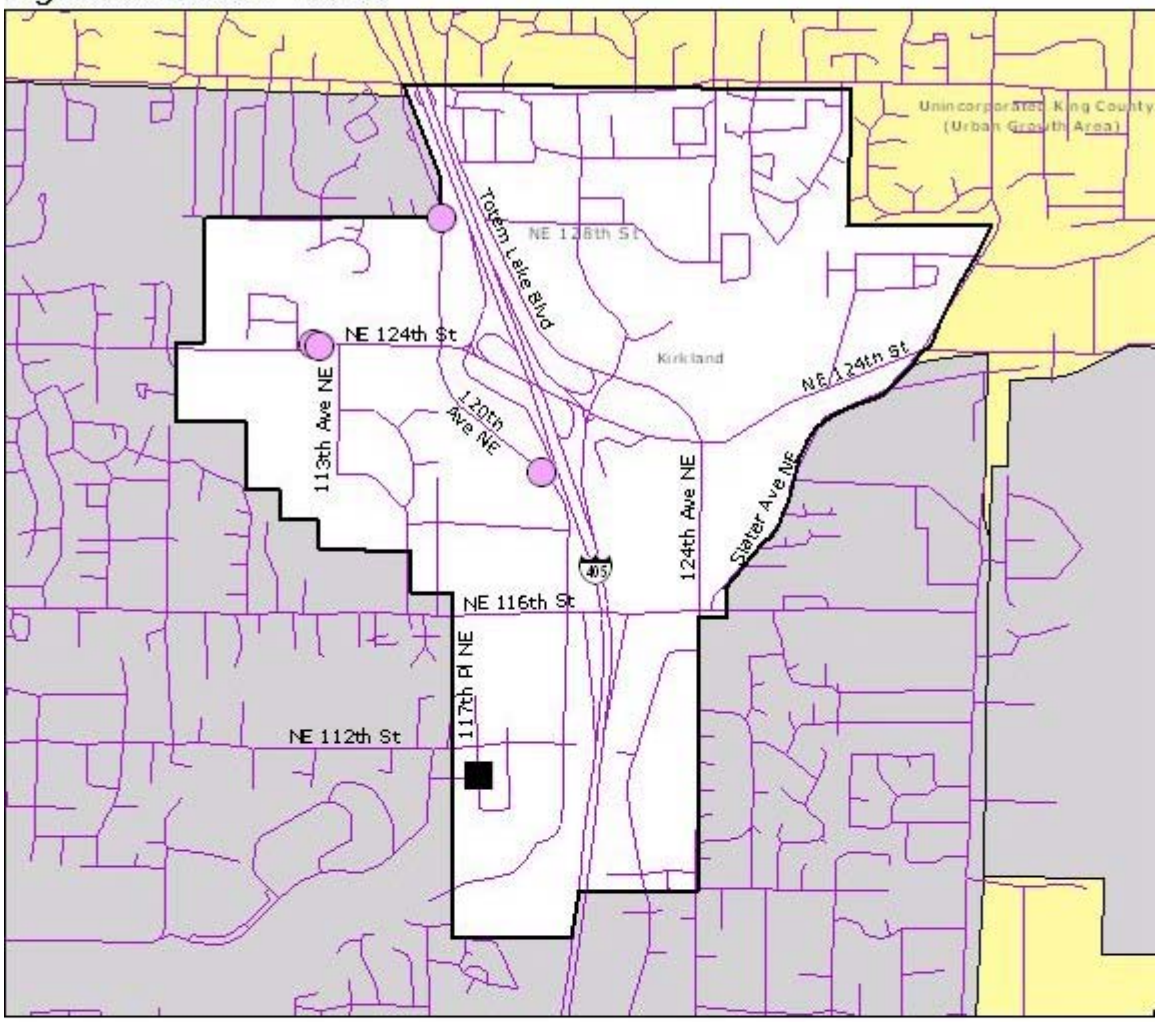
Figure 5. Juanita



0.2 0 0.2 0.4 Miles

Project Land Use Type
- Commercial
- Multifamily Residential
- Mixed-Use
- Single Family Residential
- Other

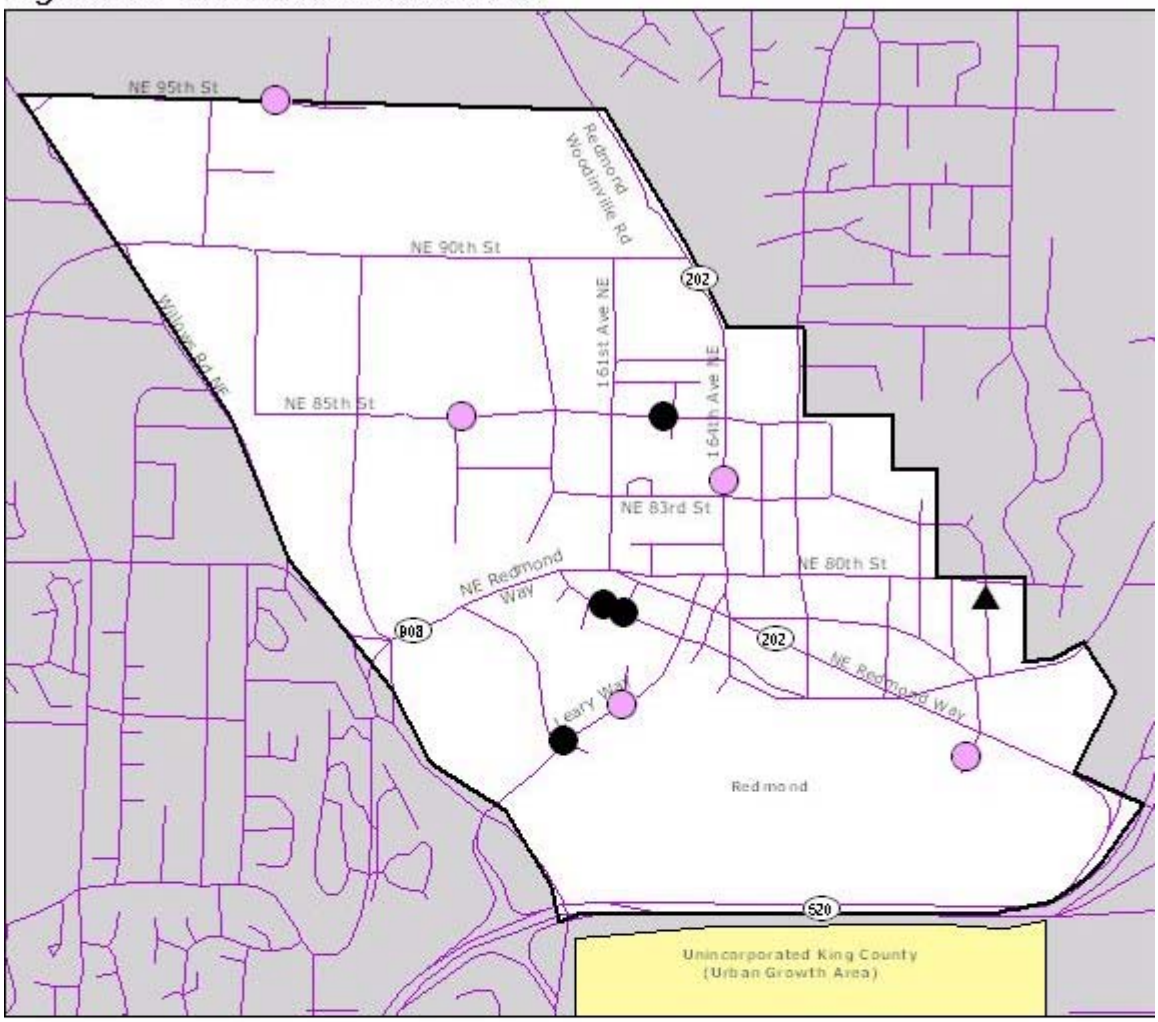
Figure 6. Totem Lake



0.2 0 0.2 0.4 0.6 Miles

Project Land Use Type
- Commercial
- Multifamily Residential
- Mixed-Use
- Single Family Residential
- Other

Figure 7. Downtown Redmond



0.2 0 0.2 0.4 Miles

Project Land Use Type
- Commercial
- Multifamily Residential
- Mixed-Use
- Single Family Residential
- Other

Figure 8. Northeast Redmond

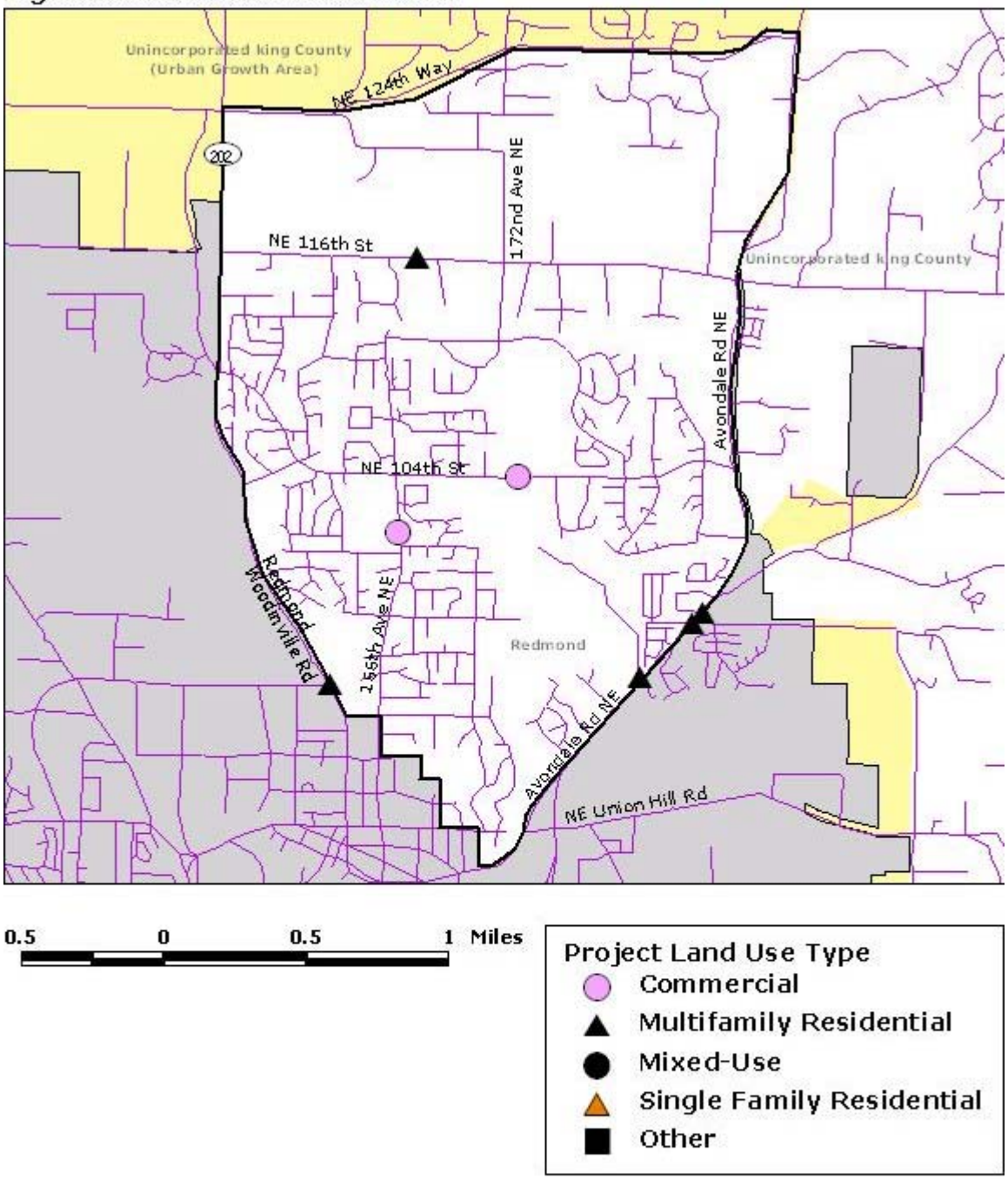


Figure 9. Overlake

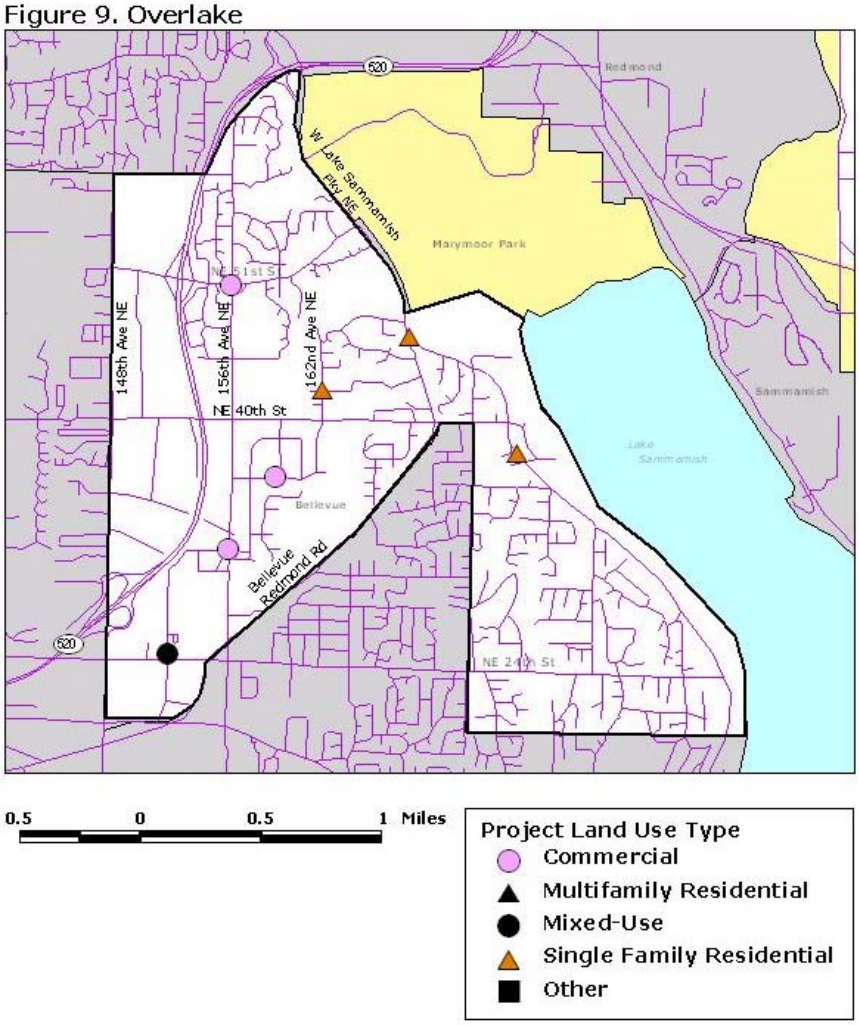


Figure 10. SE Redmond

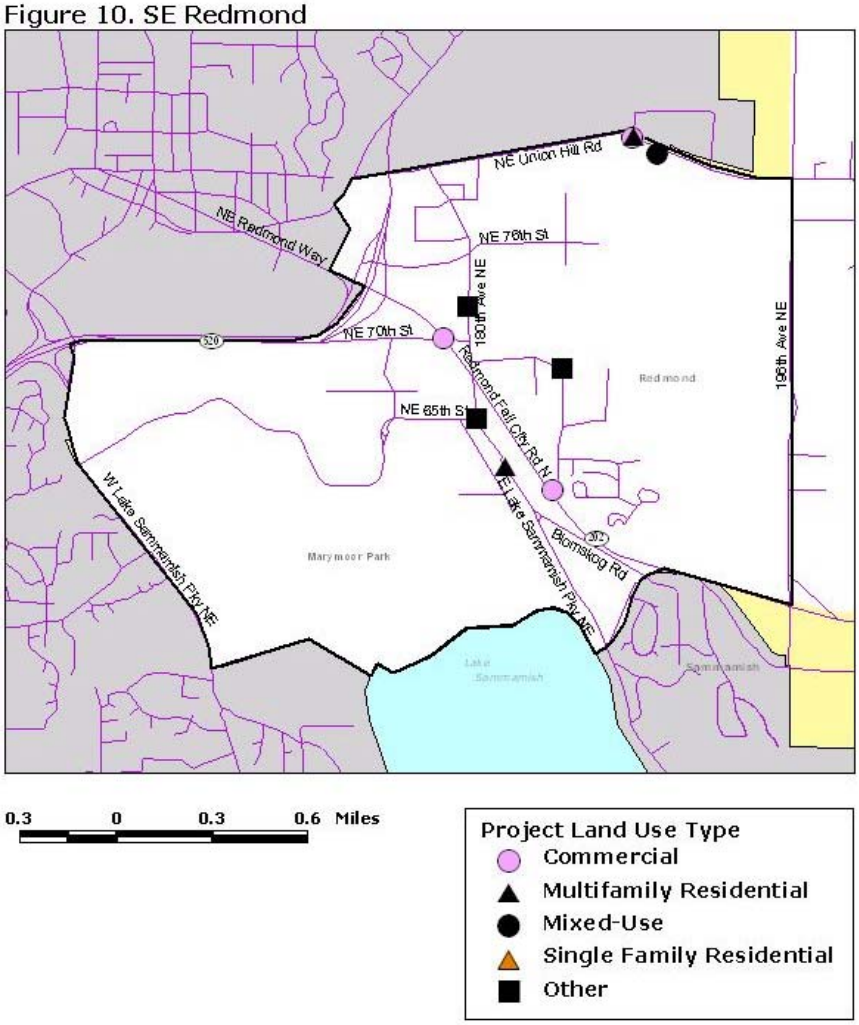


Figure 11. Willows Corridor

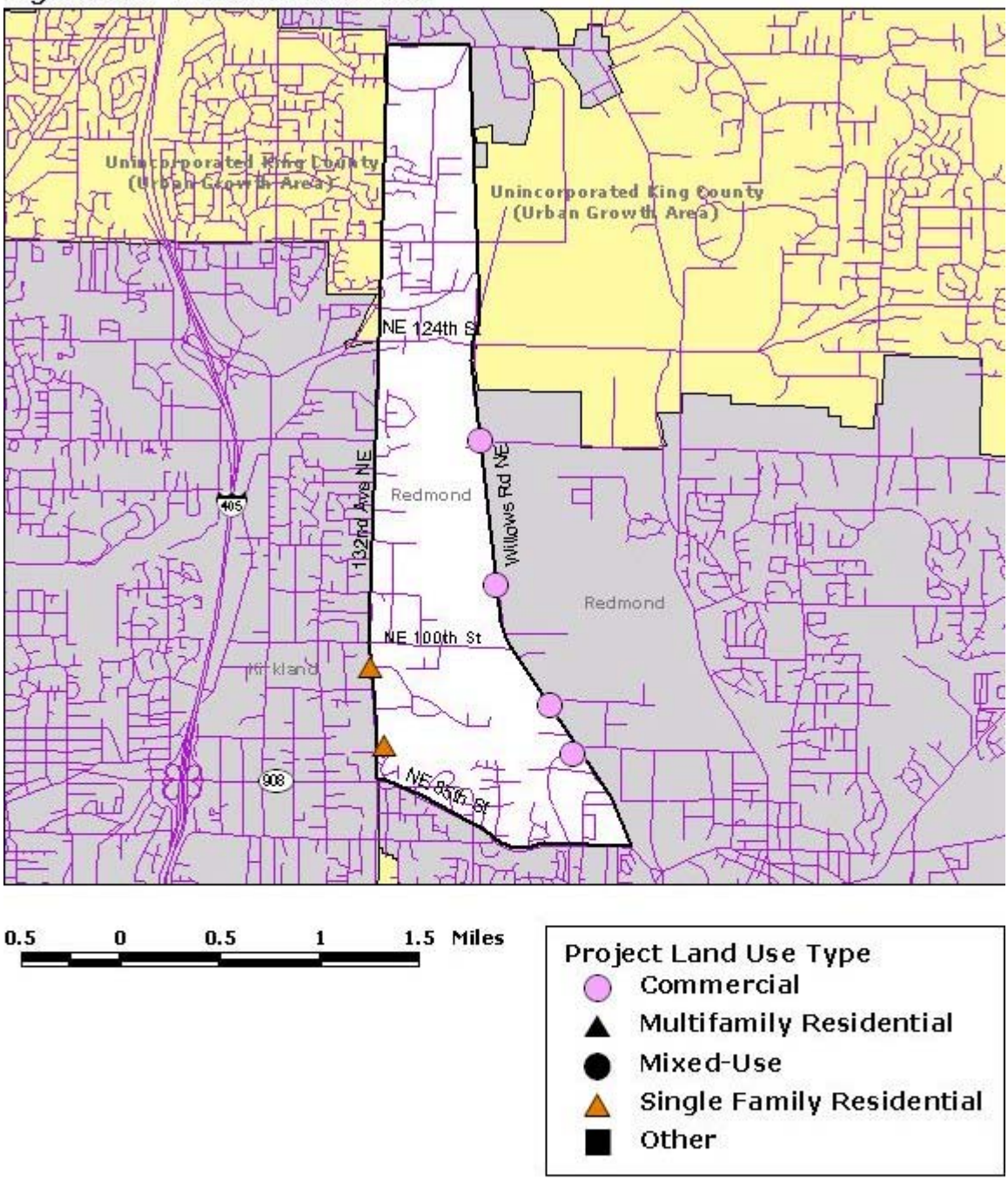


Figure 12. Downtown Renton

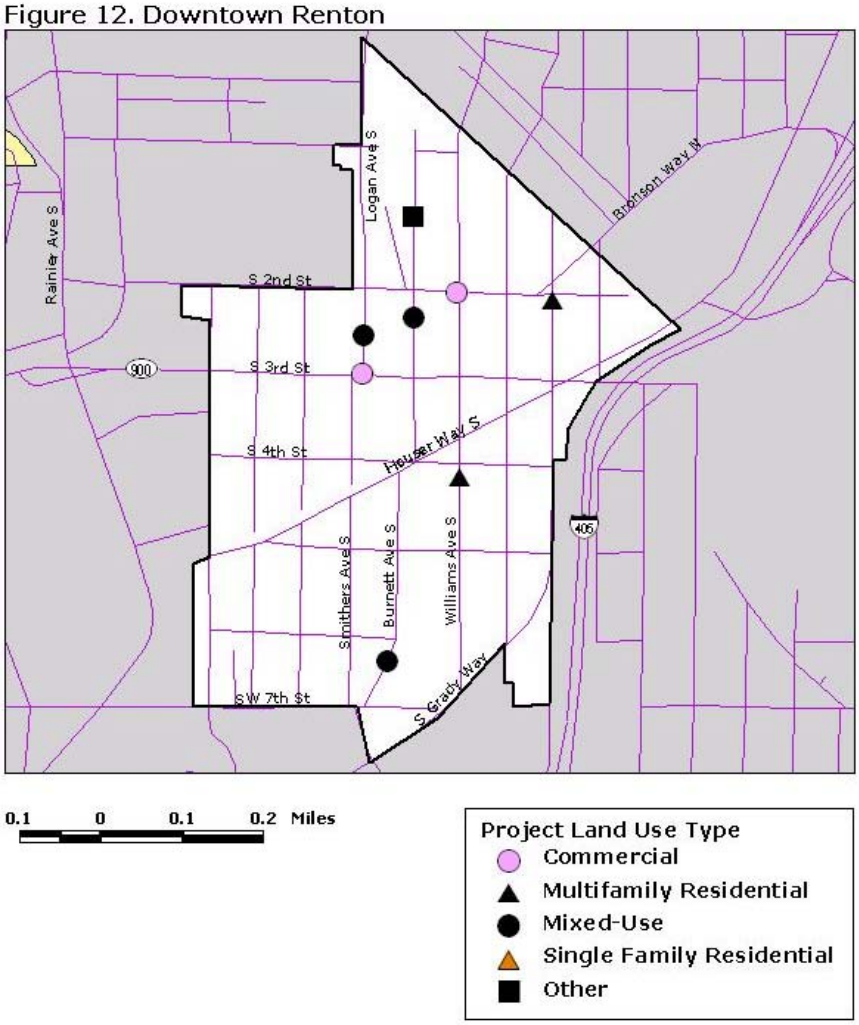


Figure 13. Renton Highlands

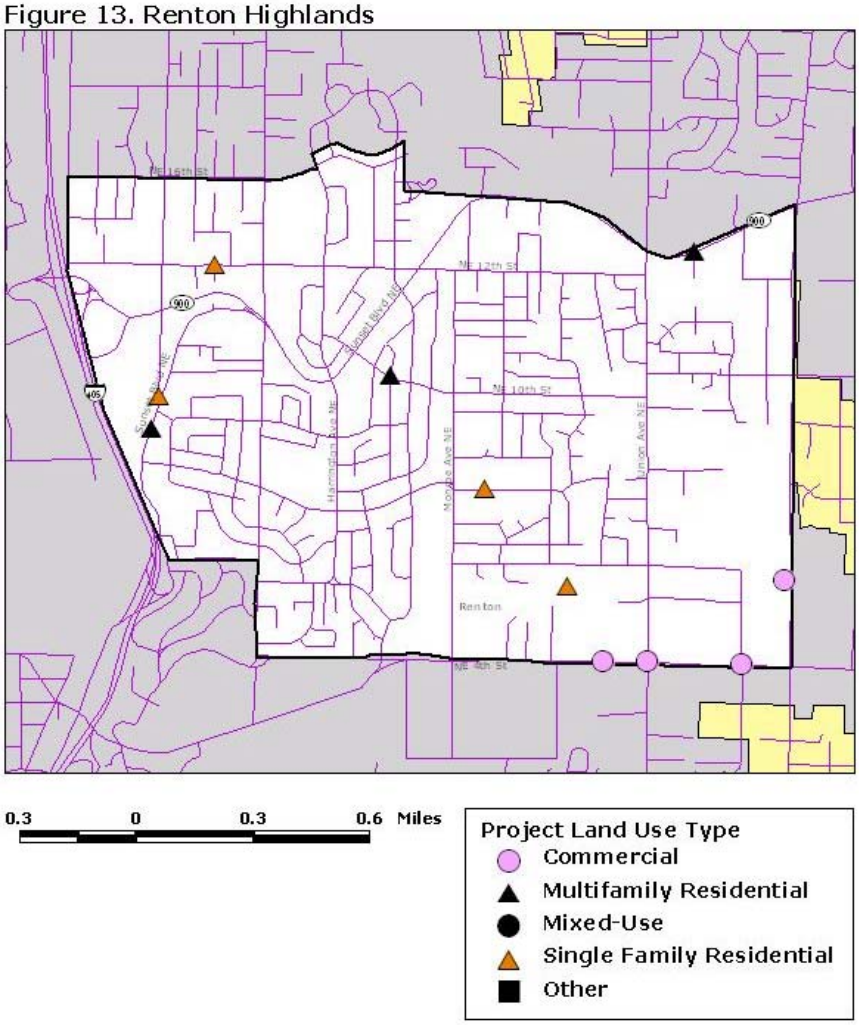


Figure 14. Northgate

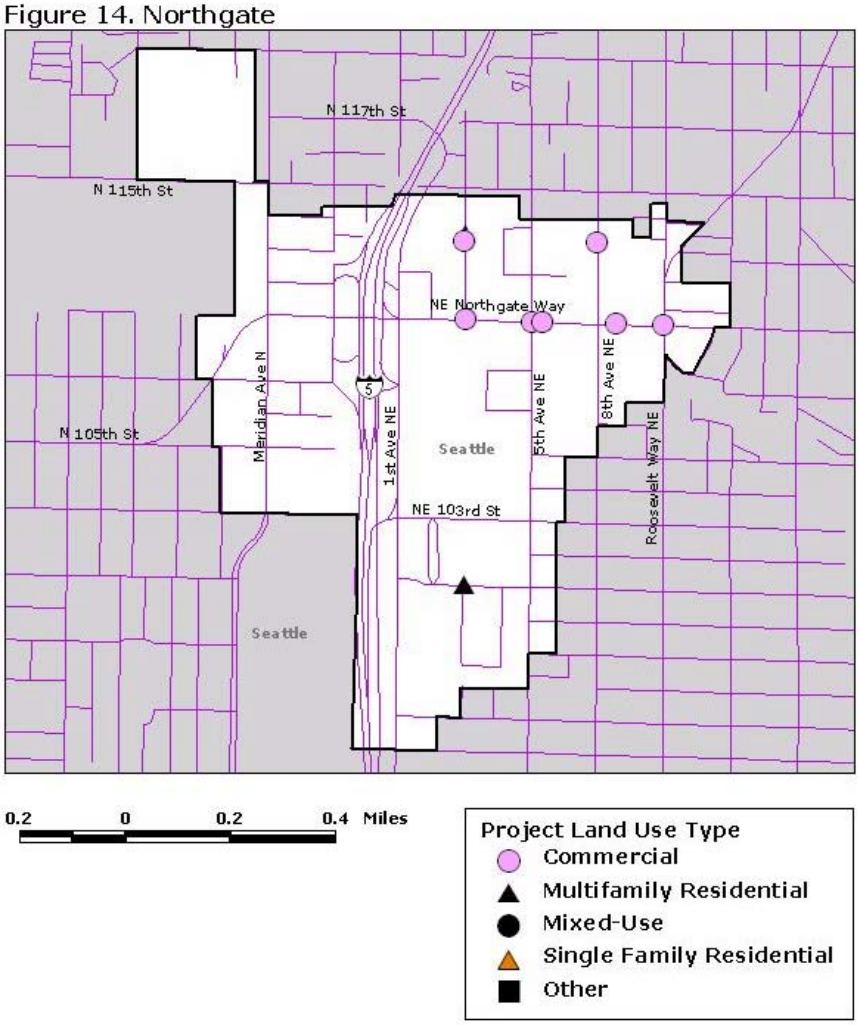


Figure 15. South Lake Union

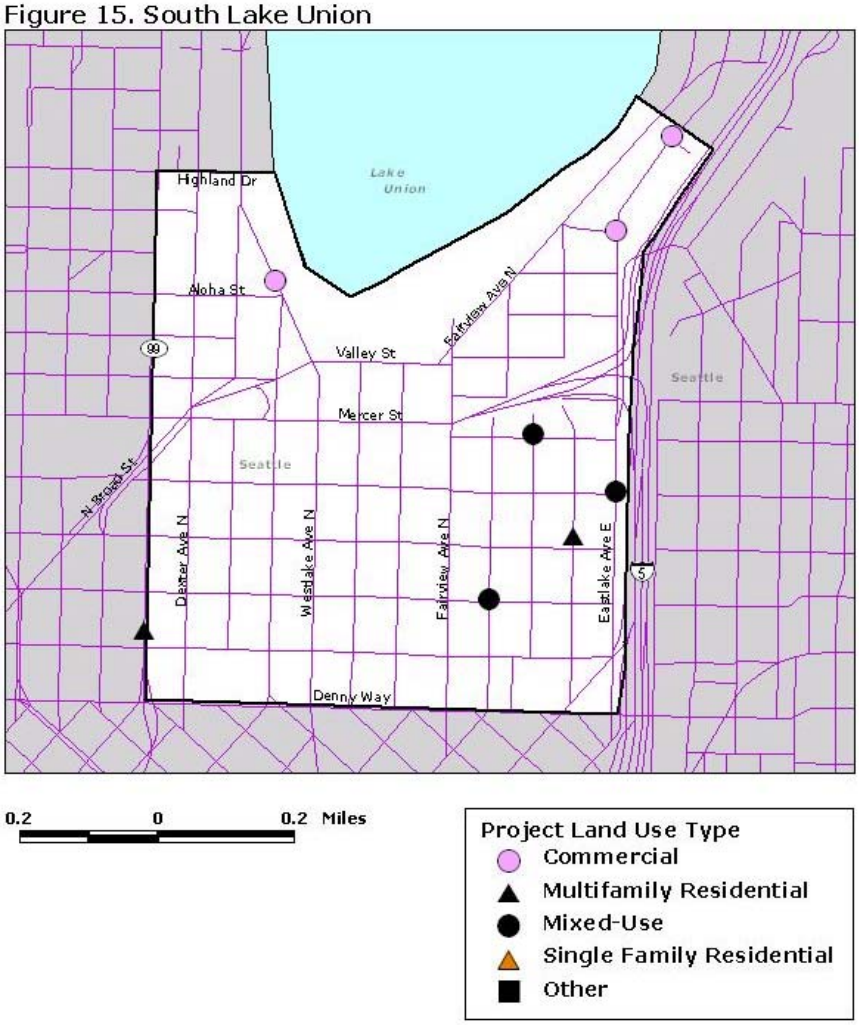
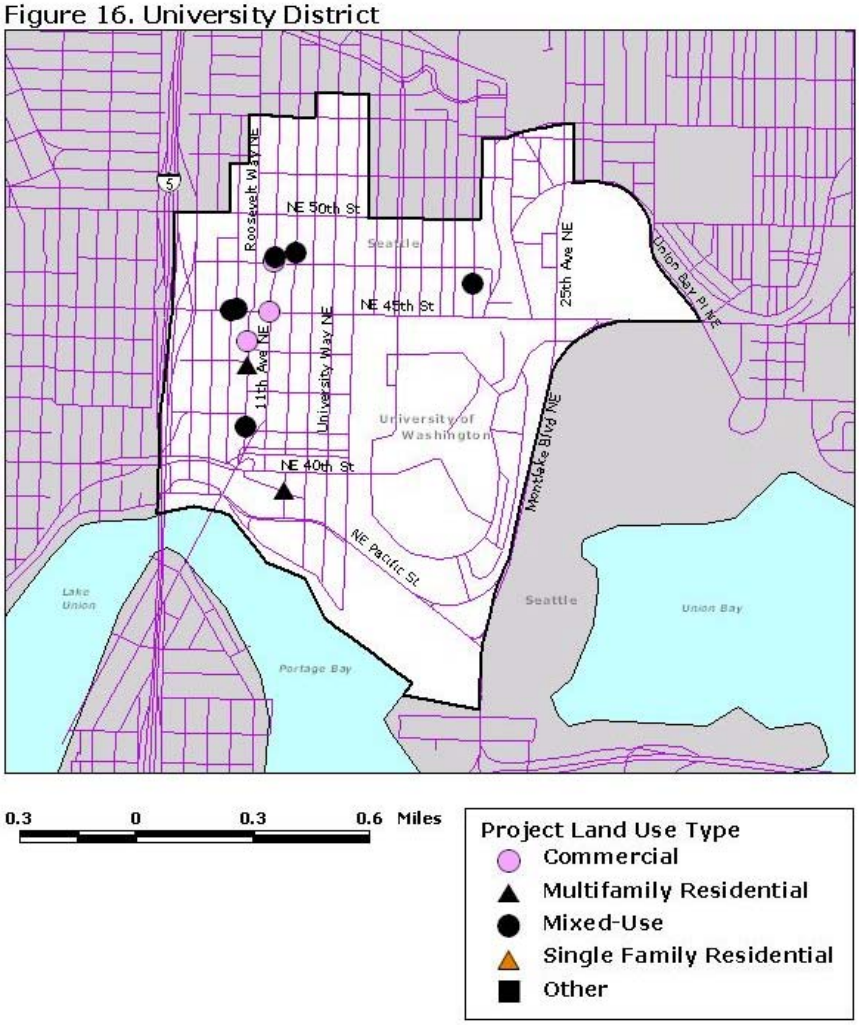


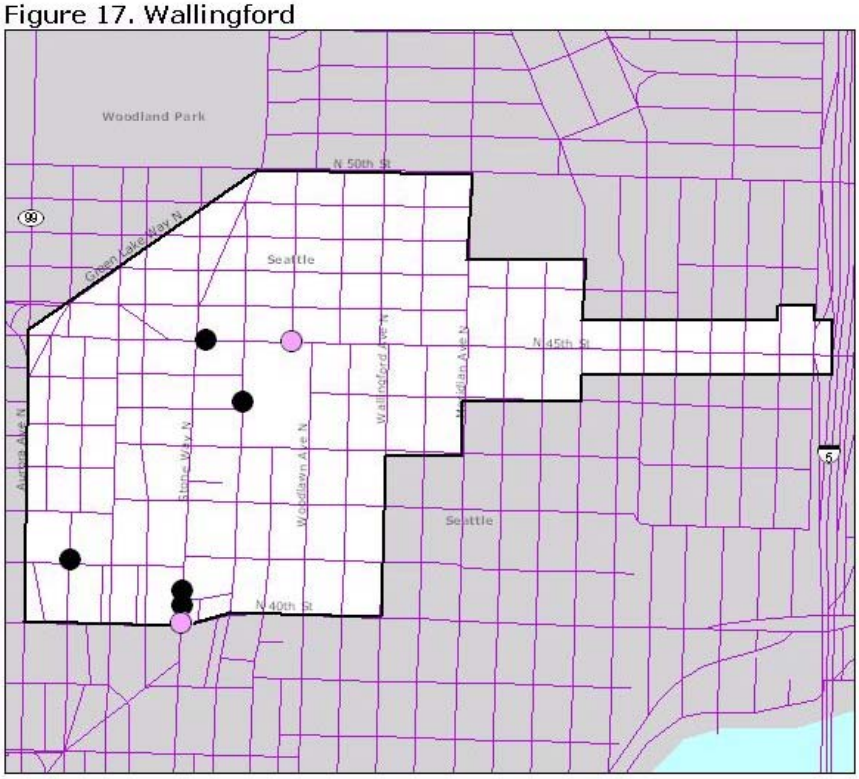
Figure 16. University District



0.3 0 0.3 0.6 Miles

Project Land Use Type
- Commercial
- Multifamily Residential
- Mixed-Use
- Single Family Residential
- Other

Figure 17. Wallingford



0.2 0 0.2 Miles

Project Land Use Type
- Commercial
- Multifamily Residential
- Mixed-Use
- Single Family Residential
- Other

Figure 18. Thrashers Corner

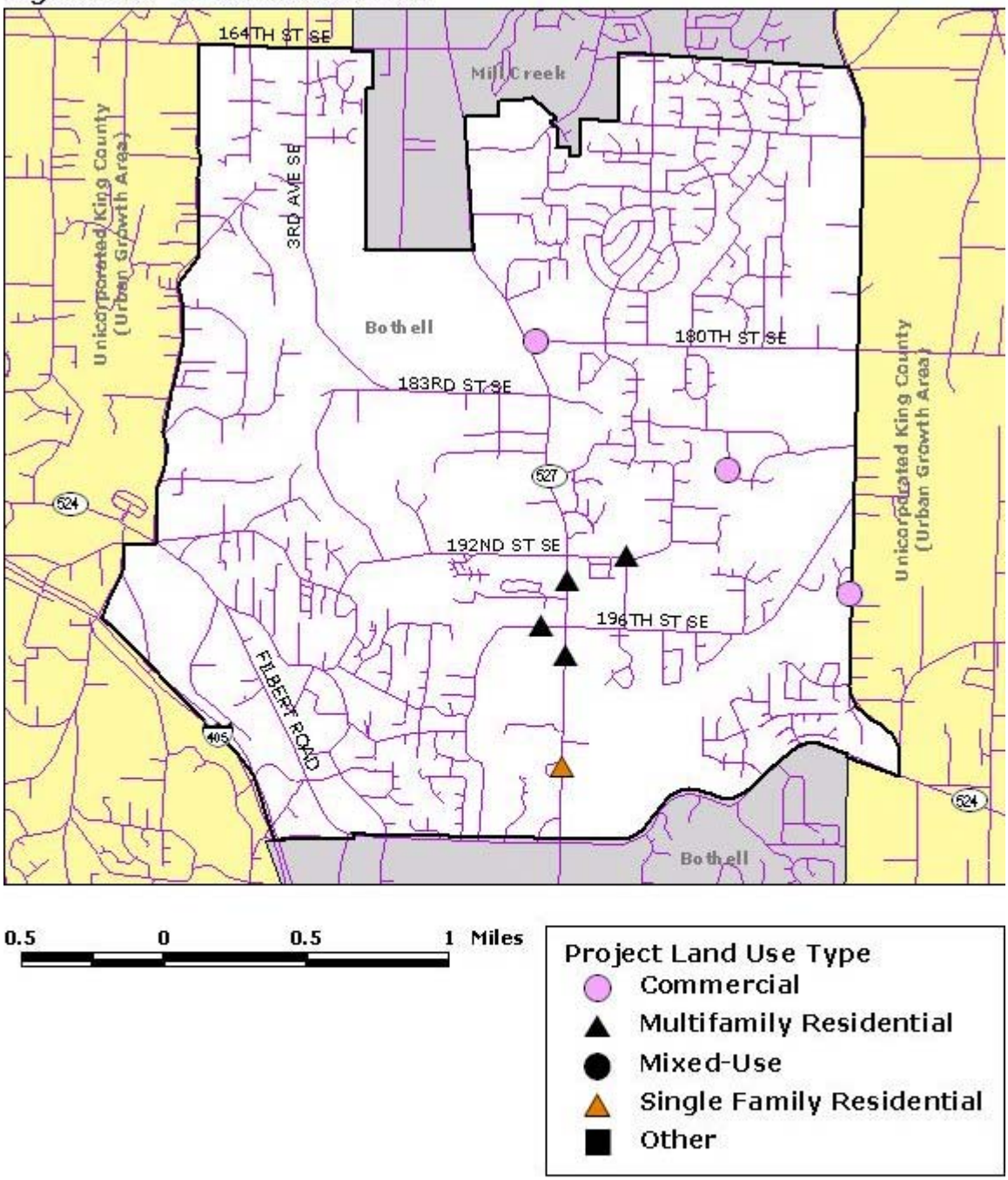


Figure 19. Petrovitsky Road/Fairwood Area

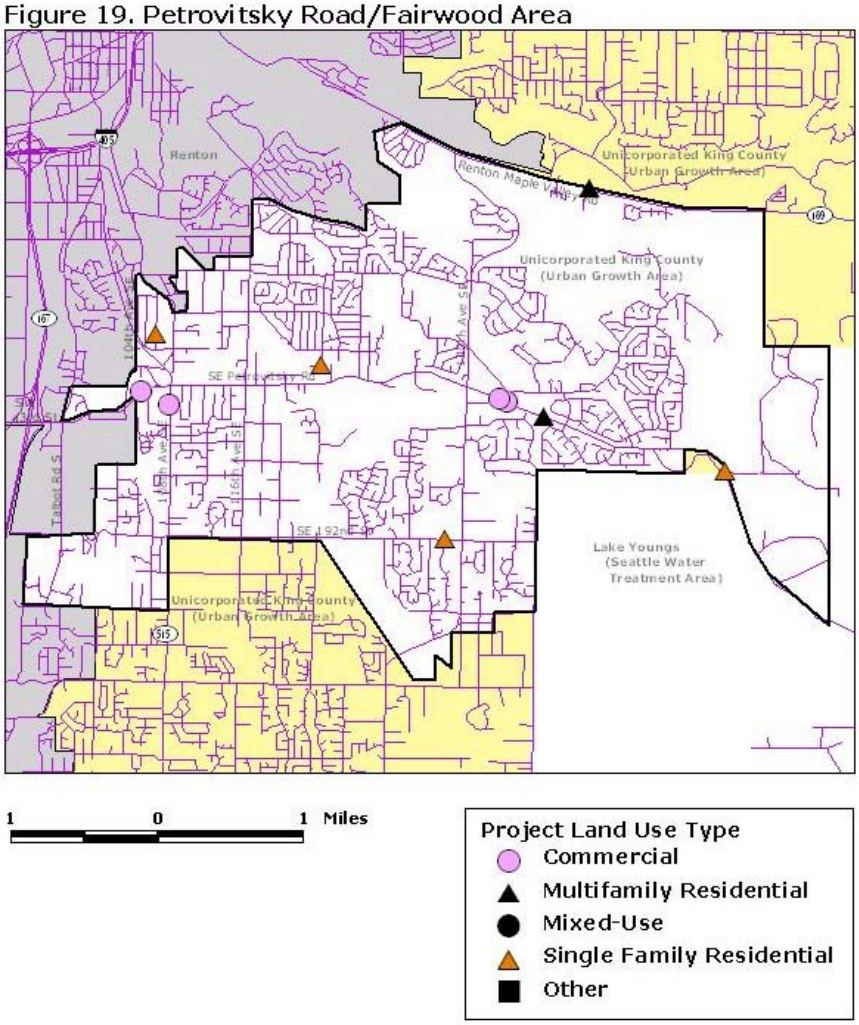
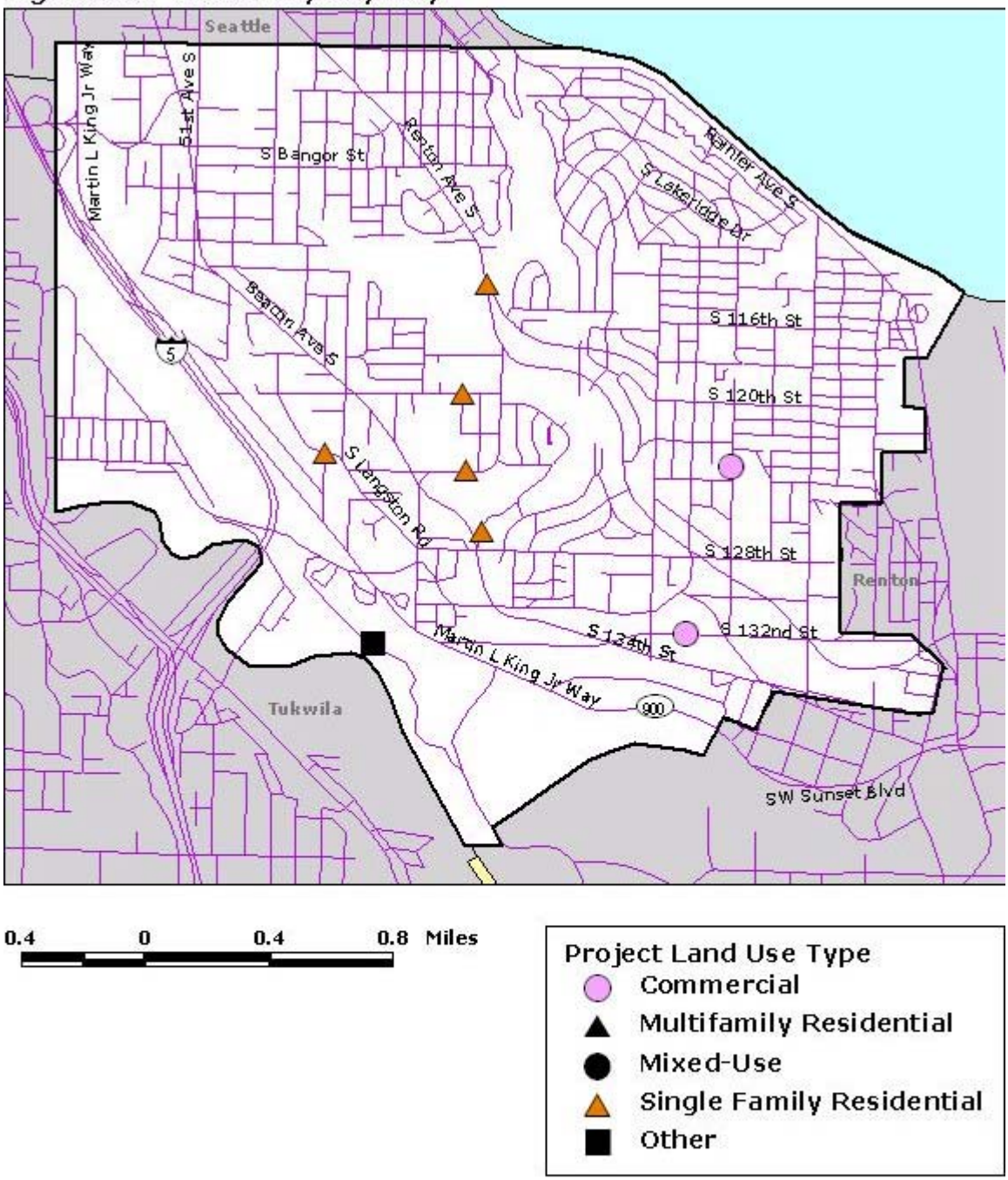


Figure 20. West Hill/Skyway



Appendix B. Regulation Survey Elements

The following is a list of questions used in the online survey of development regulations. Survey participants from the jurisdictions were directed to indicate whether or how each of these elements are currently being implemented in each of four general land use types (commercial-office, commercial-retail, multifamily residential, single-family residential and other), as seen in the sample question below.

Element: On-site pedestrian circulation (for example, from parking to entry or from transit to entry)	**Required**	**Encouraged**	**Allowed**	**Not addressed**	**Other**
Commercial (retail) zones	○	○	○	○	○
Commercial (office) zones	○	○	○	○	○
Multi-family residential zones	○	○	○	○	○
Single-family residential zones	○	○	○	○	○
Other zones	○	○	○	○	○
Comments:					

Connectivity

1. Require sidewalks
2. Require on-site pedestrian circulation (for example, from parking to entry or from transit to entry)
3. Require connections to transit
4. Prohibit cul-de-sacs or dead end streets
5. Require pedestrian or vehicular connections or prohibit pedestrian barriers (fences, shrubbery, or hedges) between adjacent developments
6. Establish maximum block size/perimeter
7. Require bicycle lanes
8. Require multi-use trails and ped/bike pathways (separated from the roadway)
9. Require marked or signalized crosswalks

Parking

21. Require rideshare parking
22. Require bicycle parking
23. Require parking to be located behind or underneath buildings
24. Allow shared parking
25. Allow use of on-street parking to meet parking requirements
26. Allow use of in-lieu-of parking fee
27. Allows redevelopment of unused parking area
28. Use flexible parking standards
29. Allow reduction of parking requirements below minimum
30. Establish maximum parking requirements
31. Have recently lowered minimum parking requirements

Mixed Use

32. Allow accessory uses (home based businesses, live/work studios)
33. Prohibited auto-oriented uses (gas stations, drive-thru banks or restaurants, auto repair businesses, etc.)
34. Which of the following zoning designations are being used in the study area?

a. General Mixed-Use (or allow mixed-use projects in commercial zones)
b. Neighborhood Commercial
c. Station Area
d. Pedestrian Oriented Zones

Pedestrian Environment and Safety

10. Require access management (driveway consolidation/coordination)
11. Limit curb cuts/driveways
12. Maximum street side garage width
13. Have changed street widths/standards in the study area to allow narrower local streets
14. Require ground floor windows/prohibit blank facades
15. Require articulated facades
16. Require weather shelter
17. Require amenities or public spaces
18. Building entry required to address or front the street
19. Establish maximum street side garage width
20. Reduced or eliminated setbacks

Compact Development

35. Established minimum density requirements
36. Have recently increased maximum density and/or height limits?
37. Have recently reduced minimum lot size in single-family zones
38. Allow clustering to maintain average densities
39. Allow cottage housing in single-family zones (smaller, detached single-family units clustered on a single lot)
40. Allow duplexes or townhomes in single-family zones
41. Allow accessory dwelling units in single-family zones
42. Allow zero lot line development
43. Require allowances for future development (future street extensions, subdivisions)

Affordable Housing

44. Require percentage of total units developed to be affordable

Appendix C. Project Evaluation Elements

Compact Development

1. Density measure
2. Available lot area is maximized
3. Attached housing
4. Located in an already developed area (infill or brownfield development)

Mix of Uses

5. Free of auto-oriented uses
6. Vertically mixed-use project (mixture of uses within same building)
7. Horizontal mix of uses within larger project (could include employment, schools, shopping, recreation activities, and civic/public uses)
8. Project is located in an area with a variety of other uses within walking distance (1/2 mile)

Connectivity

9. Sidewalks on streets within the development (this only applies to developments that have internal street systems or were built out to the street—not to on-site circulation systems)
10. Internal non-motorized routes and access points
11. Direct and convenient access to available transit service from building entry
12. Well connected street system (no dead-end streets/cul-de-sacs)
13. Multiple vehicle access points to the site
14. Attempt to reduce pedestrian barriers (such as fences, hedges and walls) to adjacent developments
15. Nonmotorized connections through any dead end streets/cul-de-sacs (if applicable)
16. Easement required for a street or pathway
17. Transit operates within the community
18. Streets within the development have bike lanes (applies only to developments with internal street systems or were built out to the street)
19. Non-motorized paths or trails (other than sidewalks)
20. Non-motorized paths/trails link up with a larger path/trail system (if applicable)

Pedestrian Environment and Safety

21. Access points into the development designed to minimize pedestrian/vehicle conflicts
22. Street widths appropriate for anticipated traffic volumes (only applies to developments with their own street system)
23. Streets designed to slow traffic speeds
24. Ground floor commercial/retail present (used as proxy for ground floor windows)
25. Building facades articulated and modulated
26. Awnings or other weather shelter provided
27. Spaces for public or recreational uses (plazas, paths/trails, small parks)
28. Incentives provided in exchange for open space/amenities
29. Bulding entrances address the street (rather than the parking lots)
30. Garages set back from street (single-family uses only)
31. Front setbacks close to street

Parking

32. Require priority parking for carpools/vanpools
33. Bicycle parking
34. Parking placed behind or underneath buildings
35. Shared parking arrangements with other developments
36. On-street parking available & used to fulfill requirements
37. Parking ratio

Affordable Housing

38. Affordable housing is a part of project
39. Incentives provided in exchange for affordable housing
40. Units available for rental as well as purchase
41. Diversity of lot sizes within the development
42. Variety of housing types within development
43. Accessory dwelling units

Permitting Processes and Incentives

44. Permit time
45. Design review/design guidelines used in the review process
46. TMP or other program to encourage transit use required

47. Flexibility with codes such as setbacks, street widths, parking, etc.
48. Other: Did this development result from city efforts, partnership or due to the existence of a city program? If so, describe.

Appendix D. Interview Questions

The following questions were used in the interviews of the local planners in order to get background information about local processes, and the range of programs being used to facilitate transportation-efficient development.

1. What kind of efforts has this jurisdiction made to streamline the development review process? (for example, code overhaul, permit process overhaul, consolidated review with SEPA (the State Environmental Policy Act), building/fire/ land use code review all in one)
2. Do developers have the option of a streamlined review? Under what conditions?
3. Does the development review process make use of design guidelines or a design review process? When and where?
4. How are impact fees structured? Do they encourage in-city development (i.e. are they higher in outlying areas)?
5. May developers reduce impact fees in exchange for a Transportation Management Plan (TMP) or other Transportation Demand Management (TDM)/urban design actions?
6. What is required of developers that submit a TMP? Does the city have a monitoring/enforcement program for TMPs?
7. Do the different departments that deal with permit standards (land use, buildings, fire, environmental, transportation) cooperate to eliminate code or procedural barriers to transportation-efficient development? If yes, please provide examples.
8. How does this jurisdiction coordinate with different districts—schools, utilities, transit—to support transportation-efficient land use patterns?
9. What type of enforcement is provided to ensure proposals get built the way they are permitted? How large is the code enforcement staff compared to the number of proposals? (What kind of caseload do inspectors have?)
10. Is there anything else that this jurisdiction has done in relation to the development process to facilitate transportation-efficient development?

Other Incentives, Programs, Tools

1. Does this jurisdiction allow phased development? Under what conditions?
2. Does this jurisdiction allow development? Where and when?
3. Does this jurisdiction have a Transfer of Development Rights program? Where are the transfers to and from?
4. Does this jurisdiction practice interim zoning? Where and when?
5. Are incentives provided in exchange for the provision of ...
   Amenities (public art, weather shelters, etc.)? Where? What incentives are given?
   Affordable housing? Where? What incentives are given?
   Open Space? Where? What incentives are given?
   Others? Where? What incentives are given?
6. Are there other types of incentives that haven't been mentioned yet?
7. Does this jurisdiction undertake parcel assembly to encourage infill development in target areas? Where has this been done?

8. Does this jurisdiction undertake infrastructure upgrades to encourage denser infill development in target areas? Where has this been done?
9. Does this jurisdiction reserve rights of way to preserve land for trail/road connections? Where?
10. Does this jurisdiction undertake programmatic environmental review for target areas? Where has this been done?
11. Does this jurisdiction have any other programs that encourage transportation-efficient development in target areas? Where?

Appendix E. Source List

The following sources provide more background on the link between land use/urban form characteristics and travel behavior. Included are articles that determine both general correlation between urban form and travel behavior as well at those that look at specific urban form characteristics (connectivity, parking, etc.). Several counter-arguments (that dispute the connection between urban form travel behavior) are also included.

Cervero, Robert. *America's Suburban Centers: A Study of the Land Use—Transportation Link.* Washington, D.C.: U.S. Department of Transportation, Urban Mass Transportation Administration, 1988.

Ewing, Reid. "Transportation, Growth Management, and the Other Four Out of Five Trips." *Environmental and Urban Issues* (Spring 1993): 24.

Ewing, Reid, Padma Haliyur, and G. William Page. "Getting Around a Traditional City, a Suburban Planned Unit Development, and Everything in Between." *Transportation Research Record 1466* (1993): 53 - 62.

Frank, Lawrence D. and Gary Pivo. *Relationships Between Land Use and Travel Behavior in the Puget Sound Region*. Seattle: Washington State Transportation Center, 1994.

Friedman, Bruce, Stephen P. Gordon, and John B. Peers. "Effect of Neotraditional Neighborhood Design on Travel Characteristics." *Transportation Research Record 1466* (1993): 63 – 70.

Gordon, Peter and Harry Richardson. "Geographic Factors Explaining Worktrip Length Changes." in *Nationwide Personal Transportation Survey Implications of Emerging Travel Trends* (Washington D.C.: U.S. Department of Transportation/Federal Highway Administration), 1994.

Gordon, Peter and Harry Richardson. "Gasoline Consumption and Cities: A Reply." *Journal of the American Planning Association 55* no. 3 (Summer 1989): 342 – 345.

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Guiliano, Genevieve. "Transportation, Land Use and Public Policy" *TR News* no. 187 (December 1996): 12 – 13.

Handy, Susan. "Regional Versus Local Accessibility: Neo-Traditional Development and its Implications for Non-Work Travel." *Built Environment* 18 no. 4 (1992): 253 – 267.

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Hess, Paul Mitchell. *Evaluating Pedestrian Environments: Proposals for Urban Form Measures of Network Connectivity with Case Studies of Wallingford in Seattle and Crossroads in Bellevue, Washington.* Seattle: University of Washington (Masters Thesis), 1994.

Holtzclaw, John. *Using Residential Patterns and Transit to Decrease Auto Dependence and Costs*. San Francisco: Natural Resources Defense Council, 1994.

Moudon, Anne Vernez, Paul Hess, Kiril Stanilov and Mary Catherine Snyder. *Effects of Site Design on Pedestrian Travel in Mixed-Use, Medium Density Environments.* Olympia, WA: Washington State Department of Transportation, 1997.

Moudon, Anne Vernez and Paul Mitchell Hess. "Suburban Clusters: The Nucleation of Multifamily Housing in Suburban Areas of the Central Puget Sound." *Journal of the American Planning Association* 66 no. 3 (Summer 2000): 243 – 264.

Newman, Peter and Kenworthy, Jeffrey. "Gasoline Consumption and Cities: A Comparison of U.S. Cities With a Global Survey." *Journal of the American Planning Association* 55 no. 1 (Winter 1989): 24-37.

Parsons Brinkerhoff Quade & Douglas. *Making the Land Use – Transportation – Air Quality Connection. Volumes 1- 8.* Portland, OR: 1000 Friends of Oregon, 1992 – 97.

Pushkarev, Boris and Jeffrey Zupan. *Public Transportation and Land Use Policy.* Bloomington, IN.: Indiana University Press, 1977.

Rutherford, G. Scott, Edward McCormack, and Martina Wilkinson. *Travel Impacts of Urban Form: Implications From and Analysis of Two Seattle Area Travel Diaries.* In Proceedings of Travel Model Improvement Program Conference on Urban Design, Telecommuting and Travel Behavior, Williamsburg, Virginia, October 1996.

Snyder, Mary Catherine. *A Study of Parking Supply and Utilization in Neighborhood Commercial Centers in the Puget Sound Region.* Seattle: University of Washington (Masters Thesis), 1997.

Steiner, Ruth. "Residential Density and Travel Patterns: A Review of the Literature." *Transportation Research Record 1466* (1993): 37-43.