APPENDIX A
Analysis of Housing and Socioeconomics Impacts

A.1 Introduction

BACKGROUND

The City of Seattle proposes to change regulations in the Land Use Code to remove barriers to the creation of ADUs in single-family zones. ADUs include backyard cottages, known as detached accessory dwelling units (DADUs), and in-law apartments, known as attached accessory dwelling units (AADUs). The proposal involves several Land Use Code changes, including allowing two ADUs on some lots, changing the existing off-street parking and owner-occupancy requirements, and changing some development standards that regulate the size and location of DADUs.

The Draft EIS analyzes three alternatives. (For a full list of the proposed changes in each alternative, see Chapter 2 of the EIS, Exhibit 2-2.)

- ***Alternative 1 (No Action).*** Under Alternative 1, no changes would be made to the existing ADU regulations.
- ***Alternative 2.*** Alternative 2 considers the broadest range of changes to the Land Use Code changes to promote the production of ADUs. These changes include: allowing lots in single-family zones to have both an AADU and a DADU; removing the owner-occupancy requirement; removing the off-street parking requirement for ADUs; reducing predevelopment costs for DADUs; and allowing lots between 3,200 and 3,999 square feet to add a DADU.
- ***Alternative 3.*** Alternative 3 considers more modest adjustments to the Land Use Code that emphasize maintaining a scale compatible with existing development in single-family zones. These changes include allowing single-family-zoned lots to have both an AADU and a DADU; removing the off-street parking requirement for the first (but not second) ADU; allowing lots between 3,200 and 3,999 square

feet to add a DADU; requiring Mandatory Housing Affordability (MHA) for creation of a second ADU; and adding a maximum floor area ratio (FAR) limit for new development.

Many of these proposed changes could affect housing and socioeconomic conditions in the study area. For example, allowing two ADUs on a single lot would legalize a new housing product in single-family zones, while changing the owner-occupancy requirement for ADUs could potentially cause a shift from owner-occupancy to renter-occupancy. This appendix summarizes the methodology and results of the technical analysis conducted by ECONorthwest to analyze housing and socioeconomic impacts of the proposed alternatives.

ANALYTICAL QUESTION AND APPROACH

This appendix considers the impacts of the proposed Land Use Code changes on housing and socioeconomics. Specifically, we first evaluate the following questions:

- ***Underlying Development Economics.*** How might the proposed changes alter the underlying real-estate economics in single-family zones? Could the proposed changes make property in single-family zones more attractive as rental investments rather than as owner-occupied assets?
- ***ADU Production.*** How many ADUs could be created given the proposed policy changes in each alternative?

This analysis allows us to consider the following types of impacts resulting from the proposed alternatives:

- ***Affordability.*** What impacts could the proposed changes have on housing affordability?
- ***Displacement.*** How might the potential housing and socioeconomic impacts vary by neighborhood? What are the potential impacts on marginalized populations (low-income people, people of color, and non-native English speakers)?

Our approach was constructed to analyze these issues. This appendix is organized as follows:

- **Framework for the Evaluation** describes our conceptual model for analyzing potential housing and socioeconomic impacts.
- **Methods** describes the steps used in our analysis and documents the key assumptions used.
- **Findings** presents the analysis results and discusses how potential impacts vary across the three alternatives.

A.2 Evaluation Framework

ESTIMATING CHANGE IN ECONOMIC ENVIRONMENT THROUGH EVALUATION OF HIGHEST AND BEST USE

To understand how the alternatives could affect underlying real-estate economics in single-family zones, we can analyze the proposed changes from the viewpoint of a profit-maximizing developer. If the proposed alternatives change the most profitable development outcome, then that indicates a potential change to the underlying real estate economics that can influence housing and socioeconomic conditions. The degree of potential impacts depends on the magnitude, characteristics, and geographic dispersal of any changes to profitability.

From this perspective, the potential effects of alternatives can be classified into three categories:

- Potential effects on the number of ADUs produced:
  - » Two ADUs on a single lot (Alternative 2, Alternative 3)
  - » Reduction in minimum lot size for DADU (Alternative 2, Alternative 3)
- Potential effects on the marginal cost of building an ADU:
  - » Reduced off-street parking for ADUs (Alternative 2, Alternative 3)
  - » Reduced predevelopment costs for ADUs (Alternative 2)
  - » MHA requirements for a second ADU (Alternative 3)
- Potential effects on the marginal revenue potential of an ADU or main house:
  - » Increased maximum allowed size of DADU (Alternative 2, Alternative 3)
  - » Removal of the requirement that either the ADU or the main house be owner-occupied (Alternative 2)
  - » FAR limit for new construction (Alternative 3)

Note that the choice to add an ADU does not occur in isolation. A profit-maximizing developer could instead choose to remodel and flip, or to tear down and build a larger home. These options do not create new ADUs but nevertheless affect housing affordability or urban form. Thus, evaluating the potential housing and socioeconomic effects of the alternatives requires a holistic analysis of development options in single-family zones.

Highest and best use provides a useful framework for evaluating how the alternatives could affect underlying real-estate economic conditions in

the study area. The 14th edition of The Appraisal of Real Estate defines highest and best use as: "The reasonably probable use of property that results in the highest value" (Appraisal Institute 2013). To be reasonably probable, a use must meet three conditions:

1. ***Physically possible.*** The use must be possible given the physical characteristics of the land, including size, shape, topography, and soils. A large, flat site with good draining offers more possibilities than a steep site with an irregular shape.
2. ***Legally permissible.*** The use must be allowed under the land's current zoning and conform to all relevant regulations and building codes.
3. ***Financially feasible.*** The final test requires analysis of the economic feasibility of potential options. If a developer would lose money on the project, it is not reasonably probable.

Of the remaining 'reasonably probable' candidates, the highest and best use is the one with the highest financial return. This financial return determines the property's value to a potential profit-maximizing purchaser. Imagine two developers evaluating the development potential of a residential property: Developer A builds only small houses, and Developer B builds only large houses. Both uses might be physically possible, legally permissible, and financially feasible on the same lot, but only one can prevail.

A useful metric for comparing the relative value of multiple possible uses is through ***residual land value***. Residual land value (RLV) is a measure of the developer's land budget for a particular project, after taking into account expected costs (including developer profit) and revenues. A higher residual land value for a particular use indicates that the developer can afford to pay more for the land. In the example above, whichever developer has the higher residual land value will outbid the other.

This framework for determining highest and best use lets us analyze how the proposed alternatives could affect the economic environment for development in single-family zones. Thus, our research question is: do the proposed alternatives change the highest and best use in single-family zones?

Current zoning restricts the legally permissible options in the study area to two main residential uses: single-family residential and single-family

residential with one accessory dwelling unit.[1] Various options exist within these uses, however, defined by the size of the house and/or ADU, the quality of finishes, the architectural style, and many other factors.

Observations of recent trends suggest that, for most lots in single-family zones, the highest and best use is an owner-occupied single-family home. Citywide, 81 percent of detached single-family homes are owner-occupied. Though legal since 1994, AADUs are present on less than 1.2 percent of single-family lots in the study area.[2] Evidence also suggests that large homes generate higher financial returns than smaller ones. The average size of a new single-family home in the study area has increased over time, from about 1,850 square feet for homes built in the 1950s to nearly 3,000 square feet for homes built 2010-2017.[3]

HIGHEST AND BEST USE IS NOT A FORECAST

Highest and best use analysis tells us the most economically productive use for a particular lot, but it does not necessarily predict what will actually happen, for several reasons.

First, highest and best use does not consider the motivation and preferences of individual property owners. Any change in use requires the cooperation of the owner, either to sell the site or to redevelop it herself. The highest and best use of my house might be to tear it down and rebuild a much larger house, but if I prefer my small house, no change in use would occur until I decide to sell. Building an ADU and renting it out may be most profitable for a homeowner but ruled out because of a preference for privacy or disinterest in becoming a landlord. Even when a property owner does wish to add an ADU or redevelop their site, they may lack the financial capital to do so.

Second, market demand is not infinite. There is limited demand for each particular use given current market conditions. Even though a site may have a willing seller and a particular highest and best use, it may not achieve that use if other better-suited sites satisfy market demand. There is also limited demand for various types of owner- and renter-occupied products. Not every prospective homebuyer can afford a 3,000-square-

1 In addition to residential uses, Seattle's single-family zones also allow parks, nursing homes, and some institutional uses (including schools and churches).

2 Anecdotal evidence suggests that illegal, unpermitted ADUs exist in Seattle. As we have no way of knowing how many illegal ADUs may exist, or where they are located, they are not included in our analysis.

3 Large new houses on relatively small lots are sometimes referred to as "McMansions."

foot house. Not every renter wants to live in someone's backyard or basement.

Thus, while highest and best use can tell us how the alternatives could change the underlying real-estate economics in single-family zones, it cannot predict what might happen or how the alternatives could affect development rates in the study area. To arrive at estimates of future single-family and ADU production for each alternative, we need a methodology that considers what is actually most likely to happen given market conditions, parcel characteristics, and individual preferences.

Nearly all forecasts start with an analysis of past trends. By looking at what actually happened, we can arrive at estimates of what might happen going forward. There are two primary approaches:

- **Use past growth rates of new single-family homes, AADUs, and DADUs to project into the future.** This "continuation of the trend line" approach is the simplest way to establish a baseline of future conditions in Alternative 1. However, it has no quantitative connection to the underlying factors that explain why and where development will occur. It also does not offer a way to forecast how development rates might change from the baseline in Alternatives 2 and 3.
- **Develop a model that connects historic rates of home and ADU production to underlying factors.** By developing a deterministic model that links past development decisions to parcel characteristics and other important variables (such as regional macroeconomic conditions), we can develop a more sophisticated forecast of baseline conditions over the next 10 years. This approach also allows us to forecast the potential impacts of Alternatives 2 and 3 by adjusting input variables in the model.

This latter approach is better suited to evaluating the potential impacts of the proposed alternatives because it provides insight into which factors make a lot more or less likely to add an ADU, and because it allows us to quantitatively estimate the potential impact of specific policy changes. For this analysis, we use an econometric model to estimate how many ADUs might be created in Alternatives 1, 2, and 3 and to observe how the potential impacts might vary by neighborhood.

Finally, it is important to note that all forecasting requires making assumptions about the future. Regardless of the method used, (1) forecasting growth requires consideration of many variables that interact in complicated ways, and (2) any forecast of a single future is more than

likely to be wrong in any absolute sense — there are many possible futures that are more or less likely depending on one's assessment of the likelihood of the assumptions. However, ours is a reasonable approach to give policymakers a reference point for the scale of ADU production over the analysis time frame.

A.3 Methods and Assumptions

The two different core research questions — 1) how could the alternatives affect highest and best use, and 2) how could the alternatives affect future production of single-family homes and ADUs — call for different methodological approaches.

Below we describe how we address the first question of highest and best use. Then we explain our methodology for estimating future production of ADUs.

HIGHEST AND BEST USE: PRO FORMA ANALYSIS

To analyze the potential impacts of the alternatives on highest and best use in the study area, we use pro forma analysis. Pro forma models are common decision-making tools used by real estate developers and policymakers. Our pro forma model uses inputs and assumptions about current market conditions, parcel characteristics, and possible development outcomes to calculate a residual land value for each development possibility. By comparing residual land values, we can estimate the highest and best use.

In the framework of highest and best use analysis, the pro forma model allows us to analyze what is:

- ***Physically possible.*** Using King County Assessor data on parcels in the study area, we created a parcel typology to examine and screen for what might be physically possible given a range of parcel sizes and existing conditions.
- ***Legally permissible: The model includes relevant information from the Land Use Code about what can currently be built on a lot.*** It also reflects proposed changes under Alternatives 2 and 3. These inputs determine which development prototypes can exist on each lot and how big they can be.
- ***Financially feasible.*** We compiled information on current market conditions, including single-family sales prices, rental rates, and construction costs, in order to test the financial feasibility of possible

uses. To account for variable market conditions across the study area, we developed three generalized profiles of rent and housing price and categorized each neighborhood into one of the three profiles. Then, we created financial pro formas for 44 different development outcomes that encompass a wide range of legally permissible variations. (Note that some development outcomes are legally permissible only under certain alternatives.) For each of these 44 development outcomes, we then analyze four different valuation options based on different possible uses (e.g., for sale, for rent). Finally, we test the financial performance for each combination of alternative, parcel typology, neighborhood profile, development outcome, and valuation — 6,336 scenarios in all.

- ***Maximally productive.*** For a given parcel type in a given neighborhood, we then compare the residual land values of the legally and physically possible development outcomes. The development outcome with the highest residual land value is the highest and best use.

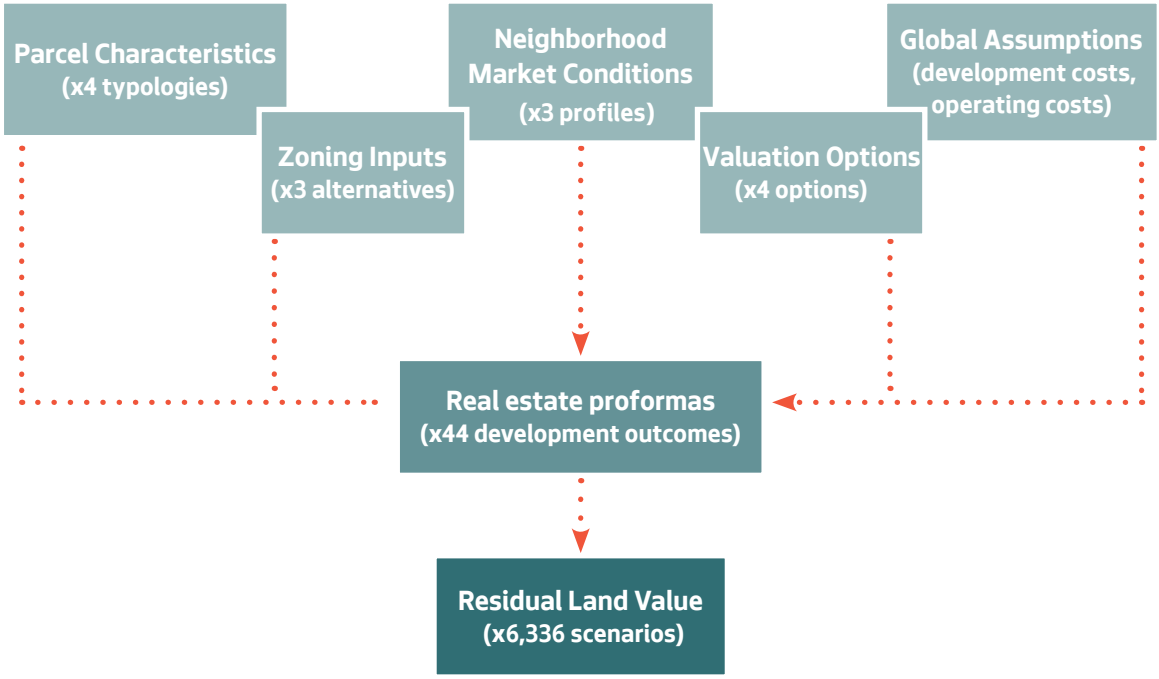
Though theoretically possible to use pro formas to analyze highest and best use for every parcel in the study area (using specific parcel characteristics and more localized rent data), we used a typology approach to facilitate interpretation of the results and highlight key differentiators related to ADU production. The typology approach — using three different neighborhood profiles and four different parcel types — allows us to analyze the relative profitability of various development outcomes on parcels of different sizes and in different parts of the city without analyzing every parcel individually.

To simplify, the key elements of the pro forma analysis are:

1. What can you build on a lot in a single-family zone?
2. Once built, what can you do with your property? Sell it? Rent it?
3. Based on market conditions, how much rental or sales income can you expect?
4. Which combination of steps 1-3 maximizes the profitability of the project?

The rest of this section provides more detail on the specific methods, inputs, and assumptions used for each step.

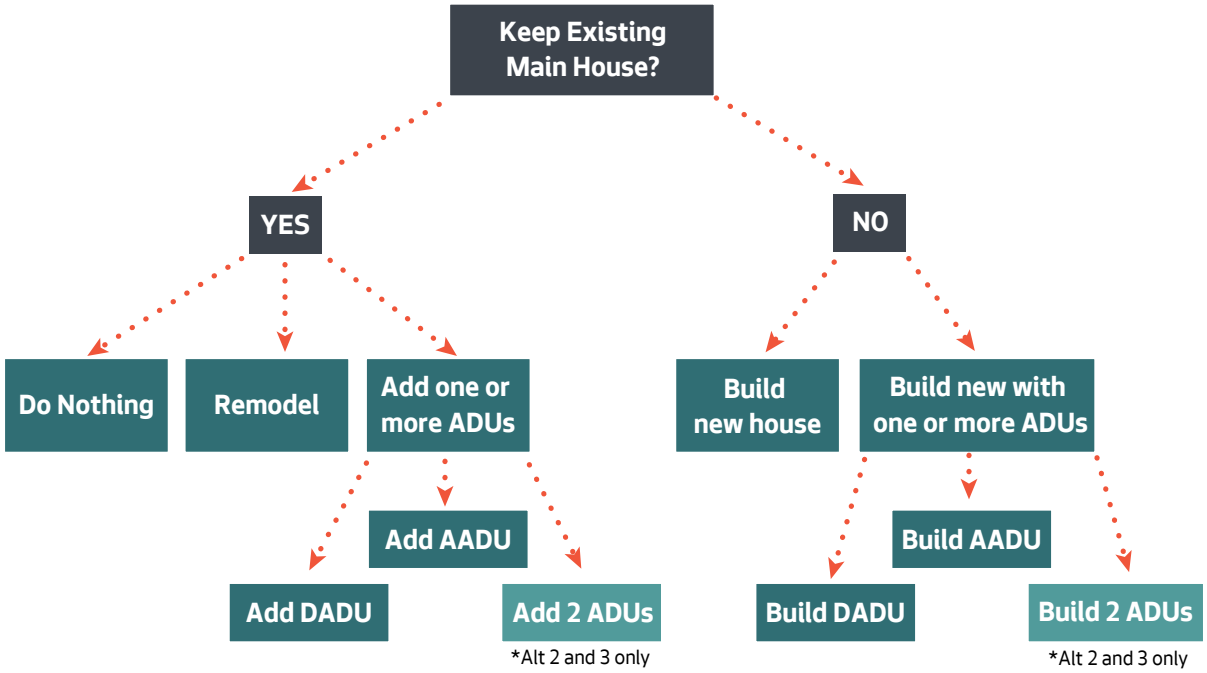
Exhibit A-1 Diagram of Inputs and Assumptions Used in Pro Forma Analysis



Development outcomes

As shown in Exhibit A-2, the owner of a single-family-zoned lot could do several different things with the lot. They could tear it down and rebuild (with or without ADU). They could keep the existing house and do nothing, remodel, or add an ADU.

Exhibit A-2 Decision tree of single-family development outcomes



To evaluate highest and best use in single-family zones, we analyzed the financial performance of 44 legally permissible development outcomes. Each outcome either demolishes or retains the existing house. Additional variations consider the number of ADUs (0, 1, or 2), size of ADUs, size of main house, and placement of parking. Outcomes marked with an asterisk (*) are not possible under Alternative 1.

Keep Existing Main House

1. No nothing
2. Remodel
3. Add 300-square-foot ADU
4. Add largest possible 1-story DADU
5. Add largest possible 2-story DADU
6. Add largest possible 1-bedroom, 2-story DADU
7. Add largest possible 1-story DADU and convert basement to AADU*
8. Add largest possible 2-story DADU and convert basement to AADU*
9. Convert existing basement to AADU

Demolish Existing Main House

10 Maximize house size, attached garage, no ADUs

11 Maximize house size, attached garage, 300-square-foot DADU

12 Maximize house size, attached garage, largest possible 1-story DADU

13 Maximize house size, attached garage, largest possible 2-story DADU

14 Maximize house size, attached garage, basement AADU and largest possible 1-story DADU*

15 Maximize house size, attached garage, basement AADU and largest possible 2-story DADU*

16 Maximize house size, attached garage, with basement AADU

17 Maximize house size, tandem parking alongside house, no ADUs

18 Maximize house size, tandem parking alongside house, 300-square-foot DADU

19 Maximize house size, tandem parking alongside house, largest possible 1-story DADU

20 Maximize house size, tandem parking alongside house, largest possible 2-story DADU

21 Maximize house size, tandem parking alongside house, basement AADU and largest possible 1-story DADU*

22 Maximize house size, tandem parking alongside house, basement AADU and largest possible 2-story DADU*

23 Maximize house size, tandem parking alongside house, with basement AADU

24 1,900-square-foot house, tandem parking alongside house, no ADUs

25 1,900-square-foot house, tandem parking alongside house, 300-square-foot DADU

26 1,900-square-foot house, tandem parking alongside house, largest possible 1-story DADU

27 1,900-square-foot house, tandem parking alongside house, largest possible 2-story DADU

28 1,900-square-foot house, tandem parking alongside house, basement AADU and largest possible 1-story DADU*

29 1,900-square-foot house, tandem parking alongside house, basement AADU and largest possible 2-story DADU*

30 1,900-square-foot house, tandem parking alongside house, with basement AADU

31 2,400-square-foot house, tandem parking alongside house, no ADUs

32 2,400-square-foot house, tandem parking alongside house, 300-square-foot DADU

33 2,400-square-foot house, tandem parking alongside house, largest possible 1-story DADU

34 2,400-square-foot house, tandem parking alongside house, largest possible 2-story DADU

35 2,400-square-foot house, tandem parking alongside house, basement AADU and largest possible 1-story DADU*

36 2,400-square-foot house, tandem parking alongside house, basement AADU and largest possible 2-story DADU*

37 2,400-square-foot house, tandem parking alongside house, with basement AADU

38 2,900-square-foot house, tandem parking alongside house, no ADUs

39 2,900-square-foot house, tandem parking alongside house, 300-square-foot DADU

40 2,900-square-foot house, tandem parking alongside house, largest possible 1-story DADU

41 2,900-square-foot house, tandem parking alongside house, largest possible 2-story DADU

42 2,900-square-foot house, tandem parking alongside house, basement AADU and largest possible 1-story DADU*

43 2,900-square-foot house, tandem parking alongside house, basement AADU and largest possible 2-story DADU*

44 2,900-square-foot house, tandem parking alongside house, with basement AADU

We chose these 44 development outcomes to illustrate a broad range of common development options in single-family zones. They are not exhaustive of every development possibility. Additional possible variations include: DADU on top of a garage, parking access from an alley, above-ground AADUs, AADUs within the main house envelope, and houses and ADUs of other various sizes. Although we did not explicitly model these development outcomes, their financial performance is likely to behave similarly to the outcomes we did model. For example, from a cost perspective, building a new garage with a DADU on the second floor is a slightly more expensive variation of building a single-story DADU.

Valuation options

For each development outcome, there are options for what to do with the property — sell it or rent it? The same house can be sold, rented to long-term tenants, or used as a short-term rental. Each option is associated with different revenues and costs that determine which use is ultimately most profitable.

Exhibit A-3 Valuation options

*For Alternatives 1 and 3, this option is only used to evaluate a main house with no ADUs.

For each development outcome, we analyzed four possible ways to value the property.

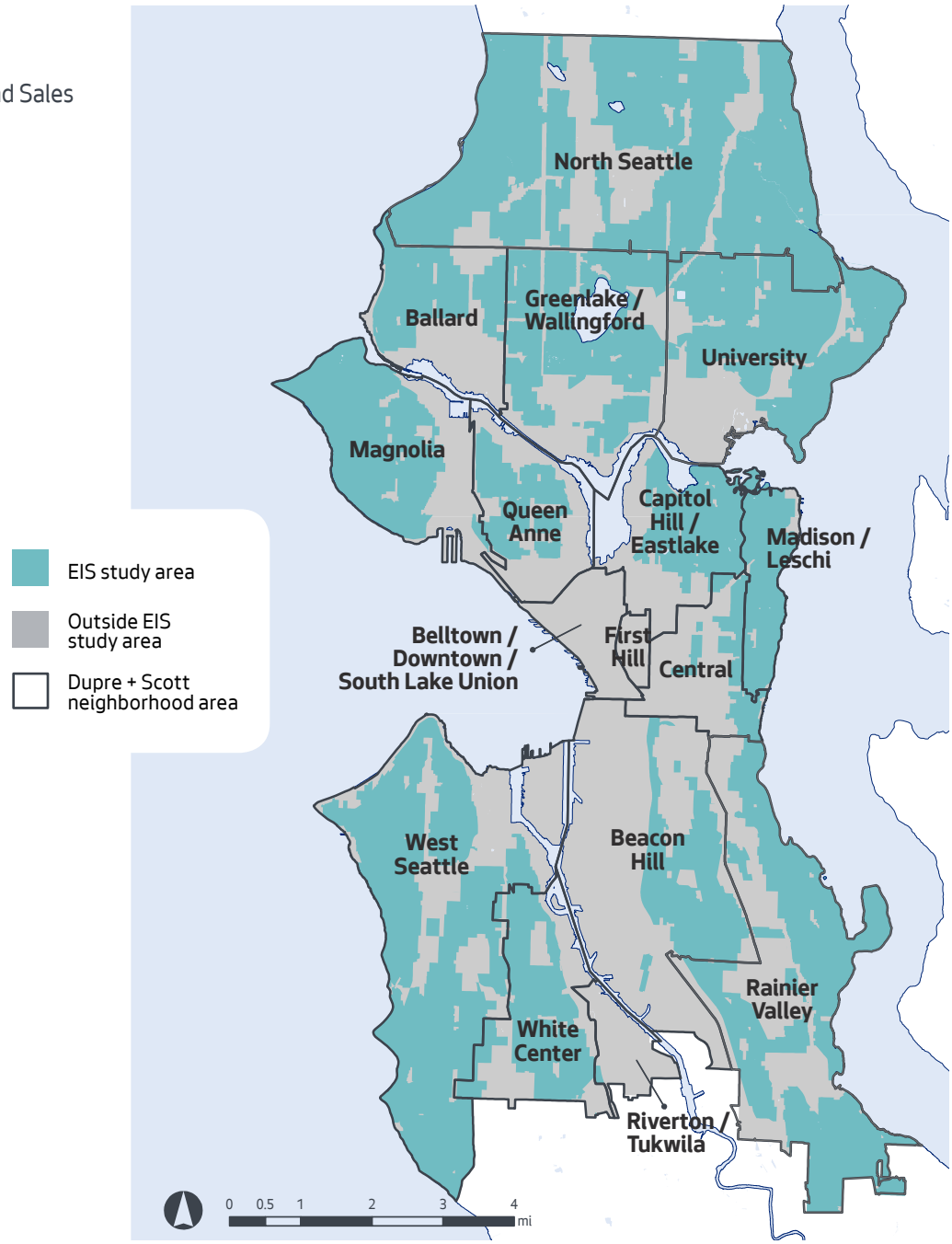
1. **All units as long-term rentals.** Every unit (including the main house) is rented out separately. The lot is valued based on the net operating income from all units.
2. **Main house valued based on for-sale price; ADU(s) as long-term rentals.** The lot is valued in two pieces: based on price per square foot of the main house and on the net operating income from the ADUs. Together, the resulting residual land values represent the total value for the lot.
3. **Main house valued based on for-sale price; one ADU as short-term rental.** Under regulations passed in December 2017, properties owners may list one short-term rental unit other than the unit where they live. This revenue scenario assumes that the main house is valued based on its sales price per square foot, one ADU is operated as a short-term rental, and the second ADU (if present) is operated as long-term rental. Similar to option 2, the main house is valued based on price per square foot and the ADUs based on net operating income from short- or long-term rental.
4. **All units valued based on for-sale price**. The lot is valued based on sales price per square foot of all units, including any ADUs.

These valuation options illustrate the relative profitability of the rental and for-sale markets in Seattle today, but they are not intended to represent the literal options for what can be done with a parcel. For example, options 2 and 3 are not possible for most single-family-zoned parcels because they require subdivision.

Development of neighborhood rent / price profiles

The revenue potential of the valuation options listed above depend on local market conditions, which vary by neighborhood. The same home costs more to buy or to rent in Queen Anne than in White Center. Throughout this report, we use Dupre + Scott neighborhoods (as shown in Exhibit A-4) when talking about neighborhood boundaries.

Exhibit A-4
Dupre + Scott Neighborhood Boundaries Used for Rent and Sales Data



To account for varying market conditions across the study area, we categorized every neighborhood in Seattle as either a "higher-," "medium-," or "lower-" price neighborhood. Neighborhoods were classified based on a combination of single-family rental rates and single-family sales prices.

To rank neighborhoods by for-sale prices, we used a hedonic price regression to control for differing house characteristics among neighborhoods.[4] We used King County Assessor's housing transactions data for lots in the study area with single-family residential use.[5] The result is an index of housing price for each neighborhood. We ranked neighborhoods based on sales price index and divided them so one-third are considered lower price, one-third medium price, and one-third higher price.

For rental rates, neighborhoods were similarly classified so that one-third are considered lower rent, one-third medium rent, and one-third higher rent. For this classification, we used Dupre + Scott data on rent per square foot for one-bedroom units in small buildings (defined as those with 1 to 19 units).[6]

Next, we combined the sales price score and the rent score into an overall index of housing price. If a neighborhood is "Lower Rent" and "Lower Sales Price," we classified it as "Lower" overall. If a neighborhood is "Higher Rent" and "Higher Sales Price", we classified it as "Higher" overall. All other neighborhoods (combinations of "Lower" and "Medium" or "Medium" and "Higher") are classified as "Medium" overall. Exhibit A-5 and Exhibit A-6 show the final neighborhood classifications.

4 The regression included housing characteristics (number of bedrooms, number of bathrooms, size of house, size of lot) and a dummy variable for each neighborhood. Each neighborhood dummy variable accounts for the portion of sales prices that is due to the specific neighborhood rather than to structure or parcel characteristics.

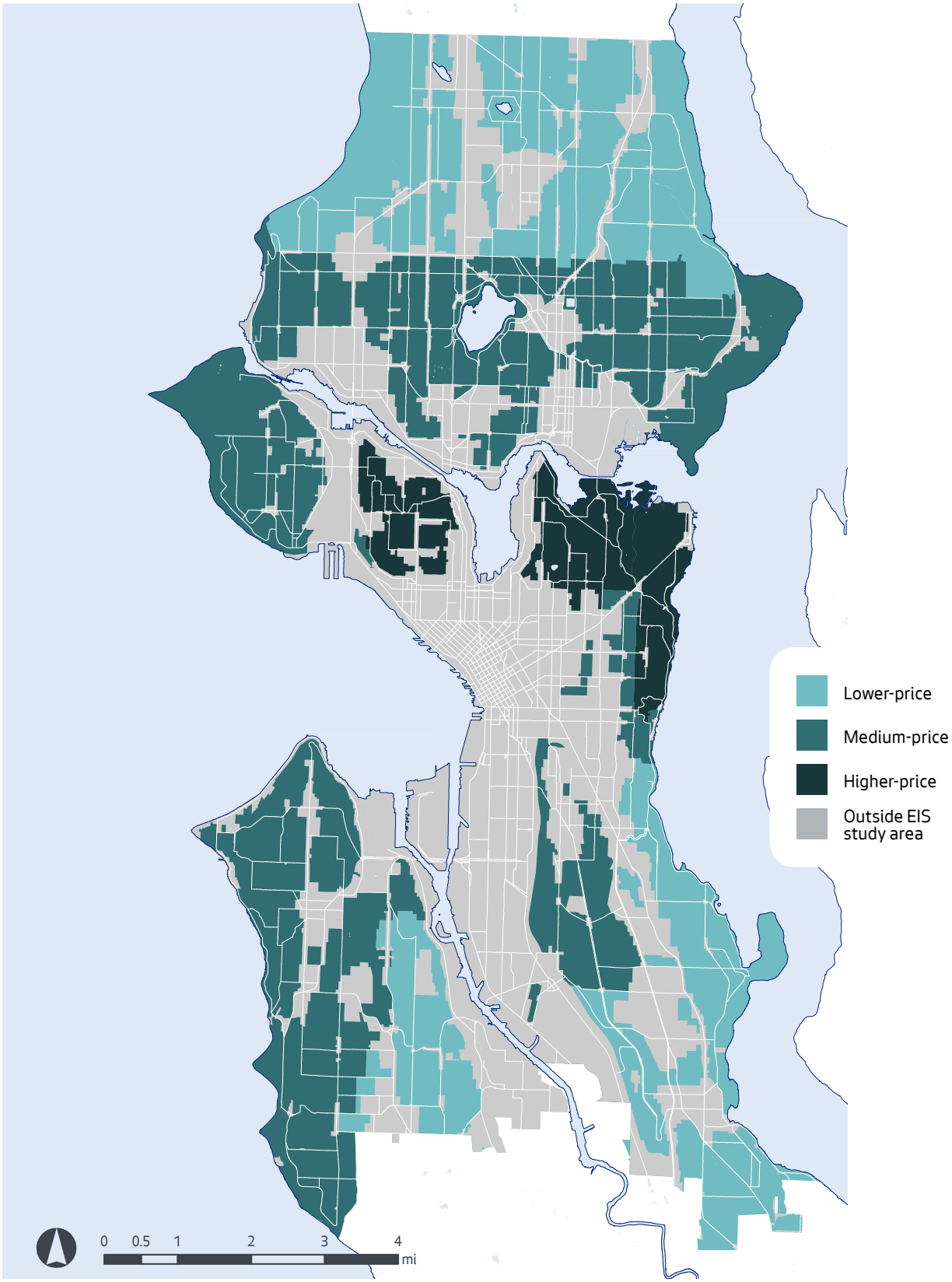
5 For this exercise, we filtered on properties that were sold in 2016 or 2017 for more than $50,000 and did not have indicators of distressed sales or non-arms-length transactions.

6 Depending on the specific rent measure used, the rent classification varies slightly, but the results are generally consistent. We achieve the same results using two-bedroom rents in small buildings, two-bedroom rents in single-family buildings, or four-bedroom rents in single-family buildings.

Exhibit A-5 Neighborhood Profile Classifications

Neighborhood	Sales price category	Rent category	Overall profile
Madison/Leschi	Higher	Higher	Higher
Queen Anne	Higher	Higher	Higher
Capitol Hill/Eastlake	Higher	Higher	Higher
Magnolia	Higher	Medium	Medium
University	Higher	Medium	Medium
Greenlake/Wallingford	Medium	Higher	Medium
Central	Medium	Higher	Medium
Ballard	Medium	Medium	Medium
Beacon Hill	Lower	Medium	Medium
West Seattle	Medium	Lower	Medium
North Seattle	Lower	Lower	Lower
Rainier Valley	Lower	Lower	Lower
White Center	Lower	Lower	Lower

Exhibit A-6 Map of Neighborhood Profiles



Neighborhood market inputs

For each neighborhood profile — Higher, Medium, and Lower — we then assigned data about expected sales price and rental rates for each valuation option.

Single-family home sales price

To ensure that our market inputs match the range of development outcomes, we calculated the sales price per square foot for each neighborhood profile three different ways: for all properties, for recently built properties, and for recently renovated properties.

Although total price increases as the homes get larger, the price per square foot generally decreases with size. To reflect this dynamic, we calculated price per square foot for different home size categories.

For the "all properties" calculation, we calculated the median price per square foot of 2016-2017 property sales within each neighborhood profile and for each size category. For the "new properties" calculation, we calculated the median sales price per square foot for properties built 2012-2017. For the "renovated properties," we calculated median sales price for properties that were renovated during or after 2010. Exhibit A-7 shows the sales prices per square foot used in our analysis.

Exhibit A-7 Single-Family Sales Price per Square Foot, by Home Size and Neighborhood Profile

Source: ECONorthwest analysis of King County Assessor's sales data

	Lower	Medium	Higher
All homes			
1,400-1,699 square feet	$356	$444	$543
1,700-1,999 square feet	$330	$404	$520
2,000 -2,499 square feet	$299	$376	$492
2,500-2,999 square feet	$308	$366	$483
3,000+ square feet	$310	$404	$504
New homes			
1,400-1,699 square feet	$296	$437	$518
1,700-1,999 square feet	$394	$402	$505
2,000 -2,499 square feet	$331	$393	$543
2,500-2,999 square feet	$336	$387	$462
3,000+ square feet	$339	$426	$496
Recently remodeled homes			
1,400-1,699 square feet	$301	$439	$665*
1,700-1,999 square feet	$376	$404	$503
2,000 -2,499 square feet	$328	$376	$557
2,500-2,999 square feet	$298	$392	$484
New homes, >3000 square feet	$322	$374	$496

*Due to insufficient observations, price per square foot was imputed using the average difference between Medium and Higher for recently remodeled homes of other sizes.

Long-term rental rates

For information about long-term rental rates for main houses, we used Dupre + Scott data for single-family rentals. To determine values for each neighborhood profile, we took the median of the composite neighborhoods. As with single-family home sales, rent per square foot typically declines as unit size increases, so we estimated the number of bedrooms for each house and used the corresponding Dupre + Scott rental rate.

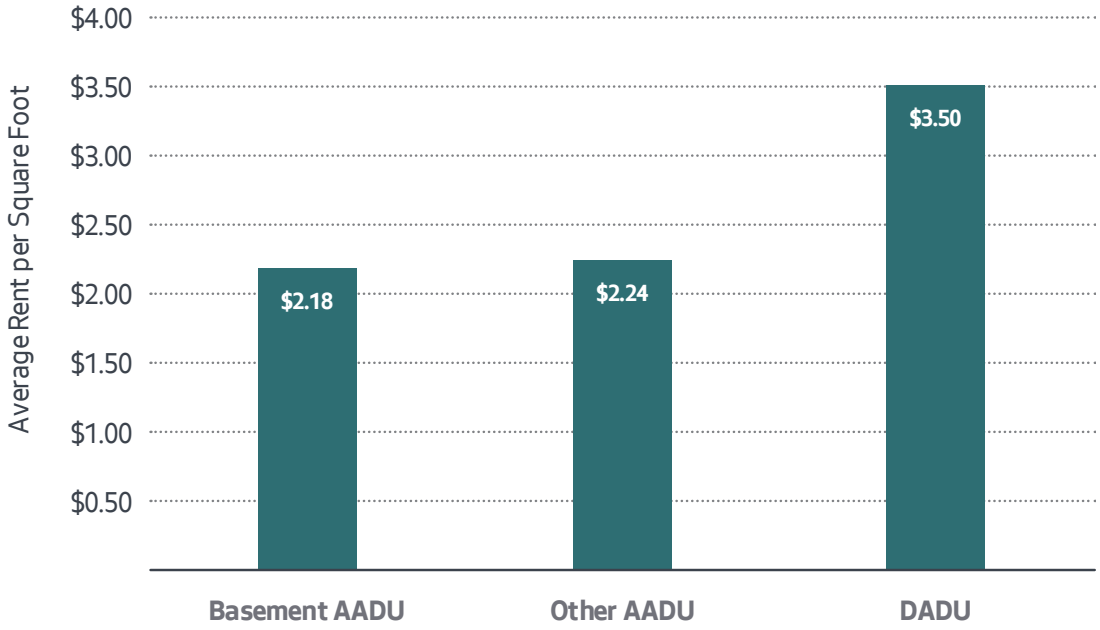
Determining rental rates for ADUs was more complex, as detailed data on AADU and DADU rents in Seattle by neighborhood does not exist.

To better understand Seattle's rental market for ADUs, we surveyed Craigslist rental postings in October and November 2017.[7] We found 83 unique listings for ADU rentals in Seattle, of which 59 (71 percent) were basement AADUs, 14 (17 percent) were other types of AADUs, and 10 (12 percent) were DADUs.

Because of the limited number of observations, we were unable to use the Craigslist rent survey data as the source for AADU and DADU rent. However, the Craigslist survey did provide information about how rent differs between AADUs and DADUs. The data indicate that DADUs command higher rents than AADUs. This finding makes intuitive sense; for most people, living in a small detached house is more desirable than living in a basement.

Exhibit A-8 Average Asking Rent Per Square Foot for ADUs in Seattle

Source: ECONorthwest survey of Craigslist postings, October–November 2017.



To reflect the observed rent differential between AADUs and DADUs, we used Dupre + Scott rent data from two- to four-unit buildings for AADUs, and single-family rent data for DADUs. This allows us to account for the observed "detachment" premium for DADUs over AADUs. Note that,

7 To conduct the survey, we searched Seattle Craigslist listings of apartments for rent (https://seattle.craigslist.org/search/see/apa). We used the following search terms: mother in law, MIL, ADU, cottage, basement apartment, carriage. Each result was manually reviewed to determine if it was actually an ADU and, if so, what type.

although we used the same rent data source (Dupre + Scott, single-family units) for both DADUs and main houses, DADUs typically have fewer bedrooms and thus typically higher rents per square foot.

Exhibit A-9 Long-Term Rental Rates Used in Analysis

Source: ECONorthwest analysis of data from Dupre + Scott 1-19 Unit Apartment Report (April 2017).

	Lower	Medium	Higher
Main house and DADU			
1 bedroom	$2.14	$2.35	$2.47
2 bedrooms	$1.78	$1.92	$2.10
3 bedrooms	$1.45	$1.66	$1.76
4 bedrooms	$1.24	$1.45	$1.62
5 bedrooms	$1.18	$1.58	$1.23
AADU			
1 bedroom	$1.32	$2.03	$2.12
2 bedrooms	$1.47	$1.67	$1.85

Notes Main house and DADU rent comes from single-family properties. AADU rent comes from 2-4 unit properties. To determine rent values for each neighborhood profile, we took the median value of the composite neighborhoods. For some neighborhoods, Dupre + Scott did not provide rents for 1 bedroom single-family units. For these cases, we calculated the "Detached premium" for two-bedroom units by looking at the ratio of single-family two-bedroom rents to two- to four-unit two-bedroom rents in those neighborhoods. We then applied this ratio to the observed two- to four- unit one-bedroom rent to impute what the single-family one-bedroom rent would be. This was necessary in Ballard, Madison, Central, Magnolia, and Queen Anne.

Exhibit A-10 shows the crosswalk we used for estimating the number of bedrooms for a unit of a given size and determining the appropriate rental rate per square foot.

Exhibit A-10 Bedroom Assumptions

Source: ECONorthwest analysis of existing single-family homes in study area.

Unit size	Number of bedrooms
<900 square feet	1
900-1,399 square feet	2
1,400-1,999 square feet	3
2,000–2,699 square feet	4
2,700+ square feet	5

We used Dupre + Scott data to determine a long-term rental vacancy rate for each neighborhood profile. We used the 1-19 unit vacancy rate and took the median value of the composite neighborhoods.

Exhibit A-11 Long-Term Rental Vacancy Rate Used in Analysis
Source: ECONorthwest analysis of Airbnb data for March 2016-March 2017.

	Lower	Medium	Higher
Vacancy rate	3.0%	2.9%	3.4%

Short-term rental expected income

To determine expected rental income from using an ADU as a short-term rental, we analyzed data on Airbnb properties. The Airbnb data was provided by the City of Seattle and includes 12-month revenue and occupancy rate for each Airbnb listing for March 2016-March 2017 to estimate the expected rental income for an ADU used as a short-term rental unit, we filtered the data to include only listings with the following characteristics:

- **Located in the study area.** This isolates results in single-family zones in Seattle.
- **"Entire Home/Apt."** This excludes listings for shared rooms or private rooms in a larger housing unit.
- **Available for at least 180 days in the last 12 months.** This removes listings that may be owner-occupied part of the year and listings where the owner is posting on Airbnb only occasionally.
- **At least six bookings in the past 12 months.** This removes listings that were unrepresentative or unpopular.
- **Fewer than three bedrooms.** This removes large houses and other properties dissimilar from ADUs.
- **Described as "Houses" or "Townhomes."** This removes units described as condos and apartments.

With the filtered dataset, we calculated average monthly revenue as the annual revenue in the last 12 months divided by 12. Based on each's property latitude and longitude, we categorized it into Higher, Medium, or Lower neighborhood and then calculated the median monthly revenue for each neighborhood profile.

Exhibit A-12 Expected Monthly Income for ADUs used as Short-Term Rentals

	Lower	Medium	Higher
Expected monthly income	$1,143	$1,080	$1,386

Development of a parcel typology

The characteristics of each parcel set an upper bound on what can be built. Some characteristics are permanent (e.g., size and shape of the parcel) while others can change over time (e.g., size and shape of existing structures). To account for varying parcel characteristics, we developed four parcel types, each defined by lot size, shape, and size of current structures. Exhibit A-13 shows the parcel typology we used. The parcel types are important for this analysis because they determine what can physically fit on the lot.

Exhibit A-13 Parcel Typology

	Parcel type			
	A	**B**	**C**	**D**
Lot size (square feet)	3,200	3,750	5,000	7,200
Lot width (feet)	32	31	50	60
Lot depth (feet)	100	120	100	120
Footprint of main house (square feet)	940	980	1,050	1,150
Living space in main house (square feet)	1,500	1,600	1,800	1,900
Footprint of accessory structures (square feet)	250	250	250	350
Size of daylight basement (if present) (square feet)	500	600	700	800
Number of parking spaces	2	2	2	2
Implications of assumptions				
Current lot coverage	37%	33%	26%	21%
Maximum DADU footprint when keeping existing main house	540	583	700	1,370
Under which alternatives are AADUs allowed?	All alternatives	All alternatives	All alternatives	All alternatives
Under which alternatives are DADUs allowed?	2, 3	2, 3	All alternatives	All alternatives

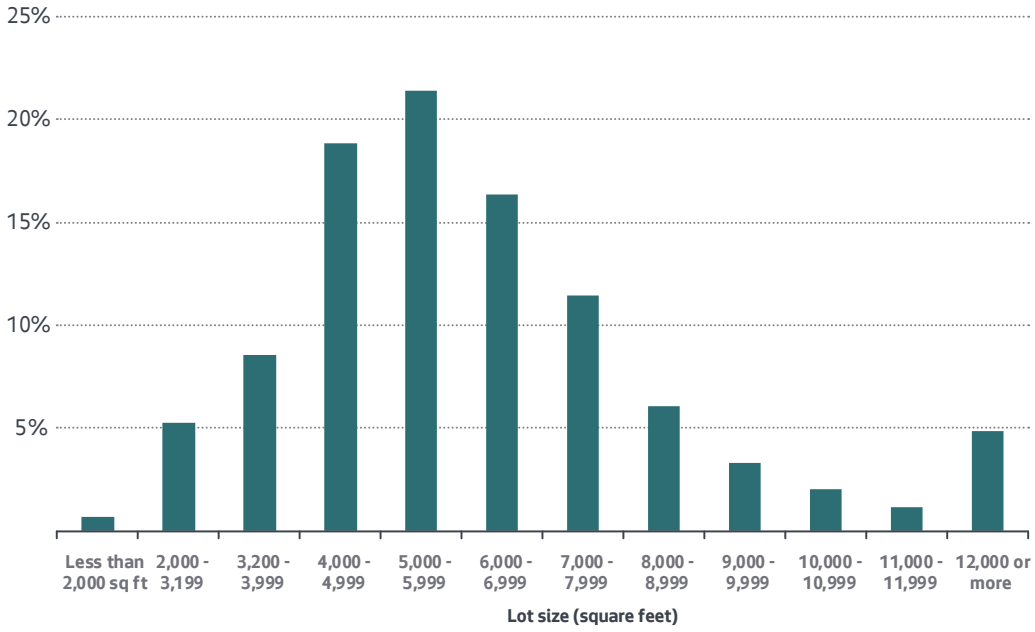
The parcel typology was developed by ECONorthwest and the City of Seattle based on analysis of current parcel conditions. In choosing the parcel types, we had several competing goals:

- Represent the most common parcel characteristics across the study area.
- Represent those parcel sizes that might be most affected by the proposed Land Use Code changes. (Parcels between 3,200 and 3,999 square feet do not allow DADUs currently but would under Alternatives 2 and 3.)
- Represent a range of parcel conditions across the city.

Lot size

Lot size determines the maximum allowed lot coverage. To select the lot sizes used for the typology, we reviewed the distribution of parcel sizes in the study area. The most common lot size in single-family zones in Seattle is 5,000 square feet. Although lots between 3,200 and 3,999 square feet comprise a relatively small share of single-family-zoned lots (nine percent), we chose to use two types in this size range to fully explore the potential impacts of the proposed alternatives on this size category.

Exhibit A-14
Distribution of Parcels by Lot Size in Single-Family Zones
Source: ECONorthwest analysis of King County Assessor Data.



Lot depth and width

Lot depth and width determine how much buildable land is available given required setbacks. Lot width also determines maximum allowed height. Based on review of GIS parcel data, we determined that the two most common lot depths in the study area are 100 feet and 120 feet. Lot depths are similar throughout a neighborhood based on original platting.

Lots less than 30 feet wide have a lower allowed height than other single-family-zoned lots. We considered including a parcel type less than 30 feet wide but decided not to because these lots are extremely uncommon in Seattle. We could not locate any single-family neighborhoods where such narrow lots exist in substantial concentrations. Lot width was determined by dividing lot size by lot depth for each parcel type.

Footprint of main house

The footprint of the main house determines the maximum DADU footprint possible while keeping the main house. To determine footprints, we analyzed mean, median, and mode footprints for each parcel type.

Living space of the house

The current built square footage of the house determines what sales price or rent is achievable for the current house. We determined living space for each parcel type by reviewing data on mean, median, and mode for parcels of a similar size.

Footprint of accessory structures

The footprint of existing accessory structures determines the square footage available for adding a DADU on a lot when preserving all structures. We determined the footprint of accessory structures for each parcel type by reviewing data on mean, median, and mode for parcels of a similar size. Our development prototypes assume that any existing accessory structures would be demolished to make room for a DADU, so the footprint determines the demolition cost.

Size of daylight basement, if present

A survey of Craigslist rental postings conducted in October-November 2017 found that most AADUs in Seattle are basement units. For this analysis, we assumed that AADUs added to existing houses would be conversions of daylight basements. Thus, the assumed size of the

daylight basement determines the maximum AADU size for development outcomes in which the current structure is retained. To determine basement sizes, we analyzed mean, median, and mode values for each parcel type.

Number of parking spaces

The King County Assessor does not track information on the number of legal parking spaces available on parcels. However, this is an important input that determines the feasibility of adding one ADU to an existing house in Alternative 1, or two ADUs in Alternative 3. Our assumption — two parking spaces available for each parcel type — means that the determination of the highest and best use will not be constrained by lack of parking.

On the whole, this assumption may result in an overestimate of the feasibility of adding ADUs. In reality, some parcels likely would be constrained from adding ADUs by lack of parking or the cost of adding an additional parking space. However, parking waivers are available in cases where adding a parking space is physically infeasible due to steep topography or the location of existing structures.

Zoning inputs

The pro forma model reflects the current Land Use Code regulations for development in single-family zones, as well as proposed changes under Alternatives 2 and 3. Zoning inputs include information about required setbacks, maximum lot and rear yard coverage, required parking spaces, allowed number of ADUs, allowed size of ADUs, and ADU owner-occupancy requirements.

The zoning inputs were compiled by ECONorthwest from the Land Use Code and the proposed alternatives and reviewed for accuracy by the City of Seattle.

Development and operating cost inputs

These inputs broadly illustrate single-family market conditions as they existed in Seattle as of Fall 2017. Each variable could change over time and vary for any particular project.

Construction costs

To develop construction cost assumptions, we conducted interviews in November 2017 with builders, architects, and developers who work in single-family neighborhoods in Seattle. We spoke with professionals who build AADUs, DADUs, and single-family homes and who renovate single-family homes.

A major finding from the interviews was that DADU construction costs per square foot are much higher than for larger houses. This is because a DADU includes all the expensive components of building a house (e.g., foundation, framing, plumbing, electrical) without any of the inexpensive components (e.g., hallway space). Several interviewees noted that it is difficult to estimate total DADU price based solely on costs per square foot. Based on that feedback, we use a base cost per DADU and an additional construction cost per square foot.

Exhibit A-15 Construction Costs Used in Pro Forma

Input	Assumption
Single-family home new construction ($/square foot)	$125
Single-family home remodel ($/ square foot)	$90
Garage ($/square foot)	$100
Surface parking and driveways ($/square foot)	$25
New below-grade AADU as part of new construction ($/square foot)	$125
Basement AADU conversion ($/square foot)	$90
DADU new construction ($/square foot)	$125
DADU base cost ($ per unit)	$125,000
Demolition ($/square foot of existing structures)	$5
Construction cost premium of for-sale housing over rental housing	5%

Other development costs and assumptions

In addition to construction costs, several other "soft" costs go into a development project. These include permitting fees, architectural and engineering fees, developer fees, and investment return.

Permitting fees are standardized costs that can be calculated for a proposed project. To estimate the cost of City permits for a particular project, we used the rates in the 2018 Fee Estimator tool (City of Seattle). For residential construction that requires a new connection to the sanitary sewer system, King County charges a sewer capacity charge (King County 2018). This fee applies to DADU construction and to new construction that includes an AADU. We used the 2018 sewer capacity charge rates and assumed that the total amount would be paid at time of construction, rather than spread over time. This charge amounts to $11,268 for a DADU or $6,760.80 for an AADU.

Other assumptions about development costs and investment metrics came from interviews with developers, architects, and builders and from ECONorthwest's experience on other recent projects in the Puget Sound region.

Exhibit A-16
Development Costs and Investment Metrics Used in Pro Forma Modeling

Input	Assumption
Architecture / engineering fees (percent of total hard costs)	6.0%
Sales tax (percent of total hard costs)	9.6%
Developer fee (percent of hard and soft costs)	4.0%
Sales costs including commission and excise tax (percent of sales price)	8.0%
Capitalization rate for rental projects (percent)	4.6%
Return on cost requirement for rental projects (percent)	20%

Alternative 2 includes a 10 percent reduction in predevelopment costs for DADUs. To reflect this in the model, we applied a 10 percent overall reduction to sum of the King County sewer capacity charge, City permit fees, and architecture/engineering fees. In reality, the predevelopment cost reduction could be implemented through other mechanisms, such as through streamlined project review, reduced permit and design costs due to pre-approved plans, or other actions.

In Alternative 3, MHA requirements apply when a property owner creates a second ADU. For development outcomes with two ADUs, we applied an affordability contribution of $13 per square foot for the larger of the two ADUs.

Operating costs

Rental properties have ongoing operating expenses. These vary based on whether the property is a short-term or long-term rental.

Exhibit A-17 Operating Cost Assumptions Used in Pro Forma Modeling

Input	Assumption
Long-term rental	
Operating cost (percent of rent)	30%
Short-term rental	
Operating cost (percent of rent)	50%
Annual City of Seattle operator fee (dollars per year)	$75
Sales tax (percent of rent)	9.6%
Airbnb service fee (percent of rent)	3.0%

Building assumptions

To avoid modeling development outcomes that are impossible or occur infrequently in the real world — such as five-foot wide DADUs or 10,000-square-foot houses — we include practical building assumptions that constrain the modeling results. We developed these assumptions based on review of building characteristics, consultation with the City of Seattle, conversations with architects, and professional judgement.

Exhibit A-18 Building Assumptions Used in Pro Forma Modeling

Input	Assumption
Building efficiency for new construction after articulation / architectural features (100 percent would be a perfect box)	90%
Floor height (feet) in principal structures	15
Minimum size of main house footprint (square feet)	600
Maximum size of main house footprint (square feet)	1,500
Minimum width of main house (feet)	15
Minimum size of DADU footprint (square feet)	250
Minimum unit size (square feet)	300
Percent of AADU above grade (for new construction)	10%
For new construction, maximum percent of total allowed building footprint that can be used for DADU	50%
If adding DADU to existing building, percent of spare lot coverage assumed to be available for DADU	80%

Pro forma modeling

Finally, we put all the pieces together and model each combination of inputs (parcel typology, alternative, neighborhood profile, valuation) for each development outcome. This results in residual land value outputs that we can compare across valuation options and alternatives.

ESTIMATING FUTURE ADU PRODUCTION: FORECAST MODEL

Model design

Owners in the study area have multiple options for developing their properties. To arrive at a reasonable forecast of future development given the proposed alternatives, we need a methodology that accounts for historic rates of ADU production. While the pro forma analysis helps us understand the most profitable outcomes, it does not necessarily reflect the real-world decisions that people make. People build ADUs for various reasons unrelated to profit, including to gain additional living space or to house a family member.

A multinomial logit model is a type of behavioral econometric model that allows us to analyze past decisions and trends to determine the factors that make a parcel more or less likely to add an ADU. By incorporating information on parcels, neighborhoods, and macroeconomic trends, this model predicts the likelihood (as a probability) that every parcel in the study area in single-family use will be modified to incorporate an AADU or DADU or be torn down. This type of model is well suited to evaluating the potential impacts of the proposed alternatives because it accounts for historic rates and characteristics of ADU production. It also allows us to quantitatively estimate the potential impact of specific policy changes. For this analysis, we use a multinomial logit model to estimate how many ADUs might be created in each alternative and to observe how the potential impacts might vary by neighborhood and parcel size.[8]

The multinomial logit model is applied to existing data to estimate the parcel-year probability of four key outcomes: 1) adding an AADU, 2) adding a DADU, 3) demolishing the home and rebuilding, or 4) doing nothing.[9] Since options 1 and 2 are mutually exclusive under the existing policy and, in application, generally not reversible, we model them as a permanent change in the property characteristics, while option 3 is an annual dichotomous event.

We applied this model to all parcels in single-family use in the study area. To estimate each parcel's outcome in a given year, we analyzed King County Assessor's data and City of Seattle permit data for 2010-2017. These sources provided us with parcel characteristics, building characteristics, and information about when properties added ADUs or were redeveloped. We analyzed the effect of:

- Neighborhood
- Topography
- Square footage of total living space (before a teardown, if applicable)

8 The multinomial logit is a very powerful choice model used in a wide variety of applications. As with any modeling approach, however, underlying assumptions and availability of data limit the ability to interpret the results. We discuss limitations and caveats throughout this section, as appropriate.

9 The probability of an individual property choosing one of these outcomes is calculated relative to a reference category (in this analysis, the no-action alternative), and is:

$$ln\left(\frac{\pi_{ij}}{\pi_{ij}}\right) = \alpha_j + \beta_j x_i',$$

where α_j is the intercept term and β_j is a vector of regression coefficients for alternatives j = *AADU,DADU,teardown*. Due to data limitations, we are unable to model the full suite of choice alternatives represented in Exhibit A-2.

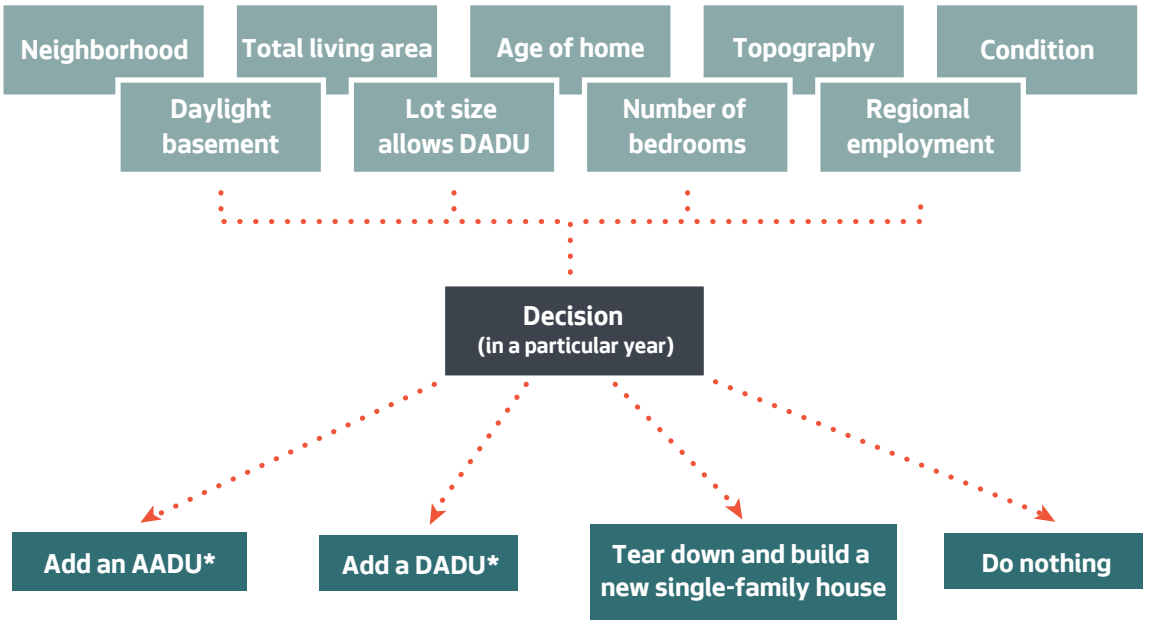
- Square footage of total living space after a teardown (if applicable)[10]
- Age of the home (before a teardown, if applicable)
- Whether the home has a daylight basement
- Number of bedrooms
- Assessed condition of the home
- Whether the lot size allows for a legal DADU
- Total regional employment of the year (PSRC 2015)

To focus on the relevant policies in question, we excluded properties with a lot size greater than one-half acre and properties where the total living area is less than 180 square feet, resulting in a total of 112,104 parcels. Our historical analysis covered 2010 (the first year the City allowed DADUs citywide) through 2017. During that period, 515 properties in the study area added AADUs, 449 properties added DADUs, and 1,803 homes were torn down and rebuilt.

Baseline model results: what characteristics Influence the likelihood of adding an ADU?

The multinomial logit model analyzes the relative effect of each variable on each outcome (AADU, DADU, teardown, or no action).

Exhibit A-19 Decision Path for Multinomial Logit Model



*Only possible if there are no existing ADUs

10 For estimation, both measures of square feet of total living areas were logged to limit the impact of a small number of very large homes.

Exhibit A-20 shows the baseline model results for 2010-2017. The coefficients for each variable can be interpreted by their sign (positive or negative) and magnitude relative to other coefficients within each alternative. Neighborhoods are treated as fixed effects, so their coefficients should be compared to other neighborhoods within the same alternative. A negative coefficient for any variable indicates that it reduces the likelihood of that outcome.

Exhibit A-20 Baseline Multinomial Logit Model Results

	AADU		DADU		Teardown	
	Coefficient	Std. Err.	Coefficient	Std. Err.	Coefficient	Std. Err.
Ballard	0.12	0.52	14.89	783.42	-0.44	0.40
Beacon Hill	0.80	0.52	14.54	783.42	-0.53	0.41
Capitol Hill/Eastlake	0.14	0.51	15.15	783.42	**-1.26**	**0.41**
Central	**1.21**	**0.51**	14.73	783.42	-0.28	0.41
Greenlake/Wallingford	**1.00**	**0.51**	14.66	783.42	-0.59	0.39
Madison/Leschi	0.15	0.51	15.10	783.42	-0.52	0.40
Magnolia	0.01	0.51	14.42	783.42	-0.47	0.39
North Seattle	0.39	0.50	14.74	783.42	-0.10	0.39
Queen Anne	0.41	0.51	14.96	783.42	**-0.95**	**0.40**
Rainier Valley	0.60	0.51	14.23	783.42	-0.64	0.39
University	0.44	0.51	14.71	783.42	-0.36	0.39
West Seattle	0.28	0.51	14.28	783.42	-0.18	0.39
White Center	0.96	0.52	13.23	783.42	-0.01	0.42
Topography	0.10	0.07	**-0.36**	**0.12**	0.00	0.08
Ln of square feet of total living area	**1.76**	**0.77**	0.63	0.51	**-2.43**	**0.07**
Ln of square feet of total living area (new)	**-0.10**	**0.77**	**-1.46**	**0.50**	**4.75**	**0.07**
Age of home (before teardown)	**0.01**	**0.00**	**0.02**	**0.00**	**0.02**	**0.00**
Daylight basement	**0.51**	**0.05**	**-0.41**	**0.09**	**-0.44**	**0.07**
Number of bedrooms	**0.21**	**0.02**	**-0.47**	**0.04**	**-0.20**	**0.03**
Assessed condition	**0.27**	**0.03**	**0.11**	**0.04**	**-0.89**	**0.05**
Lot size allows legal DADU	0.00	0.07	**1.75**	**0.11**	**-0.52**	**0.07**
Regional total employment	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Intercept	**-31.63**	**0.84**	-27.81	783.42	**-23.32**	**0.82**

Note Estimates significant at the 95% level are in **bold**. Values are rounded to two decimal points.

Every variable has a coefficient, but not all variables have a predictive effect on the outcome. We measure this using the standard error associated with each coefficient. Interpret the coefficient as the average effect of the variable. A small standard error relative to the coefficient indicates that the variable has strong predictive power. To interpret results, it is common to define a threshold of "statistical significance" to determine whether a variable has an effect. We use the common (and fairly restrictive) 95 percent confidence level, indicated in bold in the tables below. Any coefficient in bold can be interpreted as having an effect on the probability of the outcome, while any coefficient not in bold can be interpreted as having an effect that is not different than zero.

For example, homes in Capitol Hill/Eastlake are less likely to be torn down than similar homes in other neighborhoods, while homes in the Central Area are more likely than similar homes in other neighborhoods to add an AADU.

The results broadly match our understanding of past ADU production in Seattle. The neighborhood covariates indicate that AADUs are relatively more likely to occur in the Central and Greenlake/Wallingford neighborhoods, while teardowns are relatively less likely to occur in the Capital Hill/Eastlake and Queen Anne neighborhoods. Most neighborhoods do not have a significant effect on the likelihood of an AADU, DADU, or teardown, indicating that structural and lot-specific characteristics have a greater impact than unobservable neighborhood characteristics.

If a property has been identified by the assessor as not being flat (i.e., topography), it is relatively less likely to have a DADU built upon it. Older homes are more likely add an ADU or be torn down than newer homes. Homes with more bedrooms and with a daylight basement are more likely to get an AADU, while smaller homes and those without a daylight basement are more likely either to get a DADU or to be torn down. Homes in better condition are more likely to have an AADU or DADU added, while homes in worse condition are more likely to be torn down.

Several of these results indicate that a tradeoff is occurring between DADUs and teardowns. The presence of a lot over 4,000 square feet (on which adding a DADU is legal) makes a DADU more likely and a teardown less likely (with no effect on AADUs). Additionally, the total square footage variables indicate that larger homes are more likely to get an AADU, while smaller homes are more likely to be torn down. This indicates that homeowners seeking to expand their living space are deciding between tearing down the home or adding an ADU.

Forecasting future ADU production in Alternative 1 (baseline)

The above analysis evaluates all parcel-level decisions that occurred from 2010 through 2017. To estimate what decisions will be made over the next 10 years (from 2018 to 2027), we must forecast how the underlying variables will change during that period, including changes in the regional economy and the ages of individual homes. We implement this in the model by updating the variables for age of the home and regional total employment and recalculating parcel-level probabilities.

To predict the share of homes in 2027 that will have added an ADU or been torn down and rebuilt in the preceding 10 years, we update the age of the home to reflect the age of the home in 2027. For regional total employment over the forecast period, we use PSRC's 2015 Regional Macroeconomic Forecast for that year. Due to the positive effect of both age of the home and regional total employment on AADUs, DADUs, and teardowns, we see an increase in all three outcomes, at an increasing rate, by 2027.

Evaluating the potential Impacts of Alternatives 2 and 3 on ADU production

We also use the multinomial logit model to estimate the potential effects of each action alternative. Where a proposed policy change modifies a variable in the model, we update that value in the data to reflect the change and recalculate new probabilities for each alternative. (This resembles the approach used to predict changes over time.) Based on the proposed Land Use Code changes under consideration, we manipulate two elements in the forecast model:

- **Change in the minimum lot size requirement for adding a DADU.** In Alternatives 2 and 3, we modify the "Legal DADU" variable from zero to one for all properties with a minimum lot size of 3,200 square feet (as opposed to 4,000 square feet in Alternative 1).
- **Change in the maximum floor area ratio for new construction.** In Alternative 3, the "square footage total living area (for new construction)" variable is capped to a FAR limit of 0.5 or 2,500 square feet, whichever is greater.

We evaluate the impacts of these changes for the 10-year forecast period (2018-2027). Since these policy scenarios affect variables relevant only for the DADU and teardown options, we see the largest changes in those outcomes.

Note that some of the proposed changes in Alternatives 2 and 3 are not reflected in the available parcel-level data. These include changes to owner occupancy, maximum household size, parking requirements, maximum DADU size, and DADU construction cost. To the extent that any of these policy proposals affect the likelihood that a parcel has a particular development outcome, those effects are not captured in the forecast model. To compensate for this limitation and establish a reasonable upper bound for the potential number of ADUs created, we adjust these estimates based on the results from the pro forma analysis. This accounts for the potential impact of policy changes that we cannot model while still using best available information on the potential impact of those policy changes that we can model.

Estimating the number of lots in single-family zones choosing to add two ADUs

The multinomial logit model cannot predict the probability of events that do not appear in the historical dataset — namely, the construction of two ADUs on one lot. To estimate the number of lots that might have two ADUs under Alternatives 2 and 3, we use a different approach that estimates the total demand for ADUs, without constraining parcels to the variations that are currently legal.

To estimate the total demand for ADUs, we use the same data and variables[11] from the multinomial logit choice model but instead apply a count data model. For each year in the historical data (2010-2017), we predict the number of ADUs constructed in the study area. Although each parcel in the data only has one ADU, the count data model allows us to relax this constraint and assume that each parcel could have multiple ADUs.[12] Each variable now predicts the likelihood that any given parcel will have one or more ADUs. When applied to the 2010-2017 data, this model predicts the same number of ADUs that were actually built over that period. However, when modified to evaluate the impact of the different policy alternatives, the model predicts the unconstrained total number of ADUs added in a given year.

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11 Although specifications with different sets of variables might provide a better fit to the data for the count data model, we chose to use an identical specification to the multinomial logit model to simplify comparison.

12 Although only one event, Y, occurs for each parcel, we assume that the number of ADUs per parcel is an integer value y = 0, 1, 2… and has a Poisson distribution with probability:

$$\Pr\{Y = y\}_i = \frac{e^{-\beta_j x_i'}(\beta_j x_i')^y}{y!}.$$

Because lots with multiple ADUs do not exist in the historical data, this modeling approach depends more on underlying assumptions. Of the several different modeling approaches available, we opted to use the common Poisson distribution because it applies a simplified set of underlying assumptions that match what we know about ADU production.[13] The Poisson distribution assumes the following characteristics:

- **The event can be counted in whole numbers (e.g.,** 0, 1, 2). This assumption is appropriate because it is not possible to build fractional ADUs.
- **Each event occurs independently of other events.** Adding an ADU on one parcel does not affect the probability of adding an ADU on any other parcel.
- **The probability that an event will occur is relatively small.** This assumption is consistent with historic data on rates of ADU production.

Exhibit A-21 shows the results of the ADU count model for 2010-2017.

13 Other count data models include negative binomial and zero inflated Poisson. Although each model carries a slightly different set of underlying assumptions, it is unlikely that using a different model would change the overall scale of results or our conclusions.

Exhibit A-21 Baseline Poisson Model Results

	Coefficient	Standard Error
Ballard	1.38	1.01
Beacon Hill	1.06	1.02
Capitol Hill/Eastlake	1.71	1.01
Central	1.86	1.01
Greenlake/Wallingford	1.62	1.00
Madison/Leschi	1.33	1.02
Magnolia	0.82	1.01
North Seattle	0.89	1.00
Queen Anne	1.77	1.01
Rainier Valley	0.85	1.01
University	1.11	1.01
West Seattle	0.82	1.00
White Center	0.26	1.03
Topography	0.04	0.11
Ln of square feet of total living area	**-2.04**	**0.16**
Ln of square feet of total living area (new)	**1.74**	**0.15**
Age of home (before teardown)	**-0.01**	**0.00**
Daylight basement	-0.02	0.08
Number of bedrooms	0.06	0.04
Assessed condition	**0.29**	**0.05**
Lot size allows legal DADU	**0.82**	**0.11**
Regional total employment	**0.00**	**0.00**
Intercept	**-12.92**	**1.34**

Note Estimates significant at the 95% level are in **bold**. Values are rounded to two decimal points.

The magnitude, sign, and significance of coefficients can be interpreted similarly to the multinomial logit model above. Because this model does not fully represent all the choice alternatives (i.e., it does not include teardowns), some of these results are somewhat less intuitive than the forecast model results. However, consistent with the multinomial logit estimates, the assessed condition, the legality of a DADU, and regional

total employment all positively affect the number of ADUs demanded on a parcel. The coefficients on total living area mirror the sign and magnitude of the coefficients on teardowns in the previous model, but they contrast with the ADU coefficients. This likely reflects the effect of not including teardowns in the model.

To estimate the latent demand for ADUs, we calculate the probability that an additional ADU (of any type) is added to a particular parcel for each year. The cumulative probability for the 2018-2027 period reflects the total number of ADUs demanded. Since the multinomial logit model predicts whether an ADU will be added at the parcel level, we subtract the number of AADUs and DADUs the multinomial logit model predicts from the total demand for ADUs to generate an estimate of the number of ADUs that would exist without the single ADU constraint present in Alternative 1 and in the existing data.

	Unconstrained total demand for ADUs (Poisson probability model)-
–	*Predicted number of parcels with one AADU or one DADU (multinomial logit model)*
=	*Predicted number of additional ADUs in Alternatives where two ADUs are legal*

Using these results, we then estimate for each alternative from 2018 to 2027:

- The total number of ADUs built in each alternative
- The number of parcels that build at least one ADU
- The number of parcels that build exactly one AADU
- The number of parcels that build exactly one DADU
- The number of parcels that build two ADUs

The approach relies on a number of assumptions, including the same caveats described above in modeling different policy scenarios. Because two ADUs are not currently legal, we have no historical information to use in predicting future production. We can also interpret (and if necessary adjust) the resulting estimates in the context of our real estate pro forma analysis of highest and best use.

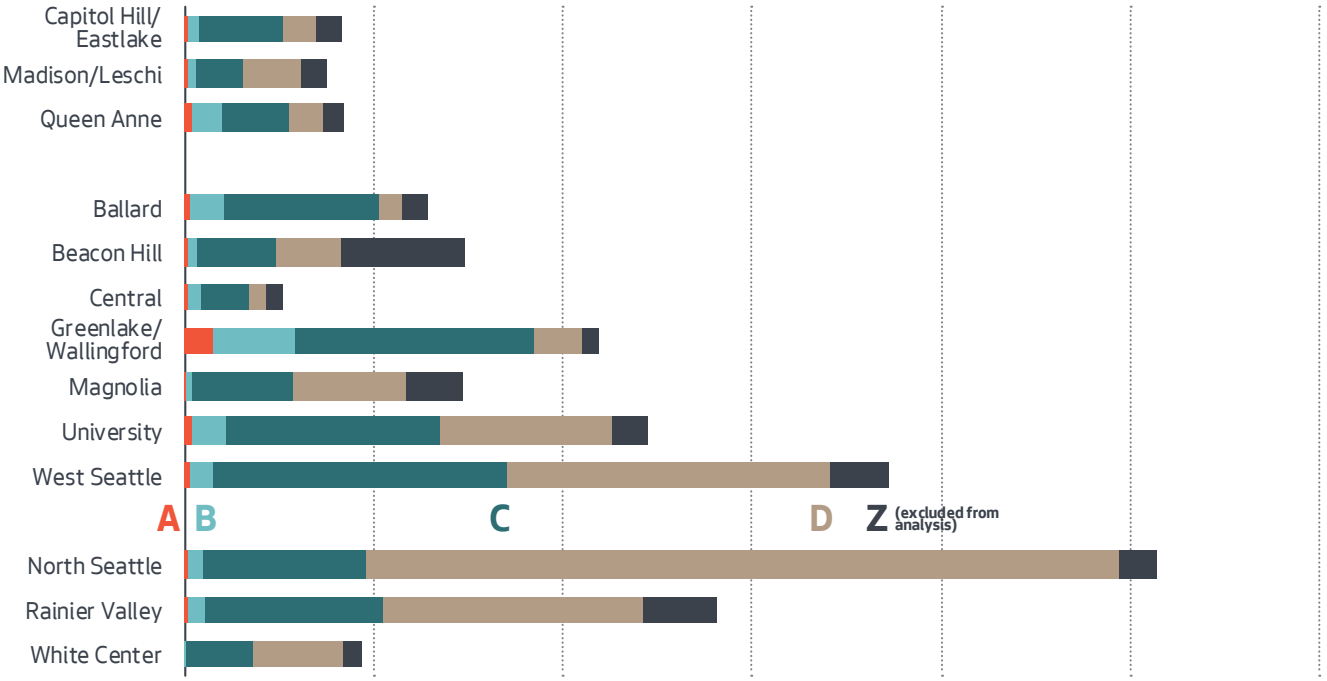
A.4 Findings and Discussion

PARCEL TYPOLOGY BY NEIGHBORHOOD

We present the analysis results in this section by parcel typology and neighborhood cost profile. To interpret the results of the financial pro-forma analysis and the econometric forecast model for specific neighborhoods, we need to know how common each parcel type is in each neighborhood. Exhibit 22 and Exhibit 23 show the number and percentage of each parcel type by neighborhood.

Exhibit A-22 Frequency of Parcel Types by Neighborhood

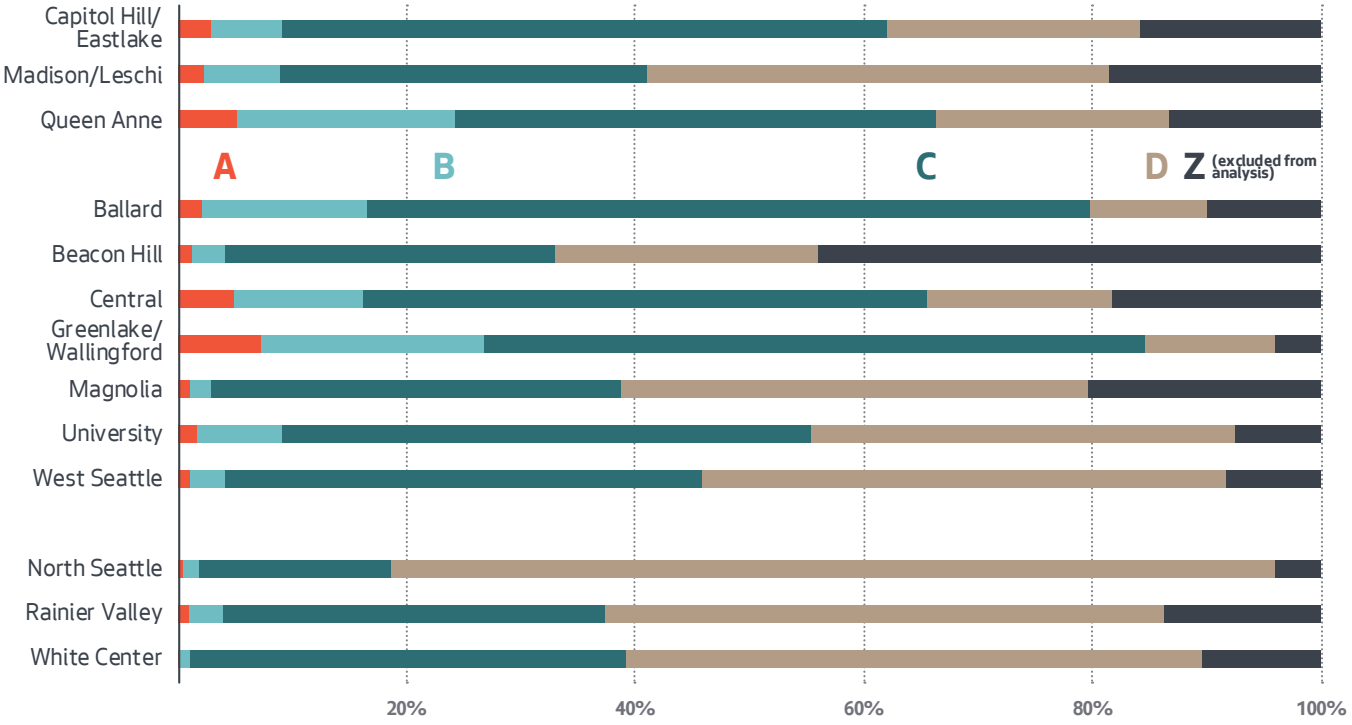
Source: ECONorthwest analysis of King County Assessor data.



Notes This exhibit shows all parcels in the study area. Type A consists of parcels between 3,200 and 3,499 square feet. Type B consists of parcels between 3,500 and 3,999 square feet. Type C consists of parcels between 4,000 and 5,999 square feet. Type D consists of parcels larger than 6,000 square feet. Parcels that are smaller than 3,200 square feet, have a restrictive size or shape, have restricted access, or do not have a single-family use are considered Type Z and were excluded from the analysis.

Exhibit A-23 Share of Parcel Types by Neighborhood

Source: ECONorthwest analysis of King County Assessor data.



Note See Exhibit A-22.

HIGHEST AND BEST USE ANALYSIS

The highest and best use analysis described earlier results in estimates of residual land value for each development outcome for every combination of neighborhood profile, parcel type, and alternative. Higher relative residual land values indicate that a developer could afford to spend more for the land while still covering costs and making a profit. The development outcome and valuation option with the highest residual land value is considered the highest and best use.

Overall, the estimates of highest and best use vary depending on the size of the parcel, the neighborhood, and the alternative. The following section summarizes results for each alternative. For each alternative, we summarize the residual land value results in several ways:

- Estimate of highest and best use (i.e., most feasible outcome)
- Relative feasibility of keeping house with no ADUs, keeping house and adding ADU(s), tearing down house and rebuilding without ADUs, and tearing down house and rebuilding with ADU(s)

- Relative feasibility of outcomes with one AADU, one DADU, two ADUs, or no ADUs
- Relative feasibility of different valuation options
- Relative feasibility of teardowns compared to keeping the existing house

The results presented here should not be interpreted as a determination of what will happen on any given parcel. Instead, this is an analysis of relative feasibility in cases where profit maximization is the only goal and where parcel and market conditions match our prototypes. The outcome for any specific parcel might differ for the reasons we stated previously.

Alternative 1 (No Action)

Alternative 1 represents existing conditions. Exhibit 24 summarizes pro forma results for Alternative 1.

Exhibit A-24 Alternative 1 Estimates of Highest and Best Use

Parcel type	Higher	Medium	Lower
A	**Build new house, as large as possible, no ADUs**	**Build new house, as large as possible, no ADUs**	*Keep house, convert basement to AADU, long-term rental*
B	**Build new house, as large as possible, no ADUs**	**Build new house, as large as possible, no ADUs**	*Keep house, convert basement to AADU, long-term rental*
C	**Build new house, as large as possible, no ADUs**	**Build new house, as large as possible, no ADUs**	*Keep house, convert basement to AADU*
D	*Keep house, convert basement to AADU*	*Keep house, convert basement to AADU, long-term rental*	*Keep house, convert basement to AADU*

Bold text indicates teardown and new construction.

Italicized text indicates keeping the existing house.

Gold highlight indicates that the highest residual land value results from valuing the parcel based on the for-sale price of the main house and the long-term rental income from the ADU.

No highlight indicates the highest residual land value results from valuing the parcel based on the combined for-sale price of the main house and ADU(s).

For small- and medium-sized parcels (A, B, C) in higher- and medium-price neighborhoods, the highest residual land value results from demolishing the existing structure and rebuilding the largest possible house (i.e.,

McMansion).[14] For larger parcels (D) and for all parcel sizes in lower-price neighborhoods, the highest residual land value results from keeping the existing house and adding an AADU.

However, these top-line results do not account for the relative feasibility among different outcomes. In some cases, the second-most feasible option may have a residual land value very similar to the most feasible option, which should be taken into consideration when interpreting results. Exhibit 25 shows the maximum residual land value of four key categories of outcomes.

By comparing the residual land values in Exhibit 25, we can evaluate the relative feasibility of the major categories of outcomes. Similar residual land values indicate that those outcomes are similarly feasible. For example, for type D parcels in medium-price neighborhoods, the maximum residual land value is $115 for outcomes with one AADU and $114 for teardown outcomes with no ADUs. Although Exhibit 24 indicates that one AADU is the highest and best use, the values in Exhibit 25 suggest that the two outcomes have similar feasibility.

The results shown in Exhibit A-25 indicate that tearing down and rebuilding with an AADU and/or DADU is the least feasible option for all parcel sizes and neighborhoods. For all parcel types, the two most feasible options are building a new house with no ADUs and keeping the house and adding an ADU. In general, teardown scenarios are relatively more feasible in higher- and medium-price neighborhoods.

14 This section uses the following descriptions of parcel sizes:
Small parcel types A and B
Medium parcel type C
Large parcel type D

Exhibit A-25 Relative Feasibility of Key Development Outcomes for Alternative 1

	Keep house, no ADUs	Keep house, add ADU(s)	Tear down, rebuild with no ADUs	Tear down ,rebuild with ADU(s)
Higher				
A	$234	$261	**$299**	$214
B	$213	$243	**$291**	$206
C	$172	$203	**$218**	$159
D	$126	**$151**	$151	$110
Medium				
A	$191	$216	**$225**	$147
B	$174	$199	**$219**	$143
C	$134	$156	**$164**	$110
D	$98	**$115**	$114	$76
Lower				
A	$154	**$162**	$133	$63
B	$140	**$148**	$130	$64
C	$109	**$122**	$97	$48
D	$80	**$91**	$67	$33

The highest residual land value for each combination of neighborhood and parcel is **bolded**.

Exhibit A-26 presents the residual land value results differently, by showing the number and type of ADUs added. For all neighborhoods and parcel sizes, development outcomes that add exactly one DADU is the least feasible outcome. On average, the maximum residual land value for an outcome of one DADU is 25 percent less than the most profitable outcomes. In general, outcomes with only a main house (whether new or preserved) and outcomes with one AADU are closer in feasibility. AADUs are generally more feasible on large parcels (type D) and in lower-price neighborhoods.

Exhibit A-26 Relative Feasibility of Different ADU Configurations for Alternative 1

	Max RLV of outcomes with 1 DADU	Max RLV of outcomes with 1 AADU	Max RLV of outcomes with 2 ADUs	Max RLV of outcomes with main house only
Higher				
A	n/a	$261	n/a	**$299**
B	n/a	$243	n/a	**$291**
C	$160	$203	n/a	**$218**
D	$117	**$151**	n/a	$151
Medium				
A	n/a	$216	n/a	**$225**
B	n/a	$199	n/a	**$219**
C	$118	$156	n/a	**$164**
D	$87	**$115**	n/a	$114
Lower				
A	n/a	**$162**	n/a	$154
B	n/a	**$148**	n/a	$140
C	$88	**$122**	n/a	$109
D	$65	**$91**	n/a	$80

The highest residual land value for each combination of neighborhood and parcel is **bolded**.

For any given development outcome, the property owner could decide to rent or sell. For a profit-maximizing owner, this decision will be influenced by the relative strengths of the rental and for-sale markets. Exhibit A-27 shows the relative feasibility of different valuation options. For all neighborhoods and parcel sizes, a house with no ADUs operated as a long-term rental is the least feasible option. On average, the maximum residual land value for an all-rental development outcome is 49 percent less than the most profitable outcome. This suggests that single-family homes are more valuable as for-sale products than as rental products. Treating the entire property (including any ADUs) as one large, for-sale unit is the most profitable outcome for most combinations of parcel type and neighborhood, except for small parcels in lower-price neighborhoods and large parcels in medium-price neighborhoods. In other words, the

estimated rental income stream from the ADU less valuable than the additional sales price that comes from having more square footage.

Exhibit A-27 Relative Feasibility of Valuation Options for Alternative 1

	Main unit as long-term rental (no ADUs)	Main unit for sale, ADU as long-term rental	Main unit for sale, ADU as short-term rental	Entire property for sale
Higher				
A	$120	$260	$247	**$299**
B	$109	$240	$220	**$291**
C	$92	$196	$175	**$218**
D	$67	$145	$126	**$151**
Medium				
A	$114	$216	$197	**$225**
B	$103	$199	$175	**$219**
C	$87	$156	$134	**$164**
D	$64	**$115**	$98	$114
Lower				
A	$99	**$162**	$161	$154
B	$90	**$148**	$142	$140
C	$76	$117	$109	**$122**
D	$56	$86	$80	**$91**

The highest residual land value for each combination of neighborhood and parcel is **bolded**.

Exhibit 28 shows the relative feasibility of outcomes with a new house compared to outcomes that retain the existing house. In all neighborhood profiles, new construction is relatively more feasible on small and medium parcel sizes. These results indicate that new construction is more feasible in higher- and medium-price neighborhoods than in lower-price neighborhoods.

Exhibit A-28 Relative Feasibility of New Construction for Alternative 1

	Tear down and rebuild	Keep existing house
Higher		
A	**$299**	$261
B	**$291**	$243
C	**$218**	$203
D	$151	**$151**
Medium		
A	**$225**	$216
B	**$219**	$199
C	**$164**	$156
D	$114	**$115**
Lower		
A	$133	**$162**
B	$130	**$148**
C	$97	**$122**
D	$67	**$91**

The highest residual land value for each combination of neighborhood and parcel is **bolded**.

Alternative 2

Alternative 2 considers the broadest range of Land Use Code changes to promote housing construction. These changes include allowing lots in single-family zones to have both an AADU and a DADU; removing the owner-occupancy requirement; removing the off-street parking requirement for ADUs; reducing predevelopment costs for DADUs; and allowing DADUs on lots between 3,200 and 3,999 square feet.

Exhibit A-29 summarizes pro forma results for Alternative 2. The most feasible outcomes in Alternative 2 resemble Alternative 1 (No Action), with a few exceptions. In higher-price neighborhoods, the highest and best uses for medium and large parcel sizes shifts to keeping the house and adding two ADUs. In addition, the highest and best use of large parcels (D) in medium-price neighborhoods changes from keeping the existing house and adding one ADU to keeping the house and adding two ADUs.

Exhibit A-29 Alternative 2 Estimates of Highest and Best Use

Parcel type	Higher	Medium	Lower
A	**Build new house, as large as possible, no ADUs**	**Build new house, as large as possible, no ADUs**	*Keep house, convert basement to AADU, long-term rental*
B	**Build new house, as large as possible, no ADUs**	**Build new house, as large as possible, no ADUs**	*Keep house, convert basement to AADU, long-term rental*
C	*Keep house, convert basement to AADU, and add DADU*	**Build new house, as large as possible, no ADUs**	*Keep house, convert basement to AADU*
D	*Keep house, convert basement to AADU, and add DADU*	*Keep house, convert basement to AADU, and add DADU*	*Keep house, convert basement to AADU*

Bold text indicates teardown and new construction.

Italicized text indicates keeping the existing house.

Gold highlight indicates that the highest residual land value results from valuing the parcel based on the for-sale price of the main house and the long-term rental income from the ADU.

No highlight indicates the highest residual land value results from valuing the parcel based on the combined for-sale price of the main house and ADU(s).

Exhibit A-30 shows the maximum residual land value of four key categories of outcomes. Consistent with Alternative 1, outcomes that tear down the house and rebuild with one or more ADUs have the lowest residual land value. In higher- and medium-price neighborhoods, the analysis shows that Alternative 2 increases the relative feasibility of keeping the house and adding one or more ADUs (compared to Alternative 1). For larger parcels in higher-price neighborhoods, the maximum residual land value of adding ADUs to an existing house increases by approximately 10 percent. Medium-price neighborhoods see a smaller increase (approximately five percent for parcel types C and D) while lower-price neighborhoods see essentially no change.

Exhibit A-30 Relative Feasibility of Key Development Outcomes for Alternative 2

	Keep house, no ADUs	Keep house, add ADU(s)	Tear down, rebuild with no ADUs	Tear down ,rebuild with ADU(s)
Higher				
A	$234	$262	**$299**	$216
B	$213	$265	**$291**	$207
C	$172	**$227**	$218	$157
D	$126	**$169**	$151	$109
Medium				
A	$191	$216	**$225**	$149
B	$174	$199	**$219**	$144
C	$134	$163	**$164**	$108
D	$98	**$122**	$114	$75
Lower				
A	$154	**$162**	$133	$65
B	$140	**$149**	$130	$65
C	$109	**$123**	$97	$49
D	$80	**$91**	$67	$34

The highest residual land value for each combination of neighborhood and parcel is **bolded**.

Exhibit A-31 shows the estimated maximum residual land value by number and location of ADUs for Alternative 2.

As in Alternative 1, outcomes with one DADU generally have lower residual land values than outcomes that result in one AADU, two ADUs, or a main house only. However, our analysis shows that the feasibility of DADU outcomes (as measured by absolute residual land value) increases in Alternative 2 relative to the no action alternative. Higher-price neighborhoods show the largest potential increase in DADU residual land value (about six percent increase between Alternative 1 and Alternative 2). Parcels in medium- and lower-price neighborhoods show more moderate changes in feasibility of approximately 2.3-2.7 percent.

Outcomes with one AADU and outcomes with only a main house show very small changes in feasibility (<0.2 percent) between Alternative 1 and Alternative 2 for all parcel sizes and neighborhoods.

Similar to Alternative 1, outcomes with one AADU or outcomes with only a main house tend to have the highest feasibility. On average across all parcel types and neighborhoods, the residual land value of the best main house outcomes is only five percent less than the most feasible outcome overall. Compared to the most feasible outcome, residual land values for outcomes with one AADU are six percent less, outcomes with two ADUs 10 percent less, and outcomes with a DADU 26 percent less.

One major policy change from Alternative 1 to Alternative 2 is that a single lot can have two ADUs. Our analysis indicates that this outcome is generally more feasible on larger parcels in higher- and medium-price neighborhoods. In lower-price neighborhoods, residual land value of two-ADU outcomes averages 18 percent less than the most feasible outcome overall.

Exhibit A-31 Relative Feasibility of Different ADU Configurations for Alternative 2

	Max RLV of outcomes with 1 DADU	Max RLV of outcomes with 1 AADU	Max RLV of outcomes with 2 ADUs	Max RLV of outcomes with main house only
Higher				
A	$223	$261	$262	**$299**
B	$202	$244	$265	**$291**
C	$170	$203	**$227**	$218
D	$124	$151	**$169**	$151
Medium				
A	$171	$216	$194	**$225**
B	$157	$199	$188	**$219**
C	$121	$156	$163	**$164**
D	$89	$116	**$122**	$114
Lower				
A	$125	**$162**	$132	$154
B	$115	**$149**	$115	$140
C	$91	**$123**	$102	$109
D	$67	**$91**	$77	$80

The highest residual land value for each combination of neighborhood and parcel is **bolded**.

Exhibit A-32 shows the estimated relative feasibility of different valuation options in Alternative 2. For only one parcel type does the most profitable valuation change between Alternative 1 and Alternative 2: type D parcels in medium-price neighborhoods. Treating the entire property (including any ADUs) as one large, for-sale unit continues to the most profitable outcome for most variations, especially in higher-price neighborhoods.

Like Alternative 1, renting all units is the least profitable valuation option for all combinations of neighborhood and parcel type in Alternative 2. However, our analysis indicates that the relative feasibility of renting (as opposed to selling) increases between Alternatives 1 and 2. In higher- and medium-price neighborhoods, the estimated residual land value of renting increases by 21-24 percent. In lower-price neighborhoods, the estimated increase is 11-14 percent.

Exhibit A-32 Relative Feasibility of Valuation Options for Alternative 2

	All units as long-term rental	Main unit for sale, ADUs as long-term rental	Main unit for sale, one ADU as short-term rental	Entire property for sale
Higher				
A	$155	$260	$247	**$299**
B	$140	$240	$221	**$291**
C	$119	$196	$175	**$227**
D	$89	$145	$126	**$169**
Medium				
A	$144	$216	$197	**$225**
B	$133	$199	$175	**$219**
C	$113	$156	$134	**$164**
D	$85	$116	$98	**$122**
Lower				
A	$111	**$162**	$161	$154
B	$103	**$149**	$142	$140
C	$87	$117	$109	**$123**
D	$65	$86	$80	**$91**

The highest residual land value for each combination of neighborhood and parcel is **bolded**.

Exhibit A-33 shows the estimated relative feasibility of new construction in Alternative 2. For higher- and medium-price neighborhoods, the feasibility of keeping the existing house is higher in Alternative 2 than in Alternative 1. This change is largest for larger parcel sizes. Lower-price neighborhoods see only a minimal (<0.2 percent) change between Alternative 1 and Alternative 2.

Exhibit A-33 Relative Feasibility of New Construction for Alternative 2

	Tear down and rebuild	Keep existing house
Higher		
A	**$299**	$262
B	**$291**	$265
C	$218	**$227**
D	$151	**$169**
Medium		
A	**$225**	$216
B	**$219**	$199
C	**$164**	$163
D	$114	**$122**
Lower		
A	$133	**$162**
B	$130	**$148**
C	$97	**$122**
D	$67	**$91**

The highest residual land value for each combination of neighborhood and parcel is **bolded**.

Alternative 3

Alternative 3 considers more modest adjustments to the Land Use Code that emphasize encouraging a variety of housing types at a similar scale as existing development in single-family zones. The ADU-related changes include allowing lots in single-family zones to have both an AADU and a DADU; removing the off-street parking requirement for the first (but not second) ADU; allowing lots between 3,200 and 3,999 square feet to add a DADU; and applying MHA affordable housing requirements for the second

ADU. Alternative 3 also adds a maximum floor area ratio (FAR) limit for new development.

Exhibit A-34 summarizes pro forma results for Alternative 3. Compared to Alternative 1, fewer parcel types have a highest and best use of building a new very large house.

Exhibit A-34 Alternative 3 Estimates of Highest and Best Use

Parcel type	Higher	Medium	Lower
A	**Build new house, as large as possible, no ADUs**	**Build new house, as large as possible, no ADUs,**	*Keep house, convert basement to AADU, long-term rental*
B	**Build new house, as large as possible, no ADUs**	**Build new house, as large as possible, no ADUs**	*Keep house, convert basement to AADU, long-term rental*
C	*Keep house, convert basement to AADU and add DADU*	*Keep house, convert basement to AADU and add DADU*	*Keep house, convert basement to AADU*
D	*Keep house, convert basement to AADU and add DADU*	*Keep house, convert basement to AADU and add DADU*	*Keep house, convert basement to AADU*

Bold text indicates teardown and new construction.

Italicized text indicates keeping the existing house.

Gold highlight indicates that the highest residual land value results from valuing the parcel based on the for-sale price of the main house and the long-term rental income from the ADU.

No highlight indicates the highest residual land value results from valuing the parcel based on the combined for-sale price of the main house and ADU(s).

Exhibit A-35 shows the maximum residual land value of four key categories of outcomes. Consistent with Alternative 1 and Alternative 2, outcomes that tear down the house and rebuild with one or more ADUs have the lowest residual land value for all combinations of neighborhood and parcel type. In higher- and medium-price neighborhoods, Alternative 3 increases the relative feasibility of keeping the house and adding one or more ADUs (compared to Alternative 1). However, this increase is smaller in Alternative 3 than in Alternative 2. In higher- and medium-price neighborhoods, the maximum residual land value for keeping the house and adding one or more ADUs increased by four percent between Alternative 1 and Alternative 3, and five percent between Alternative 1 and Alternative 2. For larger parcels in higher-price neighborhoods, the maximum residual land value of adding ADUs to an existing house increases by approximately nine percent. Medium-price neighborhoods

see a smaller increase (approximately two percent for parcel types C and D) while lower-price neighborhoods see essentially no change.

Exhibit A-35 Relative Feasibility of Key Development Outcomes for Alternative 3

	Keep house, no ADUs	Keep house, add ADU(s)	Tear down, rebuild with no ADUs	Tear down ,rebuild with ADU(s)
Higher				
A	$234	$261	**$299**	$216
B	$213	$259	**$277**	$198
C	$172	**$223**	$207	$156
D	$126	**$166**	$151	$108
Medium				
A	$191	$216	**$225**	$149
B	$174	$199	**$219**	$144
C	$134	**$163**	$164	$108
D	$98	**$122**	$114	$75
Lower				
A	$154	**$162**	$133	$65
B	$140	**$148**	$123	$59
C	$109	**$122**	$92	$47
D	$80	**$91**	$67	$34

The highest residual land value for each combination of neighborhood and parcel is **bolded**.

Exhibit A-36 shows the estimated maximum residual land value by number and location of ADUs for Alternative 3.

The results suggest that DADU feasibility in Alternative 3 would be similar to Alternative 2 (and higher than Alternative 1). DADU outcomes in Alternative 3 show slightly lower residual land values than in Alternative 2 due to policy differences that affect DADU cost. (Alternative 2 includes a predevelopment cost reduction for DADUs.)

Outcomes with one AADU show no change in feasibility between Alternative 1 and Alternative 3 for all parcel sizes and neighborhoods.

For some parcels, Alternative 3 may reduce feasibility for outcomes with only one unit. Parcel types B and C in higher- and medium-price neighborhoods show a five percent decrease in the maximum residual land value of outcomes with only a main house. Other parcel types show no change in feasibility.

As in Alternative 2, our analysis indicates that building two ADUs is more feasible on larger parcels in higher- and medium-price neighborhoods. However, the feasibility of building two ADUs is slightly lower in Alternative 3 relative to Alternative 2. Consistent with Alternative 2, building two ADUs is relatively less feasible in lower-price neighborhoods. Average residual land value of two-ADU outcomes is about 22 percent less than the most feasible outcome overall in lower-price neighborhoods, seven percent less in medium-price neighborhoods, and five percent less in high-price neighborhoods.

Exhibit A-36 Relative Feasibility of Different ADU Configurations for Alternative 3

	Max RLV of outcomes with 1 DADU	Max RLV of outcomes with 1 AADU	Max RLV of outcomes with 2 ADUs	Max RLV of outcomes with main house only
Higher				
A	$222	$261	$256	**$299**
B	$201	$243	$259	**$277**
C	$169	$203	**$223**	$207
D	$124	$151	**$166**	$151
Medium				
A	$170	$216	$189	**$225**
B	$156	$199	$183	**$209**
C	$120	$156	**$159**	$156
D	$88	$115	**$119**	$114
Lower				
A	$124	**$162**	$126	$154
B	$114	**$148**	$110	$140
C	$90	**$122**	$98	$109
D	$66	**$91**	$74	$80

The highest residual land value for each combination of neighborhood and parcel is **bolded**.

Exhibit A-37 shows the estimated relative feasibility of different valuation options in Alternative 3. Only one parcel size shows a change in the most profitable valuation between Alternative 1 and Alternative 3: type D parcels in medium-price neighborhoods. Treating the entire property (including any ADUs) as one large, for-sale unit remains the most profitable outcome for most combinations of parcel type and neighborhood, especially in higher-price neighborhoods.

As with Alternatives 1 and 2, renting all units is the least profitable valuation option for all combinations of neighborhood and parcel size. The estimated feasibility of renting in Alternative 3 is similar to Alternative 1 (and lower than in Alternative 2).

Exhibit A-37 Relative Feasibility of Valuation Options for Alternative 3

	All units as long-term rental	Main unit for sale, ADUs as long-term rental	Main unit for sale, one ADU as short-term rental	Entire property for sale
Higher				
A	$120	$260	$247	**$299**
B	$109	$240	$220	**$277**
C	$92	$196	$175	**$223**
D	$67	$145	$126	**$166**
Medium				
A	$114	$216	$197	**$225**
B	$103	$199	$175	**$209**
C	$87	$156	$134	**$159**
D	$64	$115	$98	**$119**
Lower				
A	$99	**$162**	$161	$154
B	$90	**$148**	$142	$140
C	$76	$117	$109	**$122**
D	$56	$86	$80	**$91**

The highest residual land value for each combination of neighborhood and parcel is **bolded**.

Exhibit A-38 shows the estimated relative feasibility of new construction in Alternative 3. For all neighborhoods, Alternative 3 appears to decrease the feasibility of teardowns. This effect is strongest for parcels types B and C. In higher- and medium-price neighborhoods, Alternative 3 also increase the financial incentive of keeping the existing house compared to Alternative 1. This change is largest for larger parcel sizes.

Exhibit A-38 Relative Feasibility of New Construction for Alternative 2

	Tear down and rebuild	Keep existing house
Higher		
A	**$299**	$261
B	**$277**	$259
C	$207	**$223**
D	$151	**$166**
Medium		
A	**$225**	$216
B	**$209**	$199
C	$156	**$159**
D	$114	**$119**
Lower		
A	$133	**$162**
B	$123	**$148**
C	$92	**$122**
D	$67	**$91**

The highest residual land value for each combination of neighborhood and parcel is **bolded**.

ESTIMATES OF FUTURE ADU PRODUCTION

Results

Using the methods described earlier, we arrive at estimates of ADU production and single-family new construction for 2018-2027.

The econometric forecast model cannot account for all proposed policy changes. To account for those un-modeled policy changes and arrive at a reasonable upper-bounds estimate of ADU production, we apply the

percent increases shown in Exhibit A-39 to the modeled estimates as adjustment factors.

Exhibit A-39
Assumed Percent Increases in Modeled Number of Events Due to Policy Changes Not Accounted for in Model

	Alternative 2	Alternative 3
One AADU	5%	2%
One DADU	15%	10%
Two ADUs	30%	25%
Tear down	0%	0%

- **One AADU.** The adjustment factors reflect the potential effect of modifying the parking requirement. The difference between Alternatives 2 and 3 reflects policy differences in the owner-occupancy requirement. These adjustments are higher than would be indicated by the pro forma analysis alone, which estimated that the feasibility of building an AADU would increase by less than one percent. To arrive at a reasonable upper-bounds estimate for AADU production, we are using a larger adjustment than indicated by the results of the pro forma analysis to account for the potential effect of changing the parking requirement.
- **One DADU.** The adjustment factors reflect an upper-bounds estimate of the potential effect of relaxing the parking requirement, allowing larger DADUs, and increasing the rear yard coverage limit. The difference between Alternatives 2 and 3 reflects policy differences in the cost of DADU construction and owner-occupancy requirement. (Again, these adjustments are higher than indicated by the results of the pro forma analysis. The pro forma results indicate that feasibility of DADUs would increase at most six percent in Alternative 2, and only for some combinations of parcel type and neighborhood.)
- **Two ADUs.** The count data model uses historical data to predict the total unconstrained number of ADUs added (without the current policy of one ADU per lot). Even with this approach, there is still underlying uncertainty due to the lack of data on potential demand. We used relatively high adjustment factors (30 percent for Alternative 2 and 25 percent for Alternative 3) in order to arrive at reasonable upper-bounds estimates. These adjustment factors are higher than indicated by the pro forma analysis, which found that the feasibility of building two ADUs would be at most 10 percent more feasible than the next best option, to account for this underlying

uncertainty. The difference between Alternatives 2 and 3 reflects policy differences in the proposed parking, MHA, and owner-occupancy requirements.

Exhibit A-40 presents our estimates for ADU production and new construction after applying these adjustments. These results indicate that Alternatives 2 and 3 would both have the intended effect of increasing the production of ADUs citywide. The results show that about 1,890 ADUs would be created under Alternative 1 from 2018 to 2017. In comparison, we estimate that Alternative 2 would result in about 1,440 additional ADUs over the 10-year period, while Alternative 3 would result in about 1,210 additional ADUs.

Exhibit A-40 Estimated Citywide Production of ADUs and New Homes, 2018-2027

	Alternative 1	Alternative 2	Alternative 3	Percent change from Alt 1 to Alt 2	Percent change from Alt 1 to Alt 3
Estimated number of ADUs built	1,890	3,330	3,100	76%	64%
Estimated number of parcels that build exactly one AADU	900	630	650	-30%	-28%
Estimated number of parcels that build exactly one DADU	990	940	960	-5%	-3%
Estimated number of parcels that build two ADUs	—	880	745	n/a	n/a
Estimated number of parcels that build at least one ADU	1,890	2,450	2,355	30%	25%
Percent of study area parcels that build at least one ADU	1.5%	2.0%	1.9%	30%	25%
Estimated number of existing homes torn down and redeveloped	2,610	2,460	2,200	-6%	-16%
Percent of study area parcels with tear downs	2.1%	2.0%	1.8%	-6%	-16%

Both Alternatives 2 and 3 could reduce the number of teardowns. These results reflect the finding from the forecast model that, historically, households in Seattle have traded off between adding ADUs and demolishing and rebuilding. The model predicts that allowing DADUs on smaller lots (as proposed in Alternative 2 and 3) would increase ADU production on those lots and, at the same time, decrease teardowns.

Alternative 3 would have the largest potential reduction in teardowns, with an estimated 16 percent decrease over Alternative 1. The larger reduction in teardowns under Alternative 3 is due to the proposed FAR limit.

Exhibit A-41 shows the same results broken out by neighborhood profile (higher, medium, or lower price). In Alternative 1, baseline rates of ADU production and new construction are highest in higher-price neighborhoods (where 1.9 percent of lots would add an ADU and 2.9 percent of lots would experience a teardown) than in lower-price neighborhoods (1.4 percent and 1.8 percent, respectively). Medium-price neighborhoods fall in the middle.

Exhibit A-41 Estimated Citywide Production of ADUs and New Homes, 2018-2027, by Neighborhood Profile

	Alternative 1	Alternative 2	Alternative 3	Percent change from Alt 1 to Alt 2	Percent change from Alt 1 to Alt 3
Estimated number of ADUs built					
Higher	235	460	400	96%	70%
Medium	1,020	1,880	1,750	84%	72%
Lower	635	990	950	56%	50%
Estimated number of parcels that build at least one ADU					
Higher	235	330	320	40%	36%
Medium	1,020	1,365	1,310	34%	28%
Lower	635	755	725	19%	14%
Percent of study area parcels that build at least one ADU					
Higher	1.9%	2.7%	2.6%	40%	36%
Medium	1.6%	2.1%	2.0%	34%	28%
Lower	1.4%	1.7%	1.6%	19%	14%
Percent of study area parcels with tear downs					
Higher	2.9%	2.7%	2.0%	-9%	-31%
Medium	2.2%	2.1%	1.9%	-7%	-18%
Lower	1.8%	1.7%	1.7%	-2%	-6%

Note Estimates have been rounded to the nearest 10.

This analysis also indicates that higher-price neighborhoods would see the largest potential changes under the action alternatives, followed by

medium-price neighborhoods. Lower-price neighborhoods would see the smallest potential changes from either action alternative. Alternative 2 would nearly double the number of ADUs produced in higher-price neighborhoods (96 percent increase relative to Alternative 1) and lower the number of teardowns nine percent, while lower-price neighborhoods would experience a more modest increase in ADUs (56 percent) and decrease in teardowns (two percent).

Likewise, policies in Alternative 3 that limit the maximum size of new construction would have the largest potential effects in higher-price neighborhoods. In Alternative 3, the estimated number of teardowns in higher-price neighborhoods would decrease by 31 percent relative to Alternative 1, but by only six percent in lower-price neighborhoods.

The likelihood of an ADU or new single-family home varies by neighborhood and parcel type. Exhibit A-42 shows the share of lots estimated to add an ADU or tear down and build a new single-family house over the 2018-2027 forecast period for each combination of neighborhood profile and parcel type.

Exhibit A-42 Percent of Lots Estimated to Add an ADU or redevelop, by Parcel Type and Neighborhood Price Profile

Neighborhood profile	Parcel type	Percent of parcels that add 1 AADU			Percent of parcels that add 1 DADU			Percent of parcels that add 2 ADUs			Percent of parcels with tear-downs		
		Alt 1	Alt 2	Alt 3	Alt 1	Alt 2	Alt 3	Alt 1	Alt 2	Alt 3	Alt 1	Alt 2	Alt 3
High	A	0.7%	0.5%	0.5%	0.0%	1.0%	1.1%	0.0%	1.1%	0.8%	2.8%	1.9%	1.6%
High	B	0.8%	0.5%	0.6%	0.0%	1.5%	1.7%	0.0%	1.2%	0.8%	3.1%	1.8%	1.4%
High	C	0.9%	0.6%	0.7%	1.2%	1.0%	1.3%	0.0%	1.3%	0.8%	2.3%	2.0%	1.4%
High	D	1.8%	1.5%	1.7%	0.9%	0.8%	0.9%	0.0%	0.7%	0.3%	4.3%	4.3%	3.2%
High	Z	0.6%	0.3%	0.3%	0.4%	0.2%	0.2%	0.0%	0.7%	0.7%	2.3%	2.3%	2.1%
Medium	A	0.8%	0.6%	0.6%	0.0%	1.3%	1.3%	0.0%	0.8%	0.7%	2.6%	1.6%	1.5%
Medium	B	0.7%	0.6%	0.6%	0.0%	1.4%	1.4%	0.0%	0.8%	0.7%	3.0%	1.8%	1.5%
Medium	C	0.7%	0.5%	0.5%	1.1%	1.0%	1.0%	0.0%	0.8%	0.7%	2.0%	1.9%	1.6%
Medium	D	0.8%	0.6%	0.6%	0.8%	0.6%	0.6%	0.0%	0.7%	0.7%	2.4%	2.4%	2.2%
Medium	Z	0.6%	0.3%	0.3%	0.4%	0.2%	0.2%	0.0%	0.7%	0.7%	2.1%	2.1%	2.0%
Low	A	0.5%	0.3%	0.3%	0.0%	0.7%	0.7%	0.0%	0.7%	0.6%	2.0%	1.2%	1.2%
Low	B	0.5%	0.4%	0.4%	0.0%	1.5%	1.4%	0.0%	0.2%	0.1%	2.0%	1.2%	1.1%
Low	C	0.5%	0.4%	0.4%	0.9%	0.8%	0.8%	0.0%	0.5%	0.4%	1.5%	1.4%	1.3%
Low	D	0.7%	0.5%	0.5%	0.8%	0.7%	0.7%	0.0%	0.6%	0.5%	1.9%	1.9%	1.8%
Low	Z	0.4%	0.1%	0.1%	0.2%	0.1%	0.1%	0.0%	0.6%	0.6%	1.8%	1.8%	1.8%

DISCUSSION

Taken together, the results of the highest and best use analysis indicate that Alternative 2 and Alternative 3 could increase the relative financial feasibility of different development outcomes and valuation choices, but that these shifts would likely be small compared to overall size of the single-family housing stock. Meanwhile, the forecast model indicates that Alternative 2 and Alternative 3 could increase ADU production and decrease teardowns of single-family homes, with the largest potential changes in ADU production occurring in Alternative 2.

Potential changes to owner-occupancy

The pro forma results indicate that Alternative 2 could potentially increase the profitability of treating lots in single-family zones as rental properties, but that renting would remain the least profitable valuation option. Across all alternatives, the most profitable outcome is likely to be either entirely for-sale or a for-sale main house with ADU(s) as long-term rentals. This is because in current market conditions, single-family houses and ADUs are generally more valuable on the for-sale market than as rental properties. In other words, valuing an ADU as extra square footage on a house for sale results in a higher residual land value than valuing the ADU based on its achievable rental income.

Potential changes to scale and urban form

The pro forma results suggest that both Alternative 2 and Alternative 3 may increase the relative feasibility of retaining the existing home (as opposed to demolishing and building new). In no cases did the pro forma analysis indicate a greater shift towards demolition of existing houses.

Similarly, the decision model estimates that the number of houses torn down and redeveloped would be highest in Alternative 1 and lowest in Alternative 3. Relative to Alternative 1, Alternative 2 could potentially result in six percent fewer houses demolished over the 10-year forecast period, while Alternative 3 could potentially result in 16 percent fewer houses demolished.

Alternatives 2 and 3 both legalize two ADUs on lots in single-family zones. For lots where this outcome is most likely to occur, our analysis suggests that the two ADUs would be added to the existing house (rather than built as part of new construction) as an investor weighs the trade-offs

of achieving more square footage relative to the cost to develop the product.

Potential impacts to housing affordability

Housing affordability refers to housing cost relative to income. Changes to housing affordability can occur through two primary mechanisms: 1) changing the price of housing and 2) changing income.

Potential changes to housing price

The proposed alternatives could affect housing prices in two main ways: by changing supply (i.e., the number of housing units) or by changing the size and/or characteristics of units.

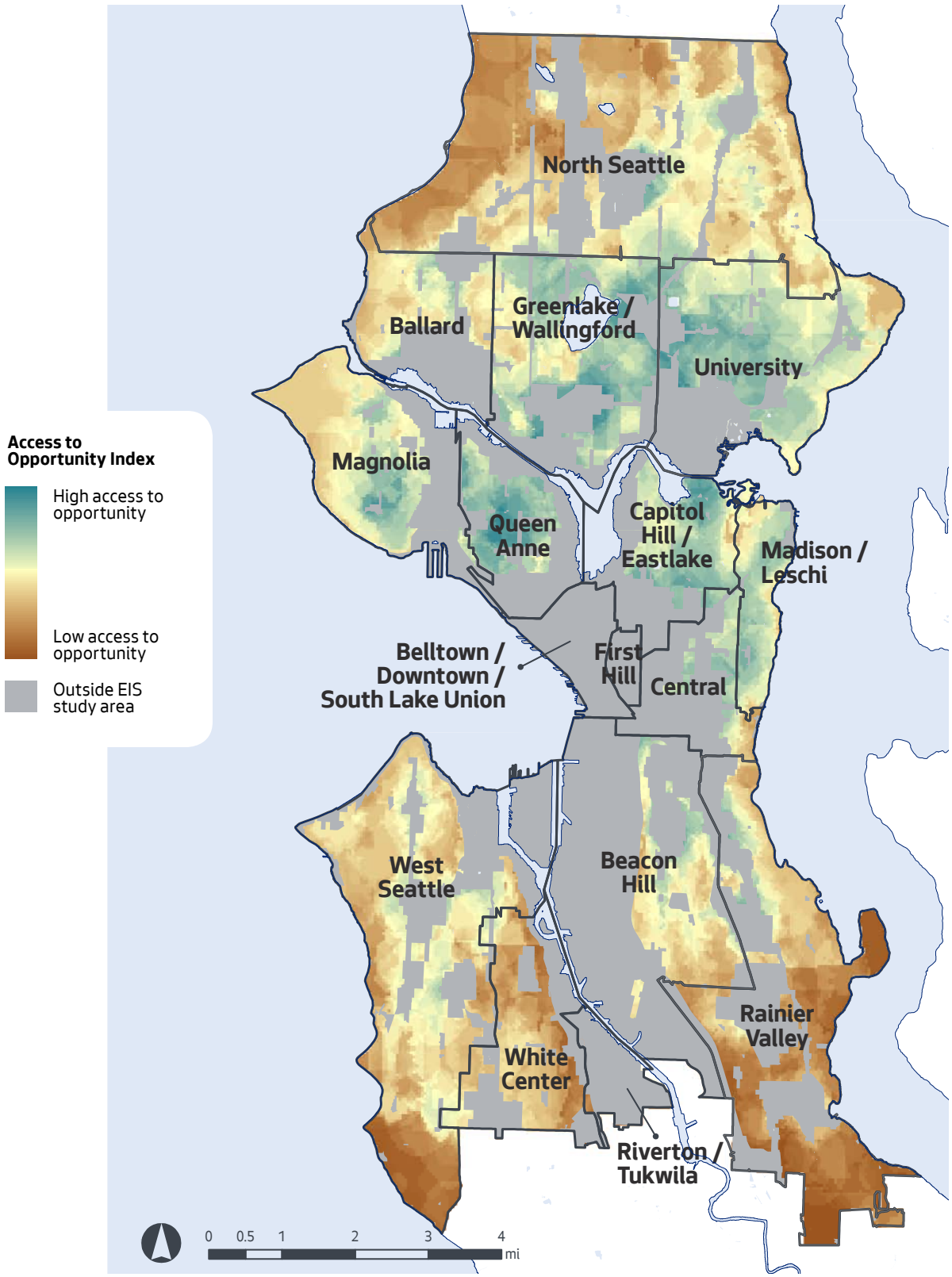
Our results indicate that Alternatives 2 and 3 may increase the supply of housing units in single-family zones by increasing the production of two- and three-unit outcomes relative to single-unit outcomes. This effect, which is larger for Alternative 2 than for Alternative 3, may marginally improve housing affordability.[15] Currently, the number of housing units in Seattle's single-family zones is relatively stable. This is a result of having few development opportunities in areas that are already built out. People who want to live in these areas have limited options (both in terms of diversity of housing products available and the number of vacant or for-sale units). Expanding the supply of housing in these neighborhoods can reduce the upward bidding pressure for housing that results from product scarcity. Generally, increasing housing supply helps drive up vacancy rates and eventually puts downward pressure on prices, although in the short-run there is a limit to this dynamic.

Both the pro forma analysis and the decision model found that ADU production rates are likely to vary by neighborhood profile, with higher rates of ADU production in more expensive neighborhoods. As shown in Exhibit A-43, these also tend to be places with greater access to opportunity.

15 For a literature review of the links between housing supply and housing costs, see Appendix I of the MHA EIS "Housing Production and Cost: A Review of the Research Literatures." http://www.seattle.gov/Documents/Departments/HALA/Policy/MHA_FEIS/AppI_MHA_FEIS_2017.pdf.

Exhibit A-43 Seattle 2035 Access to Opportunity Index

Source: Seattle 2016



Changing the size or characteristics of units can also affect the price of housing. Larger units tend to be more expensive. Increasing the number of ADUs (as we estimate may occur in Alternatives 2 and 3) has the effect of providing smaller, less expensive units in single-family areas. (The maximum size of an ADU is 1,000 square feet, compared with 3,130 square feet for the typical new single-family home.)[16]

Alternatives 2 and 3 both allow the construction of larger DADUs than are allowed in Alternative 1, which would tend to be more expensive than smaller DADUs. However, the pro forma results indicate that property owners may not build to the maximum DADU size allowed.

A final way of looking at potential effects on the price of housing is to look at estimated changes to the maximum residual land value under each alternative. An increase in the residual land value suggests developers can afford to pay more for land, and thus that land prices might increase. As shown in Exhibit A-44, estimated changes to maximum residual land value vary by alternative, neighborhood, and parcel type. In high-price neighborhoods, the amount a developer could afford to pay for land increases for parcel types C and D, suggesting that land prices could increase for those properties. In medium-price neighborhoods, the largest parcels (type D) experience an increase in residual land values, while smaller parcels show no change or a decrease. In lower-price neighborhoods, the amount a developer could afford to pay is consistent across the three alternatives, suggesting no change in land prices.

16 3,130 square feet is the median total square footage of single-family houses built 2016-2017 in the study area.

Our results indicate that Alternative 3 could decrease residual land value for certain parcel types in high- and medium-price neighborhoods relative to the no action alternative. This reflects the FAR limit on new construction included in Alternative 3.

Exhibit A-44 Estimated Changes to Maximum Residual Land Value

	Alternative 1	Alternative 2	Alternative 3	Percent change from Alt 1 to Alt 2	Percent change from Alt 1 to Alt 3
Higher					
A	$299	$299	$299	0%	0%
B	$291	$291	$277	0%	-5%
C	$218	$227	$223	4%	2%
D	$151	$169	$166	12%	10%
Medium					
A	$225	$225	$225	0%	0%
B	$219	$219	$209	0%	-5%
C	$164	$164	$159	0%	-3%
D	$115	$122	$119	5%	3%
Lower					
A	$162	$162	$162	0%	0%
B	$148	$149	$148	0%	0%
C	$122	$123	$122	0%	0%
D	$91	$91	$91	0%	0%

Potential changes to income

Decreasing housing costs is the most commonly discussed method of increasing housing affordability, but increasing income can achieve the same effect. A household with an income of $100,000 can afford to pay more for housing than a household with an income of $50,000. An ADU operated as a rental unit can provide an additional revenue stream for homeowners. Policies that make it easier or less expensive to build ADUs may improve affordability for some homeowners by providing new income sources.

Potential impacts to residential displacement, marginalized communities, and people of color

As shown in Exhibit A-45, the neighborhoods in our study area most vulnerable to displacement are Rainier Valley, White Center, Beacon Hill, and North Seattle. Except for Beacon Hill, these are all lower-price neighborhoods. Those four neighborhoods also have larger shares of people of color (Exhibit A-46).

Our analysis finds that lower-price neighborhoods would experience the smallest potential changes in development feasibility across all lot sizes. Consistent with the analysis of highest and best use, the estimate of future production also finds that lower-price neighborhoods would generally experience the smallest increases in ADU production and smallest decreases in teardowns.

Exhibit A-45 Seattle 2035 Displacement Risk Index

Source: Seattle 2016

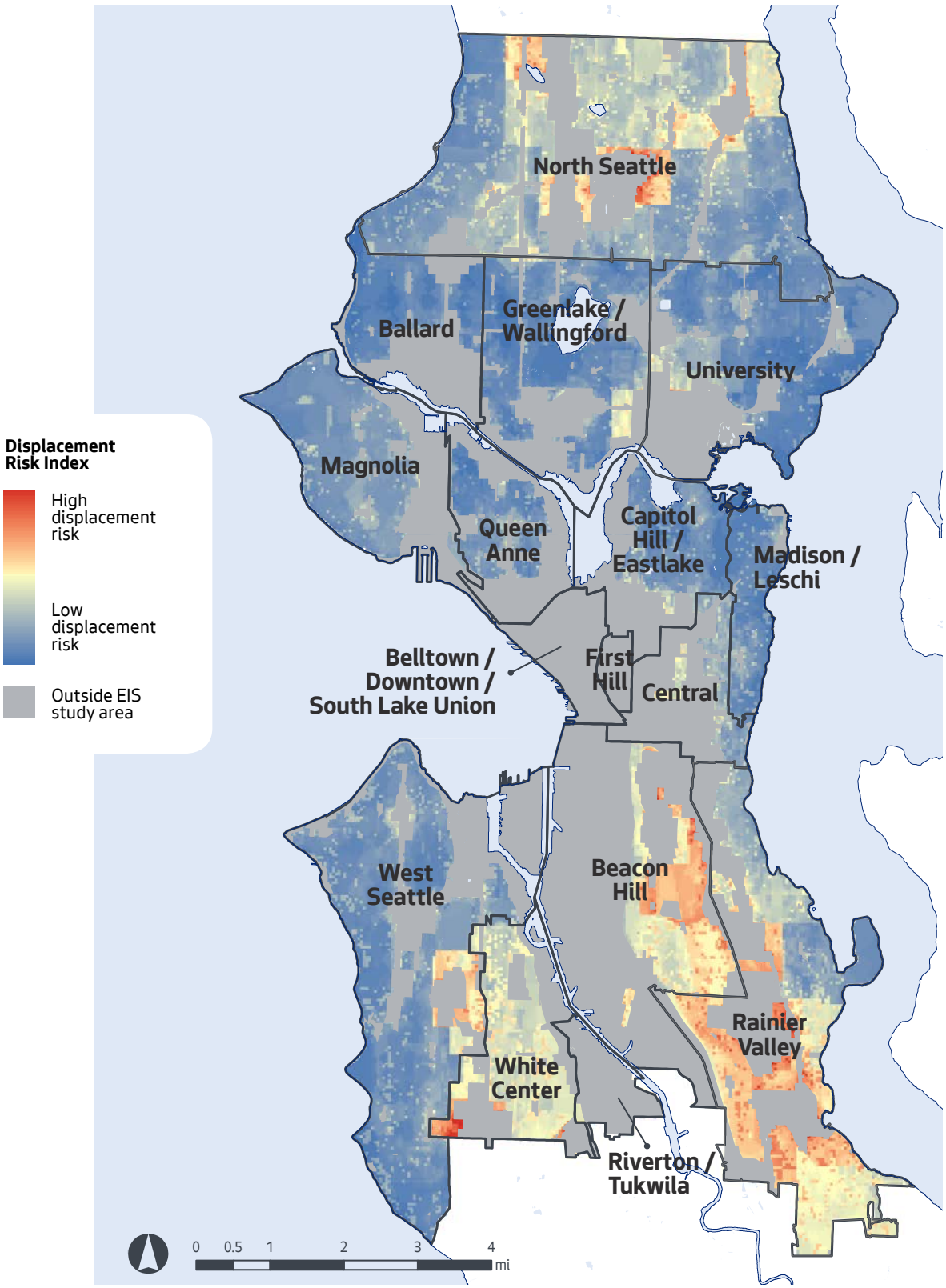
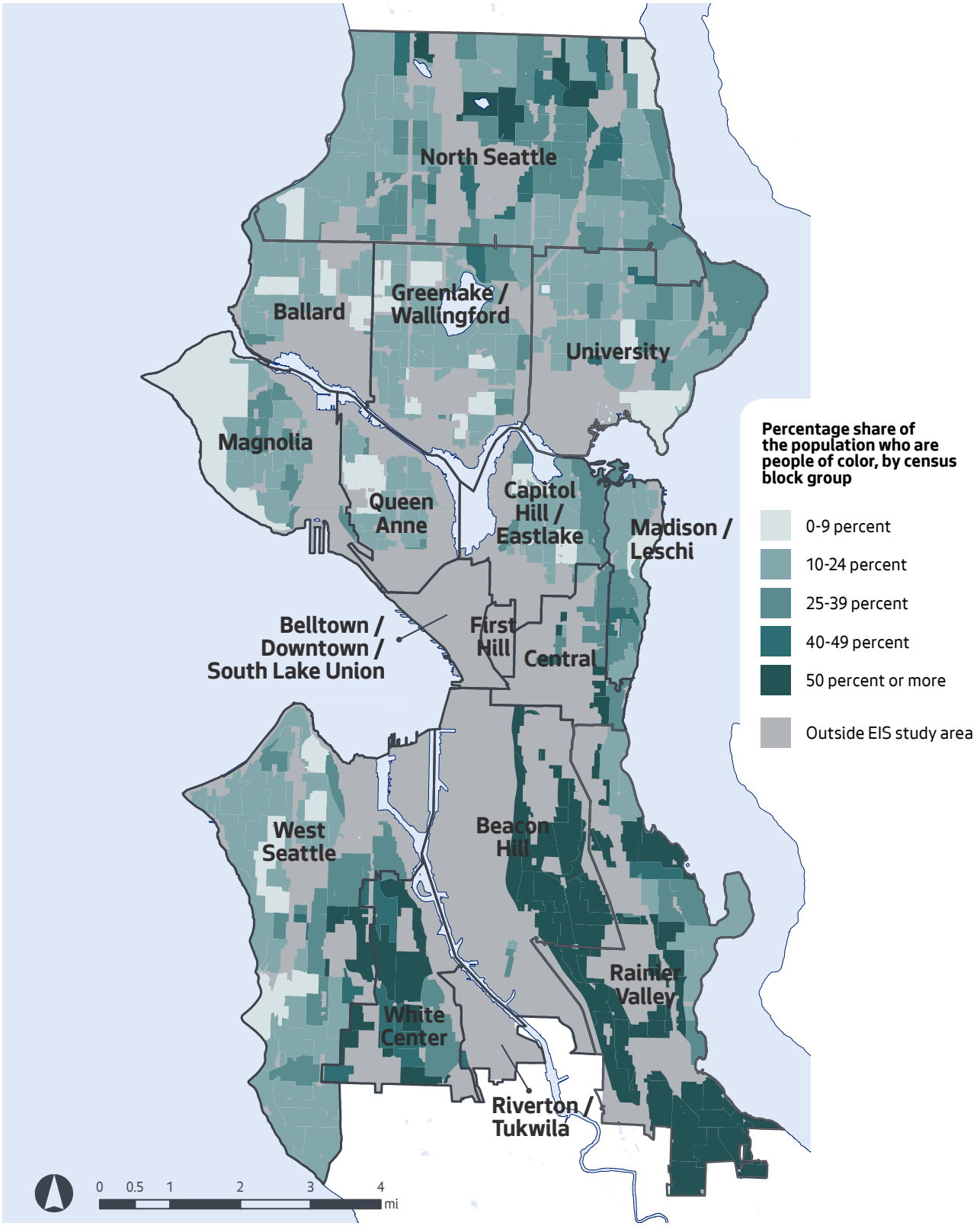


Exhibit A-46 Share of Residents Who Are People of Color

Source: 2016 5-Year American Community Survey



Potential changes to ADU production

Both Alternatives 2 and 3 are estimated to increase the number of ADUs created relative to Alternative 1 (No Action). Compared to Alternative 1, we estimate the potential for a 76 percent increase in ADUs in Alternative 2 (1,440 additional ADUs) and a 64 percent increase in Alternative 3 (1,210 additional ADUs). The results of the analysis show that additional ADUs created in Alternatives 2 and 3 would be distributed across all neighborhoods and lot sizes, but with the largest increases in higher-price neighborhoods.

APPENDIX B
Parking Analysis Methods and Assumptions

B.1 Background

The City of Seattle proposes to change regulations in the Land Use Code to remove barriers to the creation of ADUs in single-family zones. ADUs include backyard cottages, known as detached accessory dwelling units (DADUs), and in-law apartments, known as attached accessory dwelling units (AADUs). The proposal involves several Land Use Code changes, including allowing two ADUs on some lots, changing the existing off-street parking and owner-occupancy requirements, and changing some development standards that regulate the size and location of DADUs.

In May 2016, the City prepared an environmental checklist evaluating the potential environmental impacts of the proposed changes to the Land Use Code, and made a determination of non-significance. The determination made in the checklist was appealed in June 2016. In December 2016, the Seattle Hearing Examiner determined that a more thorough review of the potential environmental impacts of the proposal was required (Tanner 2016). This requested review included impacts to on-street parking. Based on the Hearing Examiner's decision, the Seattle City Council prepared an Environmental Impact Statement (EIS) in accordance with the Washington State Environmental Policy Act (SEPA).

The EIS analyzes three alternatives. (For a full list of the proposed changes in each alternative, see Chapter 2 of the EIS, Exhibit 2.2).

- **Alternative 1 – No Action.** Under Alternative 1, no changes would be made to the existing ADU regulations.
- **Alternative 2.** Alternative 2 considers the broadest range of changes to the Land Use Code to promote the production of ADUs. These changes include: allowing lots in single-family zones to have both an AADU and a DADU; removing the owner-occupancy requirement; removing the off-street

parking requirement for ADUs; reducing predevelopment costs for DADUs; and allowing lots between 3,200 and 3,999 square feet to add a DADU.

- **Alternative 3.** Alternative 3 considers more modest adjustments to the Land Use Code that emphasize maintaining a scale compatible with existing development in single-family zones. These changes include: allowing single-family-zoned lots to have both an AADU and a DADU; removing the off-street parking requirement for the first (but not second) ADU; allowing lots between 3,200 and 3,999 square feet to add a DADU; requiring MHA affordability contributions for the second ADU; and adding a maximum floor area ratio (FAR) for new development.

These proposed changes could affect parking availability in the study area. This appendix summarizes the methodology used to estimate parking demand for ADU residents and the impacts of that demand on parking in Seattle's single-family zones.

STUDY LOCATIONS

A study of on-street parking in the entire EIS study area (as shown in Chapter 2, Exhibit 2-1) would be infeasible. Therefore, we identified four smaller study locations that provide a representative sample of neighborhoods in the study area (Exhibit B-1 through Exhibit B-5). These four study locations are located across the northwest, northeast, southwest and southeast areas of the city. In each study location, we selected a set of block faces to collect data on existing conditions and estimate parking impact. The study locations represent a range of conditions found in single-family zones and include areas that vary by lot size; the presence of alleys, driveways, and sidewalks; and proximity to transit. Not all block faces in the southeast and southwest study locations are included in this analysis. Some streets have one block face included in this analysis, and other streets have both block faces. This variation is due to the repurposing of data collected for a separate parking study conducted by the Seattle Department of Transportation (see Section 4.4, Parking and Transportation).

Exhibit B-1 Overview of Study Locations

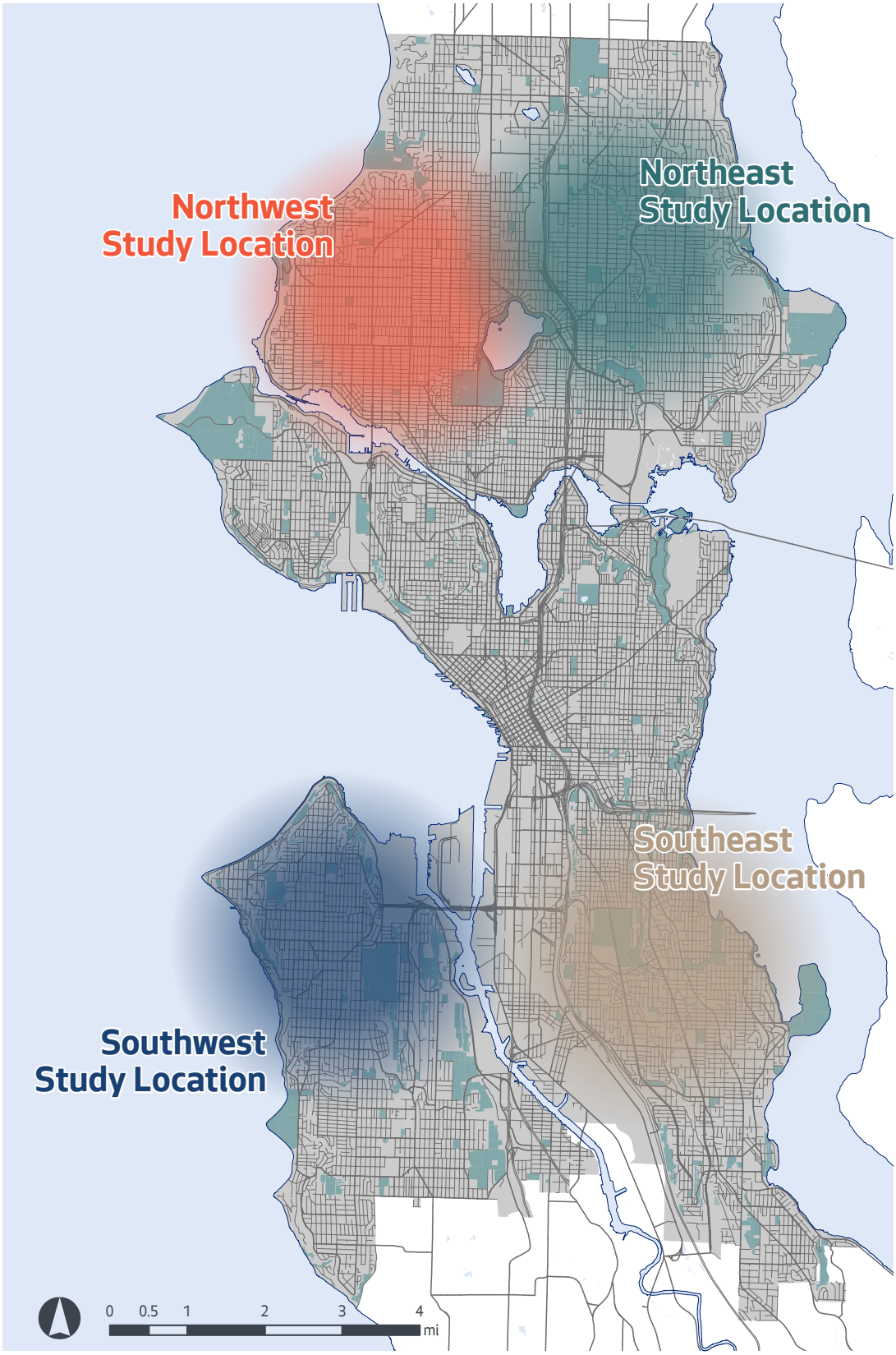


Exhibit B-2 Southeast Study Location

Exhibit B-3 Northeast Study Location

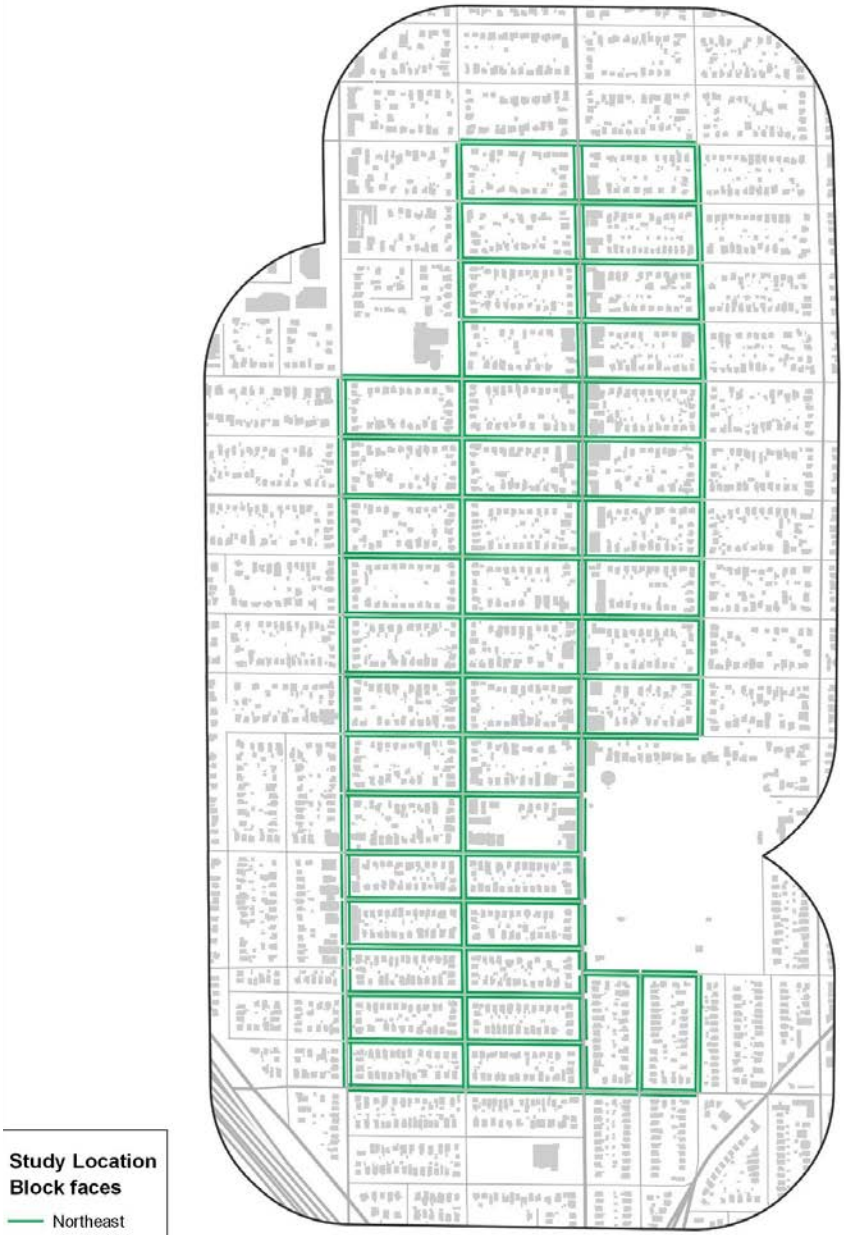
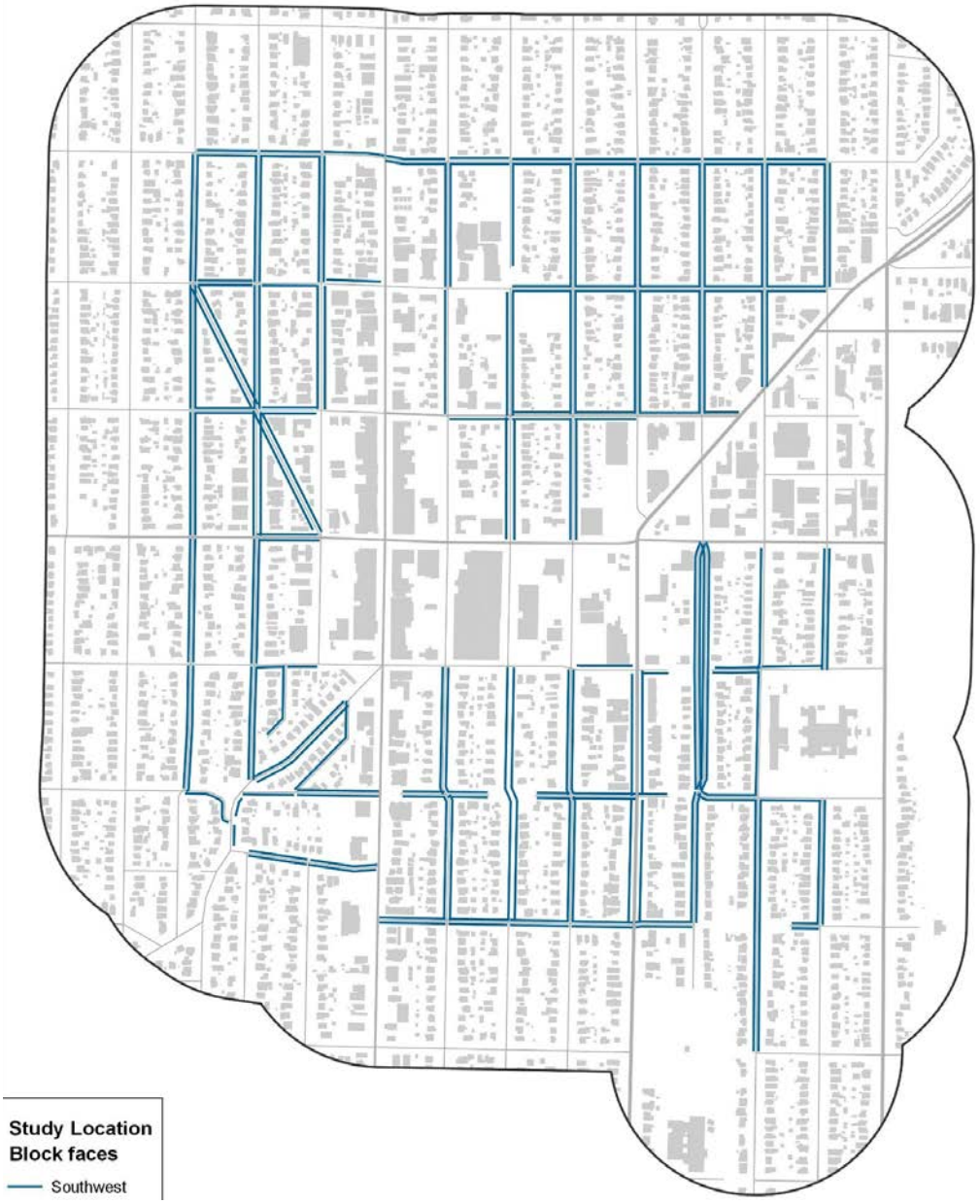


Exhibit B-4 Northwest Study Location

Exhibit B-5 Southwest Study Location



B.2 Data Sources

ON-STREET PARKING SUPPLY AND UTILIZATION DATA

We collected data on parking supply and utilization for each block face in each study location. We identified blocks with unrestricted parking, restricted parking, and no parking allowed. This report focuses on unrestricted parking spaces and their utilization in these locations. Throughout the city there are about 46,000 block faces, most of which have unrestricted parking. In residential areas, peak parking demand usually occurs overnight on a weeknight. As a result, we used weeknight overnight parking supply and utilization to estimate residential parking usage. Data collection for this analysis followed the methodology outlined in the Seattle Department of Construction and Inspection's Parking Waivers for Accessory Dwelling Units document (TIP 17).[1] We used overnight parking data collected on the following days:

- Southeast: Wednesday, October 12, 2016
- Northeast: Friday, December 15, 2017
- Northwest: Friday, December 15, 2017
- Southwest: Thursday, September 21, 2017, and Tuesday, September 26, 2017

For residential areas near neighborhood business districts, peak on-street parking demand usually occurs on weekend afternoons. While the study locations are not near large retail areas, we measured parking utilization on Saturdays to confirm that weekday overnight parking demand was the peak. For the southeast study location, we used parking data collected in 2016 for a different SDOT parking analysis that did not include weekend parking data. For the other study locations, we collected weekday overnight parking data on the following Saturdays:

- Northeast: December 9, 2017
- Northwest: December 9, 2017
- Southwest: September 23 and September 30, 2017

1 Seattle Department of Construction and Inspections. (2011). Parking Waivers for Accessory Dwelling Units. Seattle, Washington. Retrieved from http://www.seattle.gov/DPD/Publications/CAM/cam117.pdf

ADU SURVEY FOR PORTLAND, EUGENE, AND ASHLAND, OREGON

Data about the demographics and travel characteristics for current ADU residents in Seattle was not available. To estimate the characteristics of Seattle's ADU residents, we reviewed a survey that Portland State University (PSU) conducted of ADU owners in three Oregon communities in 2013 that provides valuable details about the characteristics of ADU residents.[2] Researchers at PSU's Survey Research Lab sent surveys to 839 ADU owners in Portland, Eugene, and Ashland that asked questions about ADU use, resident and owner demographics, construction, and energy use. Because Portland's land use and transportation characteristics resemble Seattle's more closely than those of Eugene or Ashland, we used data only from ADU owners in Portland. Researchers received 290 responses from Portland ADU owners out of 673 sent surveys, a response rate of 43.2 percent. For this EIS, the most relevant data collected in the PSU survey was vehicle ownership for ADU residents; the number of adult residents in each ADU; the number of bedrooms in each ADU; and the average square footage of each ADU. We estimated the average rate of vehicle ownership for ADU residents in Seattle using both data from this survey and estimates from the U.S. Census Bureau. Section 3 of this appendix describes our methodology.

AMERICAN COMMUNITY SURVEY 2012-2016

We also used data from Demographic and Housing Estimates in the 2012-2016 American Community Survey (ACS) for Portland and Seattle. Relevant data included:

- number of vehicles available per renter-occupied and owner-occupied household
- number of adults per renter-occupied household
- number of bedrooms per renter-occupied household

We collected ACS data at the census tract level to develop specific estimates for each study location. We averaged data from census tracts containing study location block faces to create these estimates. The estimate for the northeast location reflects an average of five census tracts, the northwest location six tracts, and the southwest location three tracts; all block faces in the southeast location are located in the same census tract.

2 Horn, T., Elliott, D., & Johnson, A. (2013). Accessory Dwelling Unit Survey for Portland, Eugene, and Ashland, Oregon. Retrieved from https://accessorydwellings.files.wordpress.com/2013/10/adureportfrev.pdf.

B.3 Assumptions and Methodology

ASSUMPTIONS

We made several assumptions about the characteristics of ADU residents to estimate their parking needs:

- We assumed 100 percent of ADU residents are renters. In cases where an owner builds an ADU, moves into the ADU and rents out the main house, the additional residents that arise from the creation of an ADU are also renters.
- We assumed the demographics of ADU resident match overall demographics of renters for each study location.
- While off-street parking is required only for Alternatives 1 and 3, we assumed for all alternatives that 100 percent of ADU residents who own a vehicle use on-street parking.
- We assumed that, on average, an ADU in Portland is the same size and has the same number of adult residents as an ADU in Seattle.
- We assumed the ratio of vehicle ownership among ADU households and among renter-households overall is the same in Portland and Seattle.
- We assumed that residents are willing to park on either side of the street, as long as the parking space is on the same block as their home.

METHODOLOGY

Estimating vehicle ownership for ADU residents

Characteristics of ADU residents in Portland

We used data from the PSU survey on the number of adult ADU occupants to estimate the average number of adult occupants and bedrooms per ADU in Seattle. These estimates are presented in Exhibit B-6 and Exhibit B-7. Data from the U.S. Census Bureau on age demographics indicates that age ranges in Seattle and Portland are similar overall; therefore, it is appropriate to apply the data from Portland ADUs to Seattle ADUs.

Exhibit B-6 Estimate of Adult Occupants per ADU in Portland

Adult occupants[1]	% of ADUs	Average number of adults per ADU
1	64.7%	1.36
2	34.3%	
3	1.0%	

[1] Accessory Dwelling Unit Survey for Portland, Eugene, and Ashland, Oregon, 2013. Survey Research Lab, Portland State University.

Exhibit B-7 Number of Bedrooms per ADU in Portland

Bedrooms[1]	% of ADUs	Average number of bedrooms per ADU
0 (studio)[2]	26.7%	1.25
1	50.0%	
2	21.9%	
3+	1.4%	

[1] Accessory Dwelling Unit Survey for Portland, Eugene, and Ashland, Oregon, 2013. Survey Research Lab, Portland State University.
[2] Calculated as one bedroom.

The average size of ADUs in Portland is approximately 665 square feet, with individual ADU sizes ranging from 200 square feet to 1,500 square feet.[3]

3 Horn, T., Elliott, D., & Johnson, A. (2013). Accessory Dwelling Unit Survey for Portland, Eugene, and Ashland, Oregon. Retrieved from https://accessorydwellings.files.wordpress.com/2013/10/adureportfrev.pdf

Estimating ADU vehicle ownership in Seattle study locations

We applied data from both the PSU survey and U.S. Census Bureau to estimate vehicle ownership among ADU households in Seattle. We assumed the same ratio of vehicle ownership among ADU households and all renter-occupied households in Portland and Seattle, as shown in Equation 1.

Equation 1:

$$\frac{CarOwn_{ADU,PDX}}{CarOwn_{Rent,PDX}} = \frac{CarOwn_{ADU,SEA}}{CarOwn_{Rent,SEA}}$$

where:

$CarOwn_{ADU,PDX}$ = *Average number of vehicles per ADU household in Portland*

$CarOwn_{Rent,PDX}$ = *Average number of vehicles per renter-occupied household in Portland*

$CarOwn_{ADU,SEA}$ = *Average number of vehicles per ADU household in Seattle*

$CarOwn_{Rent,SEA}$ = *Average number of vehicles per renter-occupied household in Seattle*

To estimate an average car ownership rate for ADU occupants in Seattle, Equation 1 can be written as Equation 2. In Equation 2, average vehicle ownership for renter-occupied households in Seattle is adjusted based on the ratio of average vehicle ownership for ADU households to average vehicle ownership for renter-occupied households in Portland.

Equation 2:

$$CarOwn_{ADU,SEA} = CarOwn_{Rent,SEA} * \frac{CarOwn_{ADU,PDX}}{CarOwn_{Rent,SEA}}$$

Exhibit B-8 presents weighted averages for number of vehicles per household for ADU households and renter-occupied households in Portland.

Exhibit B-8 Portland Vehicle Ownership Estimates

Number of vehicles	% of households	Average number of vehicles per household
Portland ADU households[1]		
0	19.9%	$CarOwn_{ADU,PDX}$ **0.954**
1	66.3%	
2	12.2%	
3+	1.5%	
Portland renter households[2]		
0	25.9%	$CarOwn_{Rent,PDX}$ **1.08**
1	46.5%	
2	21.3%	
3+	6.3%	

[1] Accessory Dwelling Unit Survey for Portland, Eugene, and Ashland, Oregon, 2013. Survey Research Lab, Portland State University.
[2] United States Census Bureau 2012-2016 Demographic and Housing Estimates for Portland city, Oregon

Equation 2 assumes that the average renter-occupied households in Seattle and Portland have the same number of adults. To adjust for differences in household size, we compared the average number of bedrooms in renter-occupied housing units in Portland and in each of the Seattle study locations. We then used these ratios to adjust Equation 2, resulting in Equation 3:

Equation 3:

$$CarOwn_{ADU,SEA\ ADJUSTED} = CarOwn_{Rent,SEA} * \frac{CarOwn_{ADU,PDX}}{CarOwn_{Rent,PDX} * \frac{BR_{SEA}}{BR_{PDX}}}$$

where:

BR_{SEA} = *Average number of bedrooms per renter-occupied housing unit in Seattle*

BR_{PDX} = *Average number of bedrooms per renter-occupied housing unit in Portland*

Using information from the Census Bureau, we calculated weighted averages of the number of vehicles per renter household for Seattle overall and for each study location. Exhibit B-9 provides the average number of bedrooms per housing unit in Portland or Seattle, the ratio

of average bedrooms per unit in Seattle compared to Portland, and the adjusted ratio of vehicle ownership.

We applied this adjusted ratio of vehicle ownership vehicle ownership estimates for Seattle and the four study locations to estimate the car ownership rates per ADU using Equation 3. Exhibit B-10 presents these vehicle ownership estimates. Since the four study locations are in predominantly single-family residential neighborhoods, average vehicles ownership rates above the overall average for renter households are logical based on allowable ADU unit size. The parking analysis estimated that each additional ADU would generate between 1.03 and 1.29 additional vehicles that use on-street parking throughout the study locations.

Exhibit B-9 Ratio of Vehicle Ownership Based on Number of Bedrooms

Number of bedrooms	% of households					
	Portland Renters[1]	Seattle Renters[4]	Northeast Renters[5]	Northwest Renters[5]	Southeast Renters[5]	Southwest Renters[5]
Studio	12.4%	15.6%	15.3%	8.0%	5.0%	10.6%
1	30.0%	40.1%	33.6%	33.5%	44.3%	43.6%
2[2]	26.1%	29.9%	32.4%	38.2%	35.8%	28.6%
3[2]	26.1%	9.4%	9.1%	13.7%	13.1%	8.2%
4[3]	5.4%	3.2%	7.0%	5.5%	1.9%	7.9%
5+	–	1.7%	2.6%	1.1%	0.0%	1.1%
	Portland Renters	Seattle Renters	Northeast Renters	Northwest Renters	Southeast Renters	Southwest Renters
Average number of bedrooms per household BR_{SEA} or BR_{PDX}	1.945	1.651	1.82	1.864	1.677	1.729
Ratio of bedrooms BR_{SEA} / BR_{PDX}	—	0.849	0.936	0.958	0.862	0.889
Adjusted ratio of vehicle ownership (see Equation 3)	—	1.041	0.944	0.922	1.025	0.944

[1] U.S. Census Bureau 2012-2016 estimates of Number of Bedrooms (table B25042) for all of Portland city, Oregon.
[2] Number of households with two or three bedrooms presented as one percentage (52.2%); study assumed an even distribution between two- and three-bedroom households.
[3] Information for number of bedrooms in Portland renter-occupied households given in increments of 0, 1, 2, 3, and 4+ bedroom only.
[4] U.S. Census Bureau 2012-2016 estimates of number of bedrooms (table B25042) for all of Seattle city, Washington.
[5] U.S. Census Bureau 2012-2016 estimates of number of bedrooms (table B25042) for census tracts in Seattle city, Washington.

Exhibit B-10 Vehicle Ownership Estimates for Seattle ADU Residents

Number of vehicles	% of households				
	Seattle Renters[1]	Northeast Renters[2]	Northwest Renters[2]	Southeast Renters[2]	Southwest Renters[2]
0	27.3%	18.8%	11.4%	26.3%	16.0%
1	49.2%	48.8%	50.6%	45.7%	51.2%
2[2]	18.4%	23.7%	26.3%	23.2%	27.7%
3[2]	3.5%	6.1%	8.5%	4.3%	3.9%
4[3]	0.9%	1.7%	1.9%	0.0%	0.6%
5+	0.7%	1.0%	1.2%	0.5%	0.6%
	Seattle Renters	**Northeast Renters**	**Northwest Renters**	**Southeast Renters**	**Southwest Renters**
Average number of vehicles per household **$CarOwn_{Rent,SEA}$**	1.651	1.82	1.864	1.677	1.729
Adjusted ratio of vehicle ownership **(see Equation 3)**	1.041	0.944	0.922	1.025	0.944
Estimated number of vehicles per ADU	**1.08**	**1.15**	**1.21**	**1.29**	**1.03**

[1] U.S. Census Bureau 2012-2016 estimates of tenure by vehicles available (table B25044) for all of Seattle city, Washington.
[2] U.S. Census Bureau 2012-2016 estimates of tenure by vehicles available (table B25044) for census tracts in Seattle city, Washington.

Estimating ADU parking impacts

Based on the parcel typology described in Section 4.1, Housing and Socioeconomics, we classified parcels in each study location according to their eligibility to have an ADU. This classification reflects Land Use Code regulations for development in single-family zones, requirements for vehicle access, and lot size and configuration. We consider any parcel of type A, B, C, or D to be "eligible" and any parcel of type Z to be "ineligible." To estimate parking demand for each alternative, we drew on the 2018-2027 ADU production estimates generated using the pro forma analysis and behavioral models described in Appendix A. Those estimates indicate that between 1.48 and 3.05 percent of parcels would have an ADU, depending on the characteristics of each parcel type. In our parking analysis, we apply the highest estimated ADU production rate at the nearest whole number (3 percent) for all eligible parcels. Since various

development standards vary across alternatives, including the number of ADUs allowed on a lot, we made the following assumptions about the number of lots with ADUs in each alternative:

- ***Alternative 1.*** 3 percent of eligible parcels will have 1 ADU.
- ***Alternative 2.*** 3 percent of eligible parcels will have 2 ADUs.
- ***Alternative 3.*** 1.5 percent of all eligible parcels will develop 1 ADU and 1.5 percent will develop 2 ADUs.

These rates let us estimate how many new ADUs would be created in our study locations under each alternative. We applied the vehicle ownership rates for ADU residents to estimate the total number of new vehicles (rounded to the nearest whole vehicle). Based on the number of new vehicles, we estimated demand for on-street parking in each study location.

B.4 Analysis and Results

EXISTING CONDITIONS

In this analysis, we refer to three measures of parking conditions:

- **Parking supply:** the number of unrestricted on-street parking spaces
- **Parking utilization:** the number of parked vehicles observed divided by the number of unrestricted on-street parking spaces
- **Parking availability:** the difference between total parking supply and parking demand divided by the total number of allowed unrestricted on-street parking spaces

We collected data on parking supply and parking utilization for block faces in the study locations. To visualize current parking conditions, we converted this data into GIS shapefiles and consolidated block-face data into a single centerline shapefile to show total parking supply and parking utilization along each roadway segment. This better represents the availability of parking for residents looking for parking near their home.

Existing parking supply

Exhibit B-11 shows the number of blocks (consolidated block faces) in each study location, the supply of unrestricted on-street parking, and the average number of on-street parking spaces per block. Block length, driveways per block, and parking restrictions vary throughout the city. The average number of on-street parking spaces per block in the study

locations is 22, ranging from 18 in the northwest study location to 27 in the southwest study location.

Exhibit B-11 Parking Supply by Study Location

Study location	Blocks	Total on-street parking spaces	Average number of on-street parking spaces per block
Southeast	14	327	23
Northeast	108	2,403	22
Northwest	118	2,115	18
Southwest	99	2,682	27
Total	339	7,527	22

Exhibit B-12 through Exhibit B-15 show the number of unrestricted on-street parking spaces in each study location. Streets with no parking on one side are represented with a red line on the associated block face. In the southeast study location, three blocks provide nearly half the study location's unrestricted on-street parking supply while remaining streets have many fewer parking spaces per block. Parking supply is well distributed throughout the northeast study location, though block size and parking restrictions constrain parking supply in the southeast side of the study location. In the northwest study location, parking supply is lowest in the easternmost portion due to parking restrictions on one side of every east-west street. Parking is also restricted on one side of two major east-west streets in the study location. Parking supply is consistent throughout the southwest study location except for two north-south streets in the northern portion of the study location with below-average parking supply due to a school loading zone, parking restrictions adjacent to a school, and driveways.

Exhibit B-12 Parking Supply in the Southeast Study Location

Exhibit B-13 Parking Supply in the Northeast Study Location

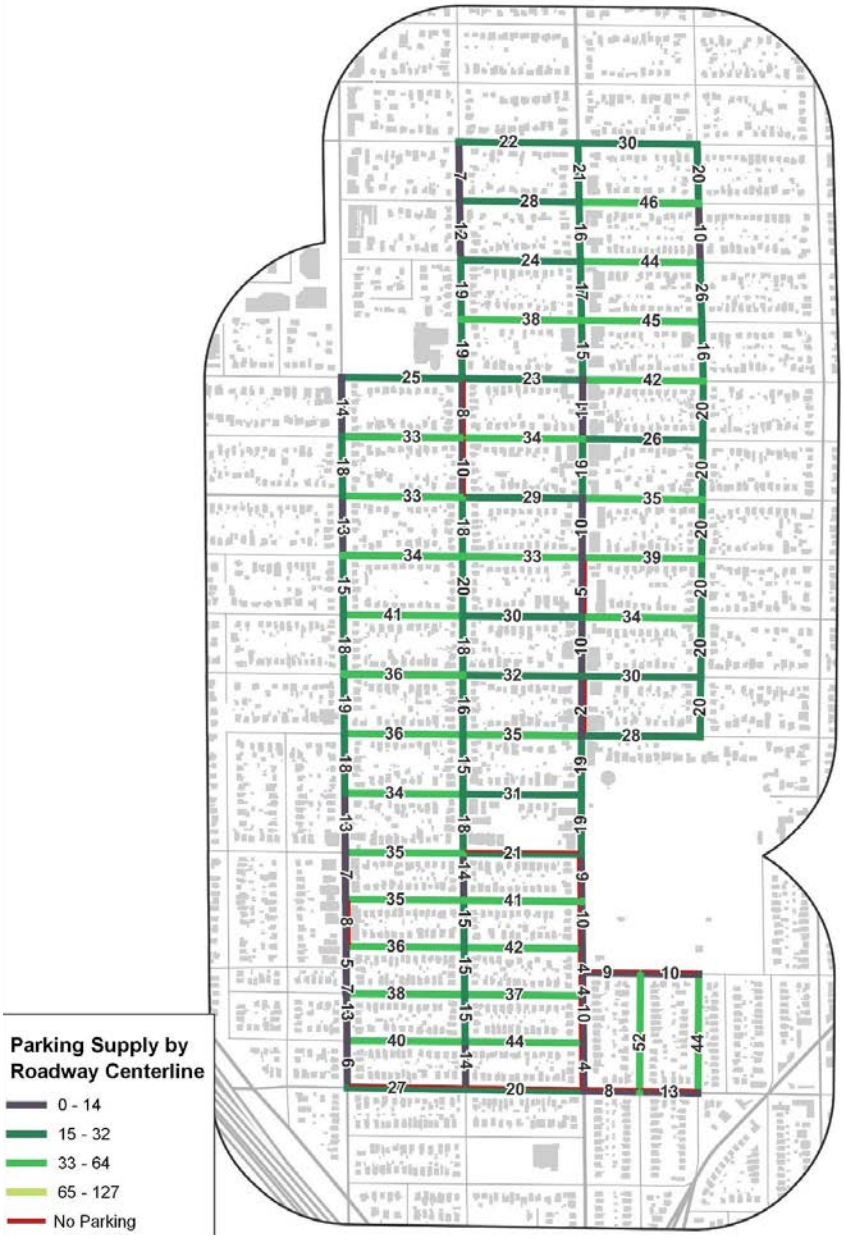
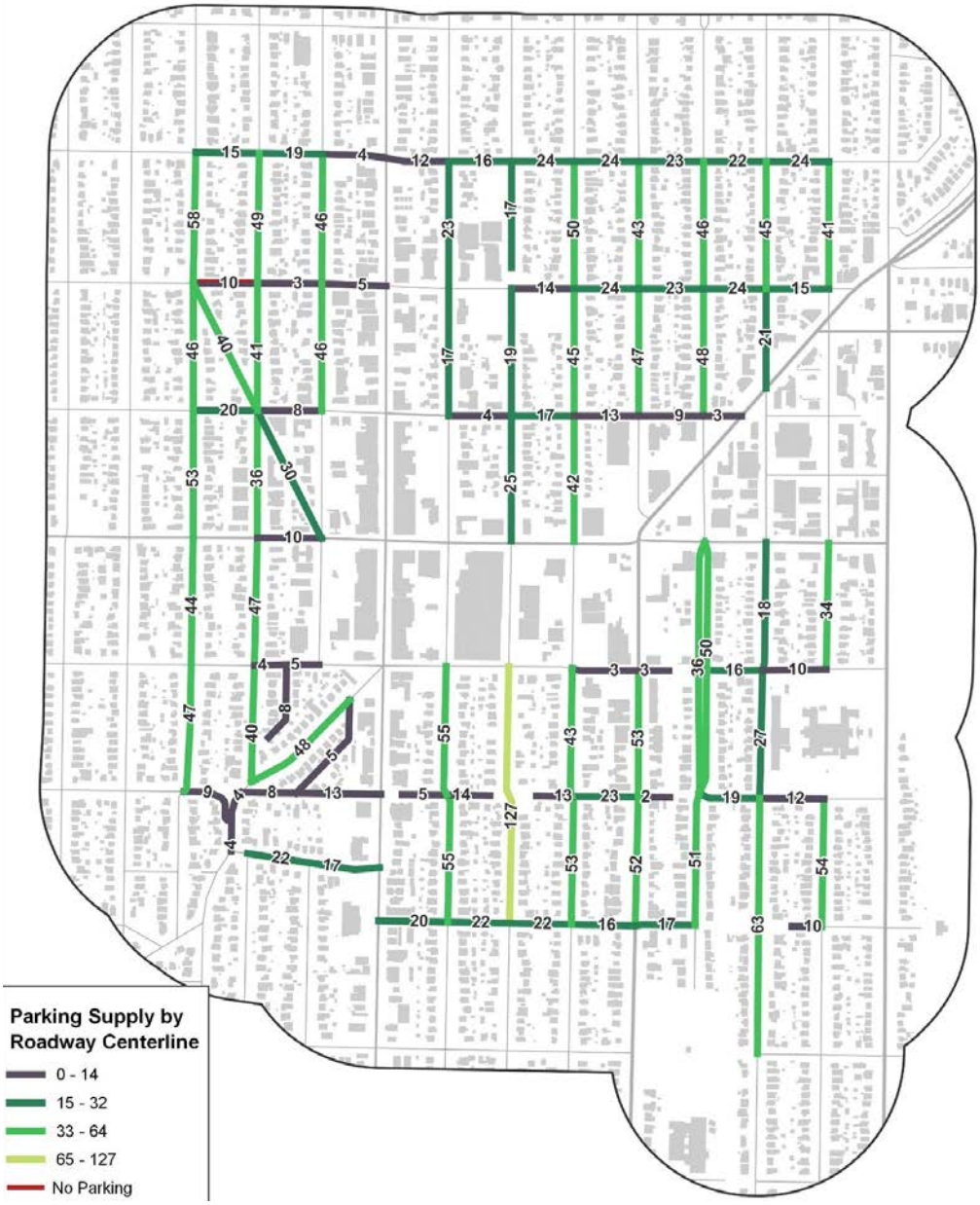


Exhibit B-14 Parking Supply in the Northwest Study Location

Exhibit B-15 Parking Supply in the Southwest Study Location



Existing parking utilization

We calculated parking utilization per block by dividing the number of parked vehicles observed per block by the total number of spaces per block. Exhibit B-16 shows parking utilization rates for each study location for weekday and weekend observations. Weekend parking utilization data was not available for the southeast location. Weekday and weekend utilization rates in each study location tend to be similar and vary by three to seven percentage points. Weekday utilization rates are higher in the northeast and northwest study locations and lower in the southwest study location. Since weekday and weekend parking utilization rates are similar, weekday utilization is higher than weekend utilization in two study locations, and weekend utilization data is unavailable for the southeast study location, the remainder of this report focuses on weekday parking observations as a the more potentially impactful scenario.

Exhibit B-16 Parking Utilization by Study Location

Study location	Weekday utilization	Weekend utilization
Southeast	78%	n/a[1]
Northeast	53%	46%
Northwest	63%	57%
Southwest	51%	54%
Total	56%	52%[2]

[1] Weekend parking data was not collected.
[2] Total excludes southeast study location.

Exhibit B-17 shows weekday parking utilization rates per block for each study location. Overall, 57 percent of blocks across the study locations have utilization rates above 50 percent. Compared to others, the southeast study location has a higher share of blocks with utilization rates of at least 75 percent.

Exhibit B-17
Percentage Share of Blocks by Study Location and Parking Utilization

Study location	Parking utilization rate			
	Less than 50%	50-75%	75-90%	More than 90%
Southeast	14%	36%	21%	29%
Northeast	53%	37%	7%	3%
Northwest	31%	44%	17%	8%
Southwest	49%	28%	13%	10%
Overall	42%	37%	13%	8%

Exhibit B-18 through Exhibit B-21 show block-by-block weekday parking utilization rates for each study location using the categories shown in Exhibit B-17. Occasionally, parking demand exceeds the available parking supply, resulting in utilization rates above 100 percent. This could indicate illegal parking or vehicles parked more closely together than supply calculations estimated for those specific blocks. Utilization rates in the northeast study location are highest towards the northern and southern edges of the study location. The northwest study location has a more even distribution (i.e., less clustering) of parking utilization rates, and on many segments with rates above 75 percent parking is restricted on one side of the street. In the southwest study location, blocks with the highest utilization rates are predominantly located immediately adjacent to or surrounded by multifamily and commercial land uses.

Exhibit B-18 Weekday Parking Utilization in the Southeast Study Location

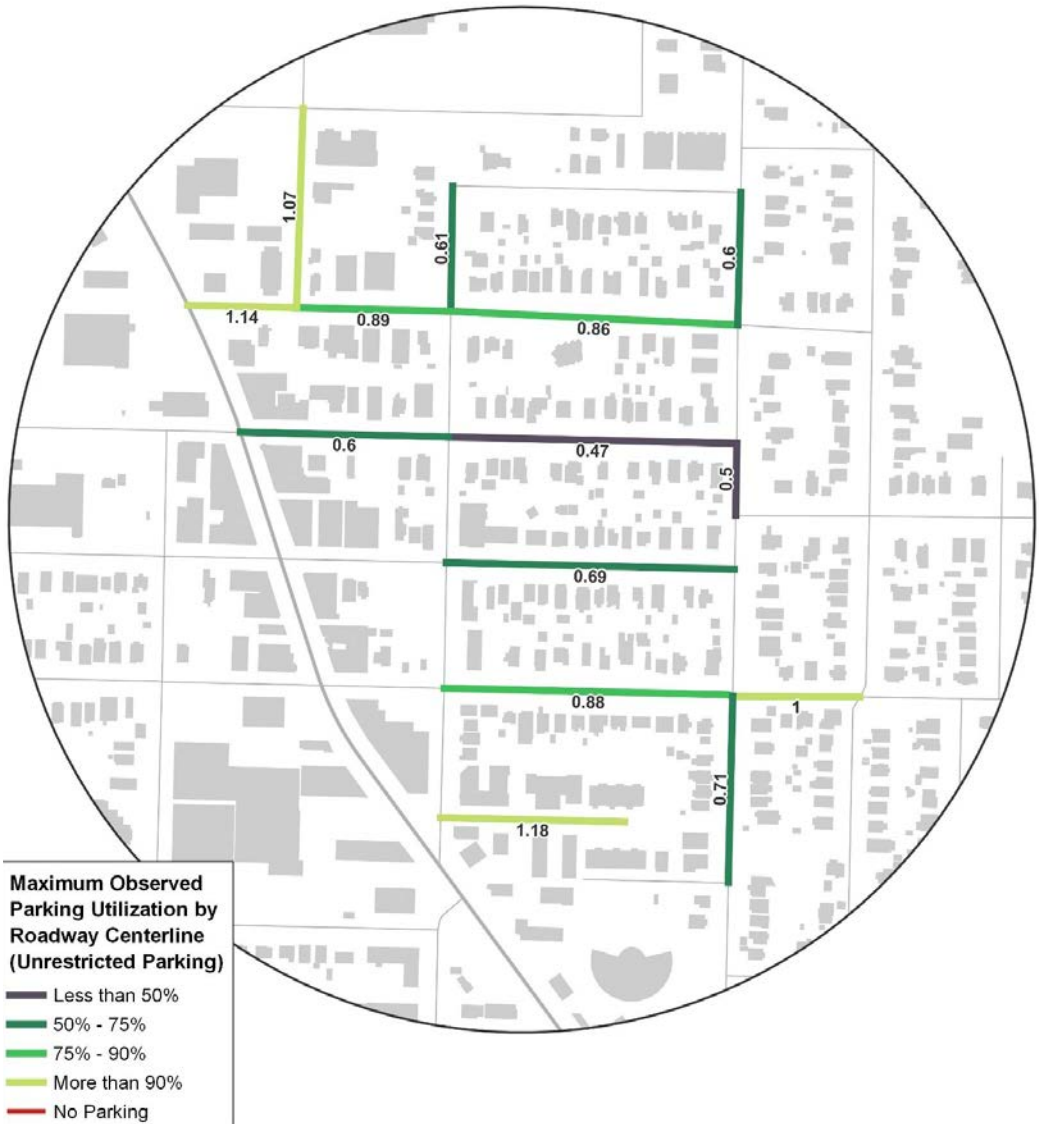


Exhibit B-19 Weekday Parking Utilization in the Northeast Study Location

Exhibit B-20 Weekday Parking Utilization in the Northwest Study Location

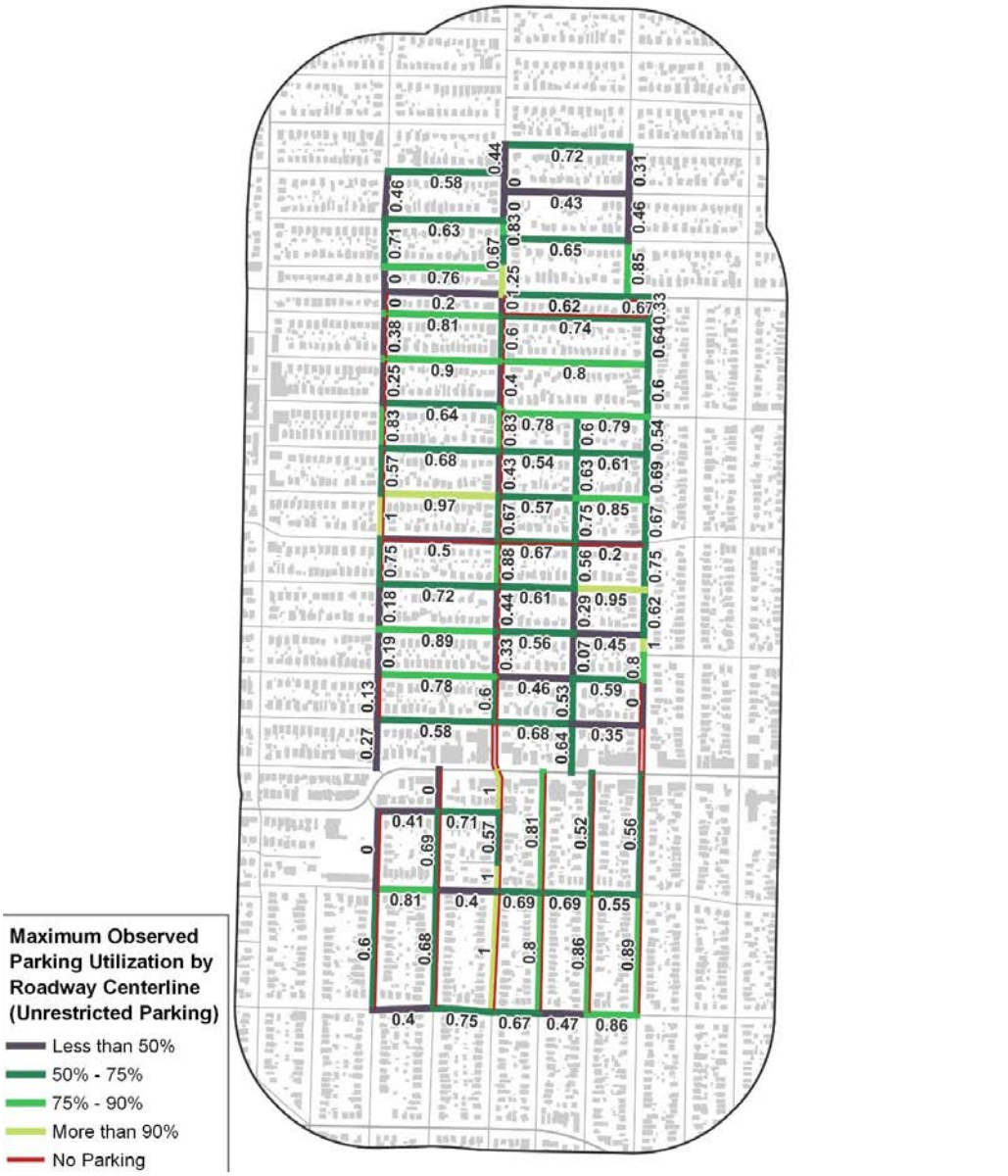
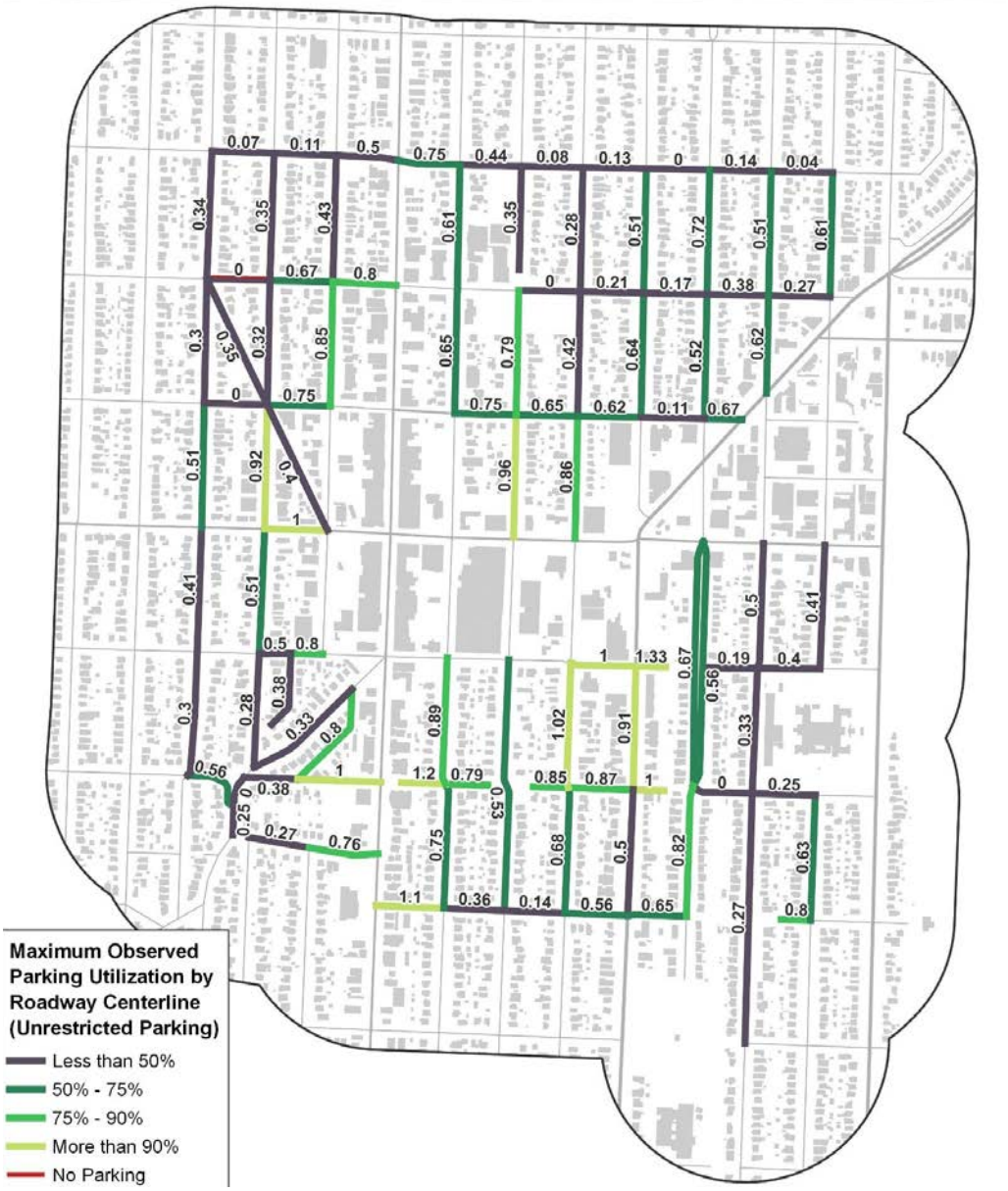


Exhibit B-21 Weekday Parking Utilization in the Southwest Study Location



Existing parking availability

Parking availability is the total number of parking spaces available per block. We calculate parking availability by subtracting the estimated future parking demand from total on-street parking supply. The result represents the existing capacity for additional on-street parking per block. While parking utilization rates generally indicate the number of parking spaces available, calculating parking availability is necessary to determine the potential impact of additional on-street parking demand. In the southeast study location, all but one of the blocks with insufficient parking supply to meet demand are where parcels are ineligible for any type of ADU. Blocks with parking restrictions on one side of the street typically have the fewest parking spaces available due to lower overall supply.

Exhibit B-22 shows the percentage share of blocks in each study location by the number of available on-street parking spaces. Twenty-one percent of blocks in the southeast study location are over capacity, meaning existing parking demand exceeds supply, the most of any study location. Across all study locations, 9.78 parking spaces are available per block on average (including blocks at or over capacity). The parking availability maps and table suggest that most blocks in each study location could accommodate increased parking demand. The southeast study location has the lowest average number of parking spaces available per block (5.14), the study location could accommodate additional on-street parking demand resulting from ADU development. Exhibit B-23 through Exhibit B-26 show existing parking availability for blocks in each study location and identify parcels by their eligibility for an ADU.

Exhibit B-22 Percentage Share of Blocks by Number of Available Parking Spaces and Study Location

		Parking Spaces Available by Block						
Study Location	**Average Parking Availability per Block**	**Fewer than zero[1]**	**0**	**1-5**	**6-10**	**11-15**	**15-25**	**> 25**
Northeast	10.6%	0%	2%	20%	30%	27%	20%	1%
Northwest	6.7%	1%	4%	46%	24%	20%	4%	1%
Southeast	5.1%	21%	7%	36%	21%	0%	7%	7%
Southwest	13.2%	4%	4%	25%	16%	10%	24%	16%
Overall	9.8%	**2%**	**4%**	**31%**	**23%**	**18%**	**15%**	**6%**

Exhibit B-23 Existing Parking Availability and Parcel Type in Southeast Study Location

Numbers on map refer to the number of on-street parking spaces available.

Exhibit B-24 Existing Parking Availability and Parcel Type in Northeast Study Location

Numbers on map refer to the number of on-street parking spaces available.

Exhibit B-25 Existing Parking Availability and Parcel Type in Northwest Study Location

Numbers on map refer to the number of on-street parking spaces available.

Exhibit B-26 Existing Parking Availability and Parcel Type in Southwest Study Location

Numbers on map refer to the number of on-street parking spaces available.

ESTIMATING INCREASED PARKING DEMAND

Exhibit B-27 shows the estimated number of parcels in each study location eligible for an ADU based on the parcel typology described in Section 3.2. The northeast study location has the most eligible parcels (1,141) and the southeast study location the fewest (127). Exhibit B-28 through Exhibit B-30 show the estimated number of ADUs created in each study location under each alternative. Alternative 1 has the fewest ADUs developed (90), followed by Alternative 3 (94), and Alternative 2 (182). We applied the vehicle ownership rates shown in Table 5 to estimate how each new ADU would contribute to future on-street parking demand in each study location. Exhibit B-28 through Exhibit B-30 also show the number of available on-street parking spaces as an indication of existing capacity for new parking demand. Across all alternatives and study locations, the total increase in on-street parking demand ranges from approximately 2 percent to -14 percent of the parking supply, with the greatest increase in demand occurring under Alternative 2.

Exhibit B-27 Existing ADU-eligible parcels

Study location	Existing ADU-eligible parcels
Southeast	127
Northeast	1,141
Northwest	952
Southwest	787
Total	**3,007**

ALTERNATIVE 1 (NO ACTION)

Assuming 3 percent of eligible parcels have one ADU in Alternative 1, 91 ADUs would be created and 104 new vehicles added across all four study locations (Exhibit B-29). We estimate four ADUs created in the southeast study location that would generate five new vehicles that would occupy 6 percent of the available parking spaces. This would reduce the parking supply from 72 to 67 available parking spaces. We expect more total parcels with ADUs in northeast, northwest, and southwest study locations simply due to the size of these study locations, but new vehicles from ADU residents would occupy a smaller percentage of available parking spaces than in the southeast study location: 4 percent for the northeast and northwest locations and 2 percent for the southwest. Under Alternative

1, increased parking demand resulting from ADU production in the four study locations does not exceed existing on-street parking availability.

Exhibit B-28 Parking Availability after ADU Production under Alternative 1 (No Action)

Study location	ADUs produced	Vehicle ownership rate per ADU[1]		Existing on-street spaces available	Available spaces used by new vehicles	Spaces available after ADU production
		Ratio	Total			
Southeast	4	1.29	5	72	6%	67
Northeast	34	1.15	39	1,140	4%	1,101
Northwest	29	1.21	35	793	4%	758
Southwest	24	1.03	24	1,311	2%	1,287
Total	**91**	**—**	**104**	**3,316**	**3%**	**3,212**

[1] See Exhibit B-9 for detailed estimated vehicle ownership rates.

ALTERNATIVE 2

In Alternative 2, we assume that 3 percent of eligible parcels have two ADUs, yielding 182 ADUs and 207 new vehicles across all study locations (see Exhibit B-29). Like Alternative 1, we estimate that share of available parking used to satisfy the increase in parking demand that new ADU residents generate would be highest in the southeast study location (14 percent). The overall utilization of available parking spaces under Alternative 2 ranges from 4 to 14 percent across all four study locations. Under Alternative 2, increased parking demand resulting from ADU production in the four study locations does not exceed the existing on-street parking availability.

Exhibit B-29 Parking Availability after ADU Production under Alternative 2

Study location	ADUs produced	Vehicle ownership rate per ADU[1]		Existing on-street spaces available	Available spaces used by new vehicles	Spaces available after ADU production
		Ratio	Total			
Southeast	8	1.29	10	72	14%	62
Northeast	68	1.15	78	1,140	7%	1,062
Northwest	58	1.21	70	793	9%	723
Southwest	48	1.03	49	1,311	4%	1,262
Total	**182**	**—**	**207**	**3,316**	**6%**	**3,109**

[1] See Exhibit B-9 for detailed estimated vehicle ownership rates.

ALTERNATIVE 3

In Alternative 3, we assume that 1.5 percent of eligible parcels have at least one ADU, and 1.5 percent of eligible parcels develop two ADUs. This yields a total of 135 ADUs whose residents bring 155 new vehicles to the study locations (see Exhibit B-30). The results for Alternative 3 are nearly identical to Alternative 1. The share of available parking spaces used to satisfy new parking demand from ADU residents ranges from 3 percent in the southwest study location to 11 percent in the southeast study location. Under Alternative 3, the increased parking demand resulting from ADU production in the four study locations does not exceed the existing on-street parking availability.

Exhibit B-30 Parking Availability after ADU Production under Alternative 3

Study location	ADUs produced	Vehicle ownership rate per ADU[1]		Existing on-street spaces available	Available spaces used by new vehicles	Spaces available after ADU production
		Ratio	Total			
Southeast	6	1.29	8	72	11%	64
Northeast	51	1.15	59	1,140	5%	1,081
Northwest	42	1.21	51	793	6%	742
Southwest	36	1.03	37	1,311	3%	1,274
Total	**135**	**—**	**155**	**3,316**	**3%**	**3,161**

[1] See Exhibit B-9 for detailed estimated vehicle ownership rates.

SENSITIVITY ANALYSIS

We also conducted a sensitivity analysis to estimate how many ADUs would have to be produced to result in on-street parking utilization rates of 85 percent in each study location using Equation 4. The sensitivity analysis compares the parking impacts we estimated for each alternative to a level of impact considered to be a potential issue. In this sensitivity analysis, we use an on-street parking utilization rate of 85 percent.

Equation 4:

$$\frac{ParkingSupply_{Existing} - ParkingDemand_{Existing}}{CarOwn_{ADU,SEA}} = ADU_{MAX}$$

Where:

$ParkingSupply_{Existing}$ = Existing number of on-street parking spaces

$ParkingDemand_{Existing}$ = Existing number of vehicles using on-street parking

$CarOwn_{ADU, SEA}$ = Average number of cars per household in Seattle ADUs

ADU_{MAX} = Number of ADUs needed to be produced to result in 85 percent on-street parking utilization rates

Exhibit B-31 Sensitivity Analysis Testing for 85 Percent On-Street Parking Utilization

Study location	Existing utilization rates	Existing parking demand	Existing parking suppy	Vehicle ownership rate per ADU[1]	Vehicles needed for 85% utilization	ADUs needed for 85% utilization	Estimated Number of ADUs Produced per Alternative		
							Alt 1	Alt 2	Alt 3
Southeast	78%	255	327	1.29	23	18	4	8	6
Northeast	53%	1,263	2,403	1.15	780	678	34	68	51
Northwest	63%	1,322	2,115	1.21	476	393	29	58	42
Southwest	51%	1,371	2,682	1.03	909	883	24	48	36
Total	**56%**	**4,211**	**7,527**	—	**2,188**	**1,972**	**91**	**182**	**135**

[1] See Exhibit B-9 for detailed estimated vehicle ownership rates.

Exhibit B-31 shows the results of the sensitivity analysis that estimates how many ADUs need to be produced to result in 85 percent on-street parking utilization rates. For all four study locations, between 10 to 835 additional ADUs would be necessary to result in 85 percent parking utilization compared to the highest estimate of ADU production in each

alternative, or 1,790 additional ADUs for all study locations combined. The southeast study location, which has the lowest supply of parking spaces and highest utilization rates, would require 10 additional ADUs (18 total) for parking utilization to reach 85 percent.

B.5 Conclusion and Findings

Based on our analysis of unrestricted on-street parking supply, observations of current parking utilization, and estimates of future on-street parking demand resulting from ADU development, we find that ADU production would not have an adverse impact on the availability of on-street parking under any alternative. Because the four study locations represent the range of lot sizes, presence of alleys and driveways, sidewalk completeness, and other conditions commonly found in single-family zones, we can extrapolate these to other land with single-family zoning in EIS study area.

Alternatives 1 and 3 have very similar impacts. On average, three percent of available parking supply across all study locations would be occupied with vehicles from new ADU residents based on ADU production estimates for 2018-2027. Compared to Alternatives 1 and 3, we estimate Alternative 2 would result in twice as many ADUs and vehicles across the four study locations, but nevertheless we find the existing parking supply sufficient to satisfy new parking demand from ADU residents. This analysis reflects conservative assumptions about ADU household sizes and vehicle ownership rates. In addition, we assumed that 100 percent of new vehicles would park on street, even though Alternatives 1 and 3 require off-street parking to be provided. Therefore, the increase in demand for on-street parking could be lower than we estimate. Exhibit B-32 shows the estimated utilization rates for existing conditions and all three alternatives. The total increase in on-street parking utilization rates ranges from 1 percent to 3 percent across all alternatives and study locations.

Exhibit B-32 Estimated Future Parking Utilization

Study location	Existing	Alternative 1 (No Action)	Alternative 2	Alternative 3
Southeast	78%	80%	81%	80%
Northeast	53%	53%	56%	55%
Northwest	63%	64%	66%	65%
Southwest	51%	52%	53%	52%
Total	**56%**	**57%**	**59%**	**58%**

APPENDIX C
Aesthetics Modeling Methods and Assumptions

C.1 Introduction

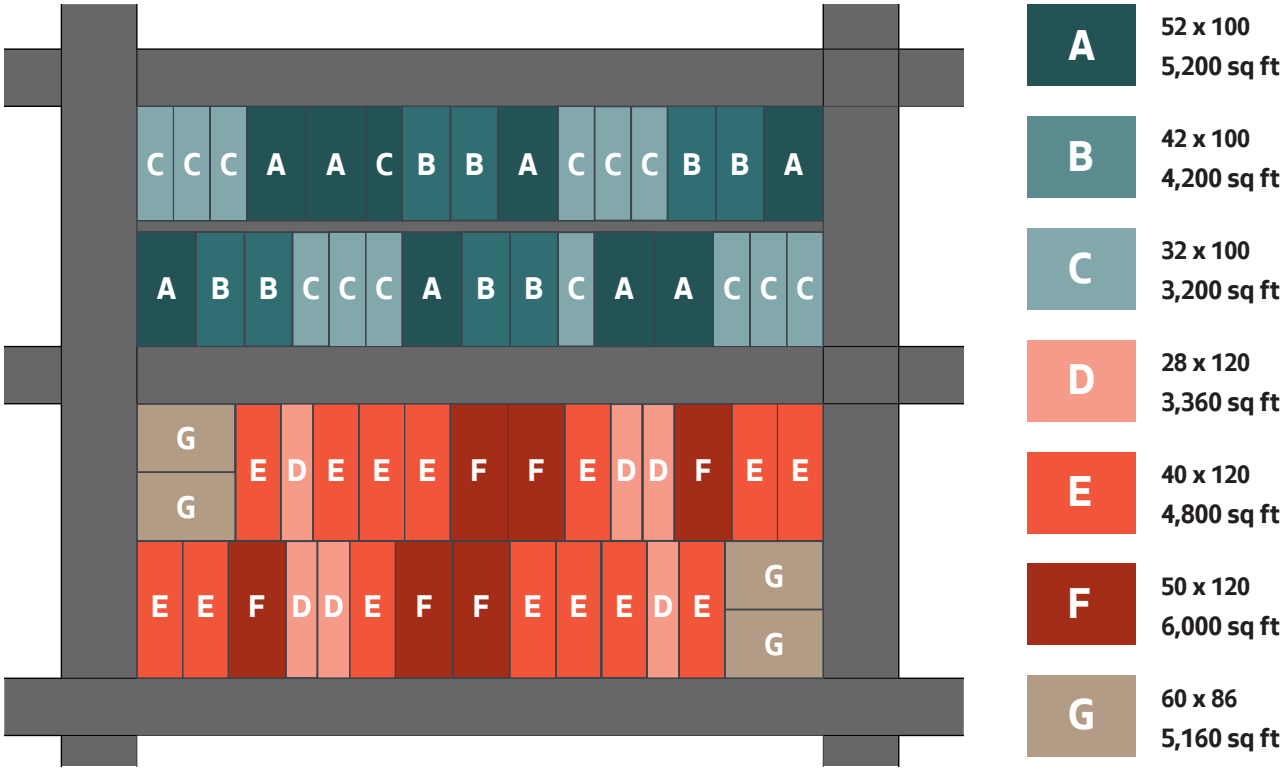
To illustrate a range of typical conditions representative of Seattle neighborhoods where the development of ADUs could occur, we assembled two hypothetical blocks consisting of 60 lots with seven distinct lot types. These lot types reflect actual lots found in representative locations in Seattle neighborhoods and illustrate various lot sizes (ranging from 3,200 to 6,000 square feet), lot widths (ranging from 28 to 60 feet), and lot depths (ranging from 86 to 120 feet). To illustrate varied frontage conditions, one block includes an alley and the other does not. The hypothetical blocks also include a corner lot in which a rear yard abuts a side yard.

Exhibit 1 depicts the configuration of the hypothetical blocks and the distribution of the seven distinct lot types (A through G). We use this configuration and lot type distribution across all alternatives and scenarios as a basis for comparison.

EXISTING CONDITIONS

We modeled "existing" conditions to illustrate a baseline for comparing the potential effects of each alternative. While the block assemblage is hypothetical, the houses modeled are closely based on actual houses found in two representative locations in Seattle neighborhoods. In addition to the various lot sizes and frontage conditions, the houses shown in the existing conditions scenario include vary in size and parking access and location in order to mimic a realistic range of conditions that are more or less favorable to adding ADUs. The scenario includes detached and attached garages with alley access; detached and attached garage with front driveway access; driveway parking; lots without off-street parking)

Exhibit C-1 Distribution of Lot Types in Hypothetical Blocks



ALTERNATIVES DEVELOPMENT

For each alternative, we modeled two scenarios:

- **Full Build-Out Scenario.** This hypothetical scenario shows complete redevelopment of all lots with the largest possible principal unit and the maximum number of ADUs allowed. We do not anticipate this scenario to occur. Instead, the model illustrates the upper limit of allowed development under each alternative.
- **10-Year Scenario.** Based on projected market conditions and trends, this scenario illustrates a realistic anticipated condition over 10 years. This scenario consists of existing houses, fully redeveloped lots, and ADUs added to existing houses. The number of redeveloped lots and added ADUs varies in each alternative, as the proposed code requirements affect the likelihood of different development outcomes. The lot selection and development action are based on the economic forecasting conducted as part of this EIS and described in Appendix A.

We included parked vehicles to approximate how each alternative and scenario could affect the availability of on- and off-street parking.

The amount and location of parking we illustrated do not specifically reflect the off-street parking requirements for each alternative but reflects anticipated real-world parking conditions based on the following assumptions:

- 2 vehicles per principal unit.
- 1 vehicle per ADU.
- No vehicle parked in front yard portion of driveway.
- No more than 1 vehicle parked in front driveway. The assumption is that some negotiation among residents is acceptable but complete blocking of the primary unit's garage by an ADU resident's vehicle is unrealistic.
- Every garage is used to store a vehicle.
- All vehicles not accommodated off-street are shown parked on the street.

Alternative 1 (No Action)

In addition to the general guidance described above, we modeled Alternative 1 (No Action) using the following assumptions:

Full Build-Out Scenario

- Maximized footprint of principal building on all lots based on allowed lot coverage while accommodating a DADU or AADU and all required off-street parking
- Maximized square footage of principal unit on all lots, fully using allowed building height
- Largest feasible DADU, where applicable

10-Year Scenario

- Development outcomes based on projected market trends as follows:
  - » 2 existing houses with added AADU
  - » 1 existing house with added DADU
  - » 2 redeveloped houses with no ADUs
  - » 1 redeveloped house with added DADU
- Remaining lots remain in existing condition

Alternative 2

In addition to the general guidance described above, we modeled Alternative 2 using the following assumptions:

Full Build-Out Scenario

- Maximized footprint of principal building on all lots based on allowed lot coverage while accommodating a DADU and all required off-street parking
- Maximized square footage of principal unit and an AADU on the ground floor of the principal building on all lots, fully using allowed building height
- Largest feasible DADU on all lots

10-Year Scenario

- Development outcomes based on projected market trends as follows:
  - 1 existing house with added AADU
  - 1 existing house with added DADU
  - 1 existing house with added AADU and DADU
  - 2 redeveloped houses with no ADUs
  - 1 redeveloped house with added DADU
- Remaining lots remain in existing condition

Alternative 3

In addition to the general guidance described above, we modeled Alternative 3 using the following assumptions:

Full Build-Out Scenario

- Maximized footprint of principal building on all lots, based on allowed lot coverage while accommodating a DADU and all required off-street parking
- Maximized square footage of principal unit on all lots or maximum allowed FAR, using allowed building height as applicable
- Largest feasible AADU in the basement or half basement of the principal building on all lots
- Largest feasible DADU on all lots

10-Year Scenario

- Development outcomes based on projected market trends as follows:
  - 2 existing houses with added AADU
  - 2 existing houses with added DADU
  - 1 existing house with added AADU and DADU
  - 1 redeveloped house with no ADUs
  - 1 redeveloped house with added DADU
- Remaining lots remain in existing condition