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HOUSING POLICY AND AFFORDABILITY CALCULATOR:

An Overview of the Calculator's Methodology, Assumptions Used, and Conclusions Reached in our Analysis of the City of Seattle's Regulatory and Housing Market Environment

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INTRODUCTION I

"The purpose of the **Housing Policy and Affordability Calculator** is to support the design of local policies that balance their impacts on housing affordability with their intended public policy goals."

1.1 PROJECT GOAL

In a national climate of rapid growth and record rents across American cities, housing affordability has become a critical issue for households at all income levels. Local policies influence these rents by changing the cost of development and the overall supply of housing.

Local policies are designed to achieve public policy goals, like public safety through earthquake codes, sustainability through energy standards, or community input through public comment periods. The impact of these on housing affordability is often not directly addressed and rarely measured. Individual policies typically have minor impacts on housing affordability, but cumulatively they can significantly affect a community's housing affordability.

The purpose of the ***Seattle Housing Policy and Affordability Calculator*** is to support the design of local policies that balance their impacts on housing affordability with their intended public policy goals.

The calculator allows the user to see this impact at three different scales: for an individual apartment, for a single building, and for all buildings citywide. For individual apartments, it calculates the rent required for a new prototypical one-bedroom apartment given changes in the policy environment. For buildings, it calculates the change in total units, development cost, and project feasibility relative to current conditions. Finally, it calculates estimated changes in housing production, rent levels and cost burden at a citywide scale.

This calculator is designed to be a living document. Up for Growth National Coalition (UFG) will iterate through and refine the methodologies outlined in this paper, and work to select up to 30 additional cities for this analysis.

We hope this calculator will promote cross-city comparisons and benchmarking by adopting a consistent and updated dataset of housing policies, development profiles, and financial metrics across the country.

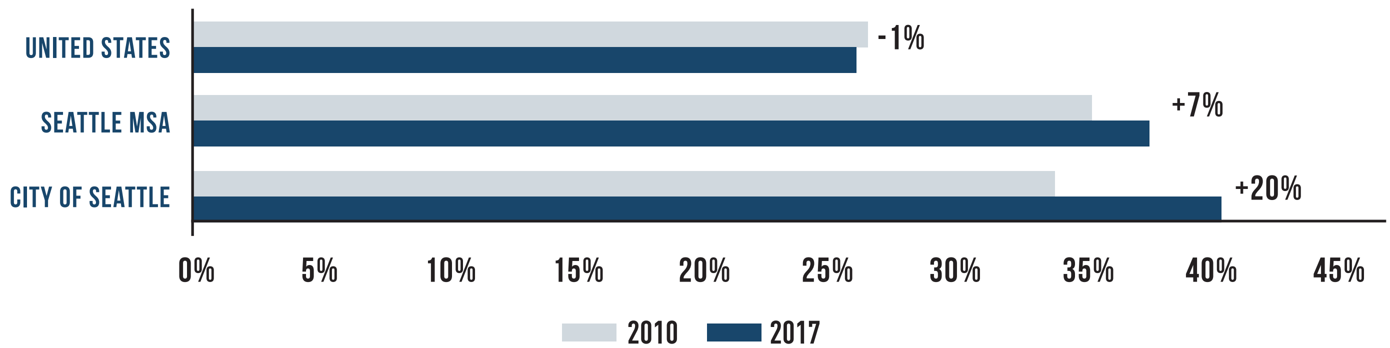
1.2 SEATTLE'S MULTIFAMILY HOUSING MARKET

Strong Demand and Rising Incomes

Seattle's housing challenges are familiar to large and fast-growing cities across the country. Since 2000, the city has faced pressing concerns over housing affordability, bred from an environment of a rapidly rising population and an inadequate housing supply.

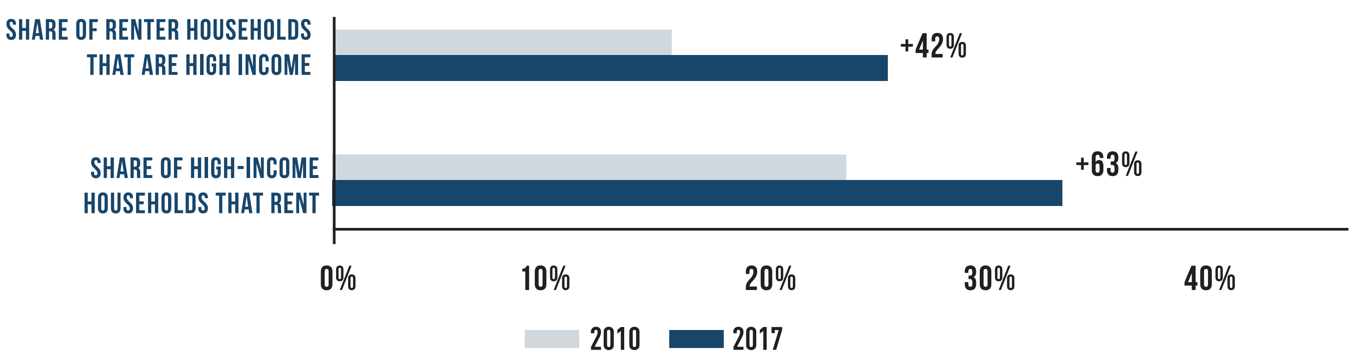
Between 2000 and 2017, the number of households in the City of Seattle grew by 22% (about 56,000)[1]. The vast influx of new households are high-income households, driven by the region's exceptional job growth within high-paying tech and professional services industries. The number of jobs in King County paying at least $100,000 in real dollars grew by 20% (nearly 77,000 jobs) between 2010 and 2017, a rate that is distinctively higher than both the MSA (7%) and the national benchmark (-1%)[2].

FIGURE 1: SHARE OF HOUSEHOLDS EARNING $100K+[3]



As a factor of both housing availability and lifestyle decisions, may of Seattle's high-income households (earning more than $100,000) are choosing to be renters and to live in central neighborhoods. As a result, an outsized share of renters are high-income households.

FIGURE 2: GROWTH IN HIGH-INCOME RENTERS[4]



The volume of high-income demand is both a signal and a driver of the rapid economic growth the city has seen, especially since 2010. High renter incomes have supported the increased construction of higher-end multifamily apartment projects in recent years.

[1] U.S. Census 2000 and American Community Survey 2017 5-Year Estimates
[2] EMSI, 2018; HR&A Analysis
[3] American Community Survey 2010 and 2017 5-Year Estimates; HR&A analysis.
[4] Ibid.

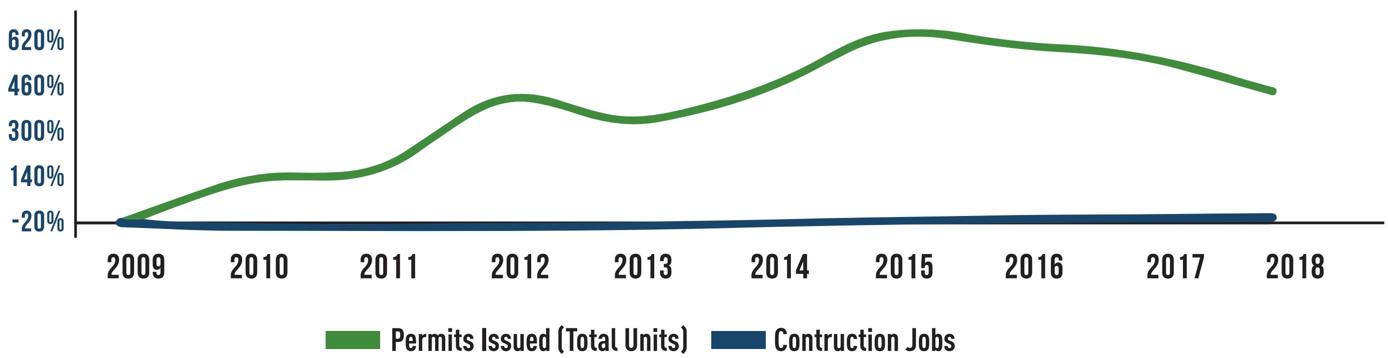
Supply-Side Constraints

Seattle's housing prices have also been inflated by restrictive land use policies and rising development costs. These pressures contribute to increased prices both by increasing the rent required for projects to be financially feasible and by slowing the growth of the housing supply. These two mechanisms are modeled in the project-level and citywide pieces of the study, respectively.

A full 70% of Seattle's land is zoned exclusively for single-family use[5], which places even greater price pressure on multifamily-zoned land. This imbalance in zoning allocation is reflected in the land prices: the average land value for a single-family parcel in 2018 was $45 PSF, compared to $78 PSF for multifamily parcels[6]. Additional regulations such as open space requirements and floorplate size restrictions further limit the effective quantity of land available for multifamily residential development.

In addition to inflated land prices, another major cost driver has been the increase in development costs, particularly construction costs and cost of labor. Residential permits in the city have spiked since 2013 after a low point in the last downturn, but construction jobs have not rebounded similarly. This effective construction labor shortage has contributed to rising construction costs, which mirror rapidly rising construction costs across the country, especially on the West Coast.

FIGURE 3: PERCENT CHANGE IN PERMITTED UNITS AND BUILDING CONSTRUCTION JOBS (INDEXED TO 2009)[7]



1.3 DEVELOPING A MODEL

To evaluate the effects of regulations on rents, project feasibility, and overall production, we developed two interrelated models: the project-based model and the citywide model.

The **project-based model** is a modified proforma analysis that changes the finances of prototypical midrise or high-rise new construction in Seattle, based on the policy environment.

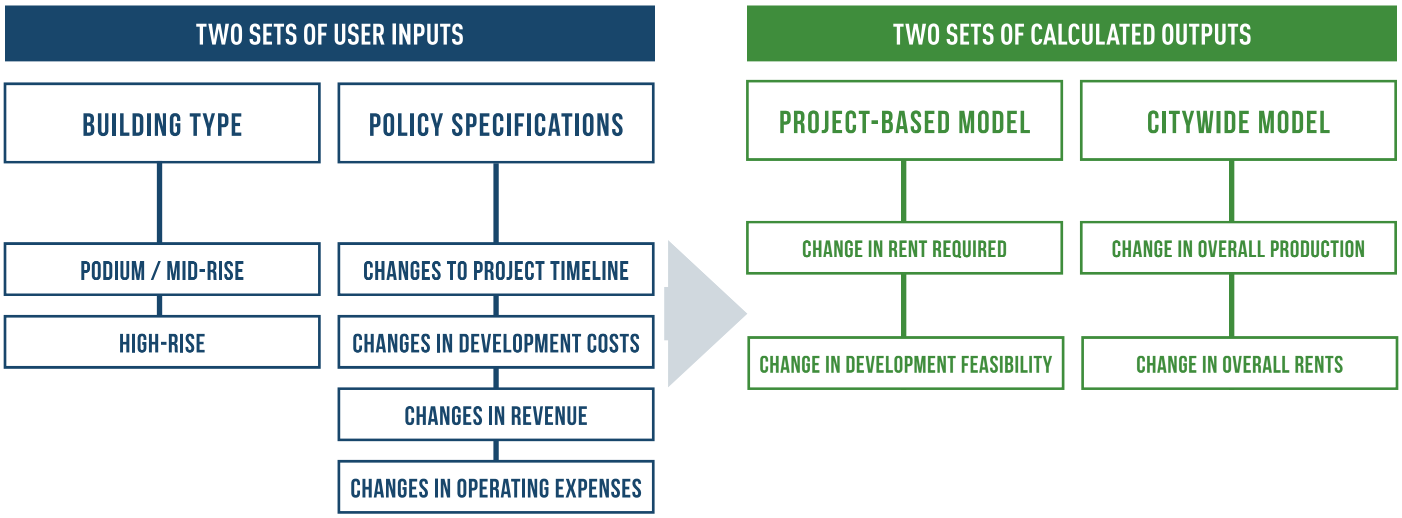
The **citywide model** is a modified residual land value analysis that evaluates the feasibility of development for each parcel in Seattle given its additional residential capacity.

[5] Eliason, Mike. (2018). "This Is How You Slow-Walk into a Housing Shortage." Sightline Institute.

[6] Seattle 2015 Parcel Capacity Data; HR&A analysis.

[7] Permit data from City of Seattle Open Data; only units for issued permits were counted. Job data for King County taken from Emsi; only jobs under NAICS code 236 (Construction of Buildings) were counted. Figure indexes numbers from their recession-period trough in 2009.

FIGURE 4: MODEL FRAMEWORK



1.4 KEY FINDINGS FROM PREVIOUS STUDIES

Our analysis relies upon theoretical and empirical findings that have been established in the existing literature. Given the specific format and purpose of our research, we were primarily interested in precedent efforts to dynamically model the effects of housing policies on housing affordability. To understand housing market dynamics at a citywide scale, we also reviewed studies that estimated the elasticities of supply and demand for housing, as these coefficients can help estimate the downstream price effects created by the cost shocks that are generated by shifts in policy. We adapted the methodologies employed in these studies into our model where possible and used empirical estimates when necessary, recognizing that these estimates are mutable across geographies and time periods. We also reviewed areas of research that highlight the functional limitations of the first version of our model and point to market complexities that will be incorporated in future versions.

The Price of Policies and Regulations

The effect of local policies on housing prices is well-documented. Gyourko and Molloy (2015)[8] review this literature and conclude that regulatory policies generally raise prices, reduce construction, and dampen the responsiveness of supply to changes in demand. Specifically, Glaeser and Gyourko (2018)[9] build upon past work to find that the gap between housing price and production cost is effectively a regulatory tax, which — at its existing levels — has cost at least 2 percent of national output (GDP). Glaeser, Gyourko, and Saks (2005)[10] emphasize that housing prices have been driven not only by rising construction costs and regulatory policies, but also by an increased ability for residents to block new projects and influence local development decisions.

The specific nature and extent of these impacts are still largely debated, especially when focusing on idiosyncratic markets or when trying to measure the downstream outcomes of high housing prices. New studies that explore this topic should help to better structure local and national policies that are data-driven and empirically based.

[8] Gyourko, Joseph and Molloy, Raven. (2015). "Regulation and Housing Supply." *Handbook of Regional and Urban Economics, 5*, 1289-1337. doi: 10.1016/B978-0-444-59531-7.00019-3

[9] Glaeser, Edward and Gyourko, Joseph. (2018). "The Economic Implications of Housing Supply." *Journal of Economic Perspectives, 32* (1), 3-30. doi: 10.1257/jep.32.1.3

[10] Glaeser, Edward, Gyourko, Joseph, and Saks, Raven. (2005). "Why Have Housing Prices Gone Up?" *American Economic Review, 95* (2), 329-333. doi: 10.1257/000282805774669961

Housing Impact Models

There have been several efforts to model the effect of regulatory policies on components of the housing market. For the U.S. Department of Housing and Urban Development, Dacquisto and Rodda (2006)[11] prepared a thorough guidebook on the components of and considerations surrounding housing impact analyses for for-sale and rental housing. This paper drew many of its recommended methodologies from precedent studies performed at a national or inter-metropolitan scale, such as those measuring the effects of federal environmental regulations on housing construction costs. Our study largely follows the framework outlined by Dacquisto and Rodda and is an example of the housing impact analyses that their paper is meant to inform. For the purpose of approaching execution and tractability, our model does not yet incorporate the breadth of considerations outlined in the paper. These considerations include conducting a more thorough regression on historical trends, incorporating indirect or secondary market effects, and drilling down to the submarket and neighborhood level. Moreover, our model is currently intra-metropolitan in that it focuses on the contained ecosystems of individual cities.

The format and execution of our model most closely follow the precedents set in 2016 by the Terner Center for Housing Innovation at the University of California at Berkeley.[12] The Terner Center published two online web tools that allow users to adjust development pro forma inputs (such as costs, return expectations, rents, and affordability) to see the effects on rent and production feasibility at a project-level and citywide scale. Our model adopts a similar method of calculating the probability of development at both scales, but it shifts the perspective by designing the levers of the model around policies rather than direct cost and revenue assumptions of the underlying model.

Our model estimates the probability of development through a distribution function that relates development to anticipated financial returns. The Terner Center model, documented by MacDonald (2016)[13], determines the spread of construction likelihood as a ratio between a parcel's residual land value and market land value. When the two values are equal, the development probability is 79% — meaning that "about 79% of motivated land sellers agree to sell at the market price." We use a similar distribution for our citywide model and adapt it for our project-level model, which pegs the likelihood of development to the expected internal rate of return. These distributions of probability represent a developer's shifts in tolerance for idiosyncratic and systemic risks involved with the parcel and development conditions for each city, and the probability serves as an illustrative indicator of development risk inherent in different regulatory environments.

Holland et al. (1995)[14] emphasize that investors in commercial real estate particularly respond to irreversibility and delay, which are two prominent risks to real estate development. The paper explores how the actual rate of commercial real estate construction responds to volatility in building property value and finds that value uncertainty significantly decreases the rate of investment and therefore the probability of development.

Supply and Demand Elasticity Coefficients for Housing

For our citywide model, we used housing supply and demand elasticities to estimate the shift in housing prices as a result of a shift in the equilibrium housing supply. The supply elasticity of housing indicates how responsive supply (or new construction) is to an increase in price, and the demand elasticity indicates how responsive housing demand is to prices.

To estimate price shifts using these elasticities, we replicated a methodology outlined by Dacquisto and Rodda (2006). This methodology was applied by Dr. Ted Egan for a 2014 report for the City of San Francisco[15], which estimated the

[11] Dacquisto, David and Rodda, David. (2006). "Housing Impact Analysis."
[12] MacDonald, Graham. (2016). "The Effects of Local Government Policies on Housing Supply." Terner Center for Housing Innovation, UC Berkeley.
[13] MacDonald (2016).
[14] Holland, Steven, Ott, Steven, and Riddiough, Timothy. (1995). "Uncertainty and the Rate of Commercial Real Estate Development." Real Estate Research Institute.
[15] Egan, Ted. (2014). "The Economics of San Francisco Housing." Presentation for the City and County of San Francisco.

percent price impact of a percent increase in development. The method was also employed in Bellisario et al. (2018)[16]. The change in price is calculated as the change in production divided by the difference between the local supply and demand elasticities (see methodology below for the derivation of this relationship). As with Egan's report, we drew upon supply elasticity values from the existing literature, while we calculated a set of custom demand elasticities by taking a linear regression over a panel of Census Public Use Microdata Samples (PUMS) and quality-adjusted time-series rent values from Zillow.

Several studies have calculated supply elasticities of housing, at both national and local scales. A 2016 Trulia report estimated the supply elasticity of housing in Seattle to be 0.17, slightly below the 30-year average of approximately 0.2.[17]

Filtering and Housing Submarkets

One key feature of the housing market that will be considered in future variations of this model is segmentation. Housing quality and price can vary greatly: high-quality, high-cost housing and low-quality, low-cost housing are not perfect substitutes. The majority of new housing in most major cities is delivered at the top end of the market and are only affordable to high-income households. As these units age, they can "filter" down in several ways: income filtering, as the base of demand shifts from high-income households to low-income households, and price filtering, as the price lowers to reflect relatively lower quality. This trend does not necessarily happen in markets with strong pricing pressures and limited supply, as even aged units may experience rapid rent growth.

Here, the concept of price and quality filtering is applied to market-rate housing. Subsidized affordable units are not addressed in our study. Rosenthal (2014)[18] finds that in many places, filtering is a viable way to provide low-income housing when the rate of filtering adequately exceeds the local rate of price inflation. The paper supports price filtering as a force that supplements traditional ways of providing low-income housing through subsidization, though some public intervention is likely necessary for housing to reach households at the deepest levels of need.

As a process, filtering takes time and is often unpredictable in volatile or in markets that are rapidly appreciating. Housing types continue to fall on a wide spectrum of price and quality at any point in time. These segments can roughly be categorized into segments according to parameters such as geography or price ranges. Household compete within separate but overlapping housing markets depending on their ability to afford housing. As households of different income bands have different elasticities of demand (in that they respond to price change to different extents), the price sensitivities of each segment of housing are different.

Several seminal studies have modeled the separation of housing submarkets and their interacting effects. Rothenberg et al. (1991)[19] use a hedonic regression to divide housing markets into submarkets defined by housing quality. The empirical results identify highly differentiated price sensitivities within different sectors of the market and reveals the limitations of estimating "the elasticity for an unstratified market." This analysis will require a model that accounts for additional rounds of secondary and interacting market effects.

Goodman and Thibodeau (1998)[20] use hierarchical linear modeling to segment housing by geographical submarkets rather than by quality. Local regulatory changes are naturally targeted to contained areas (neighborhoods, towns, cities) because political jurisdictions are confined. However, a market that experiences a new policy is surrounded by other unregulated housing submarkets that may be potential substitutes if prices become too high in the regulated market. The greater the substitutability, the lesser the cost effect of regulations, because households can easily relocate

[16] Bellisario, Jeff, Weinberg, micah, Camila, Mena and Yang, Lanwei. (2018). "Solving the Housing Affordability Crisis: How Policy Impacts the Number of Alameda County Households Burdened by Housing Costs." Bay Area Council Economic Institute.

[17] McLaughlin, Ralph. (2016). "Is Your Town Building Enough Housing?" Trulia.

[18] Rosenthal, Stuart. (2014). "Are Private Markets and Filtering a Viable Source of Low-Income Housing? Estimates from a 'Repeat Income' Model." *American Economic Review,* 104(2), 687-706. doi: 10.1257/aer.104.2.687

[19] Rothenberg, Jerome. (1991). The Maze of Urban Housing Markets: Theory, Evidence, and Policy. Chicago: University of Chicago Press.

[20] Goodman, Allen and Thibodeau, Thomas. (1998). "Housing Market Segmentation." Journal of Housing Economics, 7(2), 121-143. doi: 10.1016/S1051-1377(03)00031-7

to other areas and prices will moderate. Glaeser and Ward (2009)[21] find empirical evidence from Massachusetts that small towns that are clustered and interchangeable experienced lower price increases despite increased stringency in housing regulations. These papers collectively imply that housing models should account for inter-city housing optionality, as the attractiveness of one city (whether through lower prices or higher quality) relative to "competing" cities will induce additional housing demand. Currently, our model does not endogenize the critical secondary effect where housing demand and net migration responds to the relative strength of housing prices, nor does it make any assumptions about the profiles (incomes, sizes) of the households that would enter or leave a market due to changing conditions.

[21] Glaeser, Edward and Ward, Bryce. (2009). "The causes and consequences of land use regulation: Evidence from Greater Boston." Journal of Urban Economics, 65, 265-278. doi: 10.1016/j.jue.2008.06.003

II KEY FINDINGS

Rather than advocate for or against a specific set of policies, the calculator is a model designed to explore tradeoffs inherent to policy changes and the resulting shifts in overall rents. To illustrate some of these impacts, we have highlighted five scenarios that demonstrate the mechanics of our model and offer interesting takeaways about the Seattle housing market.

2.1 PRO-HOUSING POLICIES REDUCE OVERALL RENTS SIGNIFICANTLY, BUT STOP SHORT OF PROVIDING AFFORDABLE RENTS FOR LOWER-INCOME HOUSEHOLDS.

A new prototypical midrise apartment that rents for $2,460 a month is affordable for families earning about $88,500 — about 110% of the area median income (AMI) in Seattle for a two-person household. If a series of incremental pro-housing policies are implemented (as seen in the table below) we estimate that rent can be reduced quite substantially by about $190 per month. This would make the prototypical midrise affordable for households earning about $81,000 — or about 100% of AMI.

This is a substantial shift in rent. At the unit-level, an 8% decrease in rent can translate to middle-class increases in household spending, savings rates, and investments.

On a project-level, the total cost by units is estimated to decrease by 9% and the total unit count is projected to increase by 13 units (from 250 to 263). Project feasibility also increases drastically, as a shorter timeline and increased units greatly reduce overall project risk.

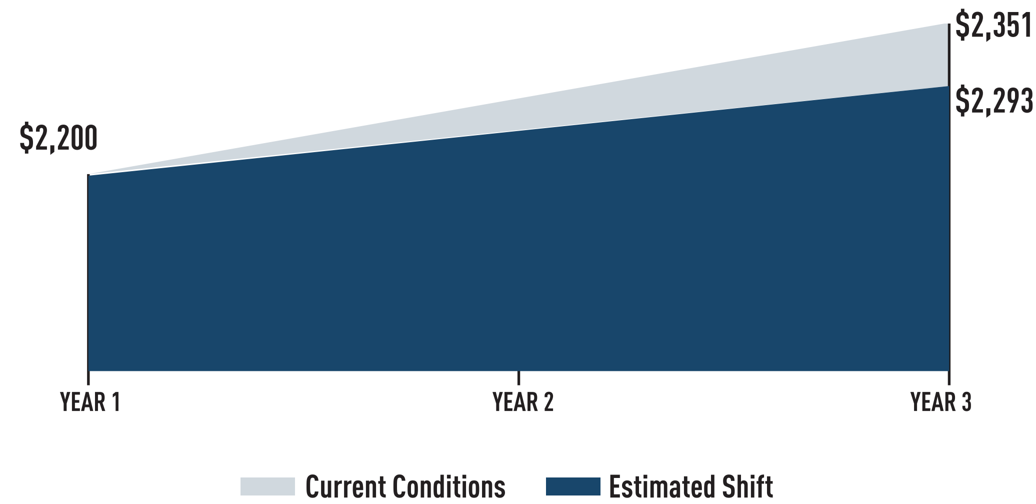
FIGURE 5: SCENARIO: INCREMENTAL PRO-HOUSING POLICIES

Rent Shift	-8%	($190)	
CURRENT CONDITIONS RENT		**$2,460**	**POLICY SHIFTS**
Parking Costs		-$10	Parking ratio reduced from 0.7 to 0.5 spaces per apartment
Open Space Requirements		-$36	15% Open Space Requirement (from 20%)
State Real Estate Excise Tax		-$9	No Real Estate Excise Tax at sale (from 1.3%)
Annual Property Tax Increase		-$42	2% Annual Tax Increase (from 4%)
MHA Fees		-$5	MHA fees reduced to $6 psf (from $10)
Timeline Cost		-$88	6 month total permitting process (from 18 months)
RESULTING RENT		**$2,270**	

Additionally, on a citywide scale, we can expect a 10% increase in production over a three-year horizon for Seattle. (An increase of 1,000 units to the average production of 9,800 units per three-year period).[22] On aggregate, we can estimate a 6.4% decrease in overall rents over the modeled three-year period. For an existing unit in the market that rents for $2,200 annually, that means that rent is now projected to increase to $2,293 over three years — instead of $2,351 in current conditions. Over three years, this represents a savings of about $1,000 on total rent paid.

[22] Based on Seattle's long-term annual production since 2000 from CoStar.

FIGURE 6: ESTIMATED 3-YEAR SHIFT IN RENT FOR EXISTING ONE-BEDROOM APARTMENT



However, these policies in a vacuum will likely have little effect on the housing cost burden of lower-income households.[23] A two-person household at 50% of Seattle's AMI earns half of the household at the 100% AMI (at $40,100). For a unit to be affordable to this household, the unit must cost approximately $1,100 per month — a $1,360 per month decrease from the current rent. While developing a pro-housing policy narrows the gap to $1,100, public subsidy is still needed to create a unit affordable to a household earning $40,100.

2.2 SEATTLE CAN GENERATE SIGNIFICANT AFFORDABILITY BY LEVERAGING TAX POLICY AND SHORTENING THE APPROVAL TIMELINE.

Tax policy and expediting the permitting timeline are specific tool that Seattle can use in tandem to develop units for lower-income households. Seattle currently uses the Multifamily Property Tax Exemption (MFTE) program to offer tax exemption for setting aside 20–25% of homes as income and rent restricted.[24] This program has been successful in creating units for households earning 60% of AMI: 592 affordable apartments came online through this program in 2017, along with another 645 apartments that were approved in the same year.[25]

The City of Seattle also has control over the *design review process*. This process aims to ensure that projects meet local design standards and aesthetic qualities. Most projects are subject to review by a local Design Review Board, which can take about six months if designs are approved on the first iteration. Bertolet[26] describes the process as counter-productive to affordability, as projects are often caught up in lengthy reviews that spend months on the minutia of building materiality and color. He points to the example of "Passive House" apartments at 1300 East Pike, an ultra-green apartment that outperforms Seattle's energy code by a wide margin with a percentage of affordable units. The developer was instructed to explore a brick façade which was found to decrease energy efficiency and increase costs. The project spent 19 months in design review. Our model estimates that this delay resulted in a 26-point decrease in the probability of development from a six-month process. This type of delay results in fewer and more expensive apartment developments.

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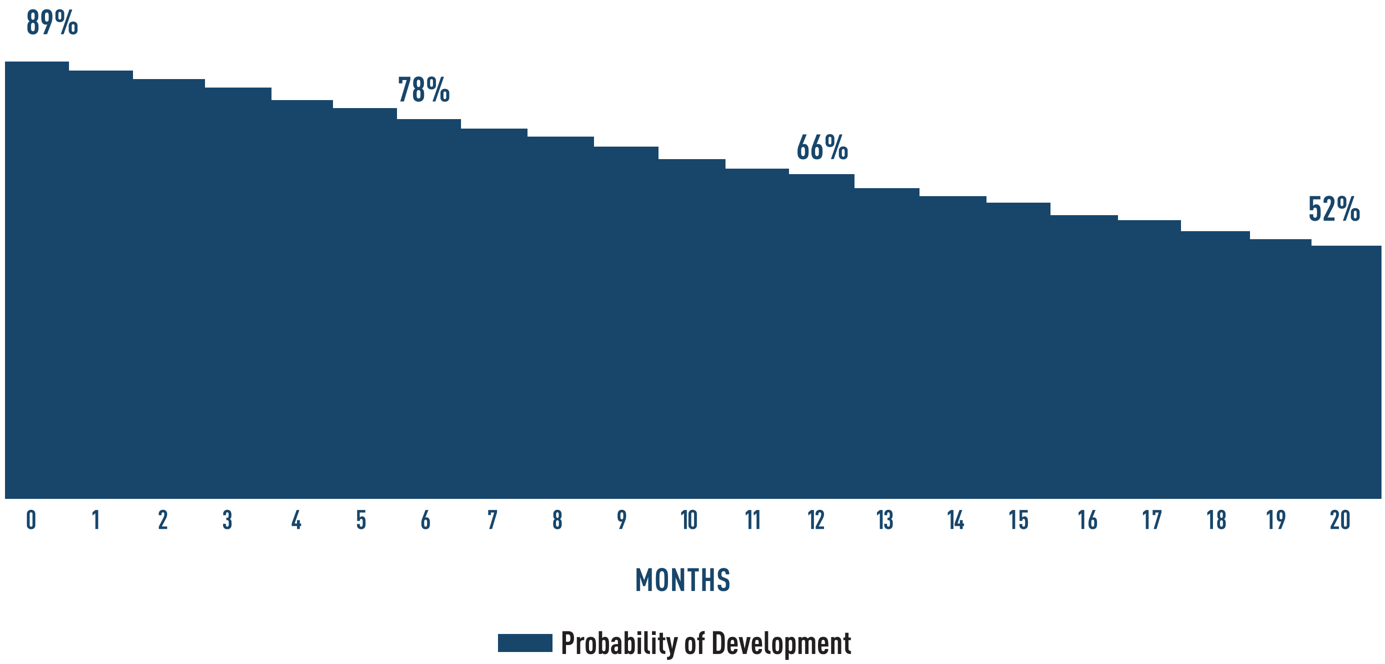
[23] As per our previous discussion in Section 2.2, we expect a certain amount of *unit filtering* to take place in the market. However, as most units are being delivered at or near the top of the market – this filtering effect is expected to have a longer lag than the 3 years modeled. We will model the effects of cross-elasticity and subsequent filtering in a future iteration of this model.

[24] City of Seattle, 2017. Multifamily Tax Exemption. Accessed at https://www.seattle.gov/housing/housing-developers/multifamily-tax-exemption

[25] City of Seattle, 2017. "Office of Housing Annual Investments Report – 2017"

[26] Bertolet, Dan 2017. "How Seattle's Design Review Sabotages Housing Affordability." Accessed at https://www.sightline.org/2017/09/06/how-seattles-design-review-sabotages-housing-affordability/

FIGURE 7: DESIGN REVIEW MONTHS VERSUS PROBABILITY OF DEVELOPMENT



Conversely, cities can combine these tools to encourage more affordable production. The example below models a new high-rise development with 100% tax abatement, a slightly reduced timeline, and with 25% affordable units (90 units out of 360).

FIGURE 8: SCENARIO – TAX ABATEMENT AND REDUCED TIMELINE WITH AFFORDABILITY

Rent Shift	0%	$0	
CURRENT CONDITIONS RENT		**$3,120**	**POLICY SHIFTS**
Tax Abatement		-$304	100% Tax Abatement
MHA Fees		-$116	No MHA fees required due to affordability
25% Affordability Set-Aside (60% AMI)		+ $499	25% affordability set-aside
Timeline Costs		-$79	4-month reduction in timeline
RESULTING RENT		**$3,120**	

2.3 THE PREDEVELOPMENT TIMELINE CAN HAVE SIGNIFICANT AND OUTSIZED EFFECTS ON THE REQUIRED RENT AND FEASIBILITY

The predevelopment period is when projects are most precarious and public policies can have outsized impacts on the feasibility and affordability. During predevelopment government agencies, local review boards, and community members to determine if proposed buildings comply with local requirements and meet community standards. Streamlining the predevelopment period makes development less expensive by limiting the ongoing holding costs of property and decreasing overall project risk. Providing space for by-right apartment development can minimize these delays and allow developers to avoid navigating a regulatory maze of variances, adjustments, and permits. Reducing the entitlement period lowers cost by decreasing risk and reducing project development expenses. Developers have reported that it takes 24 months on average to secure entitlements in Seattle. This process has been lengthened even further, with the Early Community Outreach requirement and longer Design Review processes.

We compared an expedited development process (6 months for midrise and 8 months for high-rise) to a drawn out 36-month process, which assumes a full community outreach process and a few iterations in the design review process. A 36-month process can add up to $237 in monthly rent for a midrise development and $222 for a high-rise — a significant increase of 7 to 10%.

Predevelopment timelines also have a significant impact on the feasibility of development. Our model estimates that development feasibility decreases 34 points as a result of the increased timeline due to increased carrying costs, changing market conditions, and project uncertainty.

FIGURE 9: TIMELINE VARIABILITY ON REQUIRED RENT

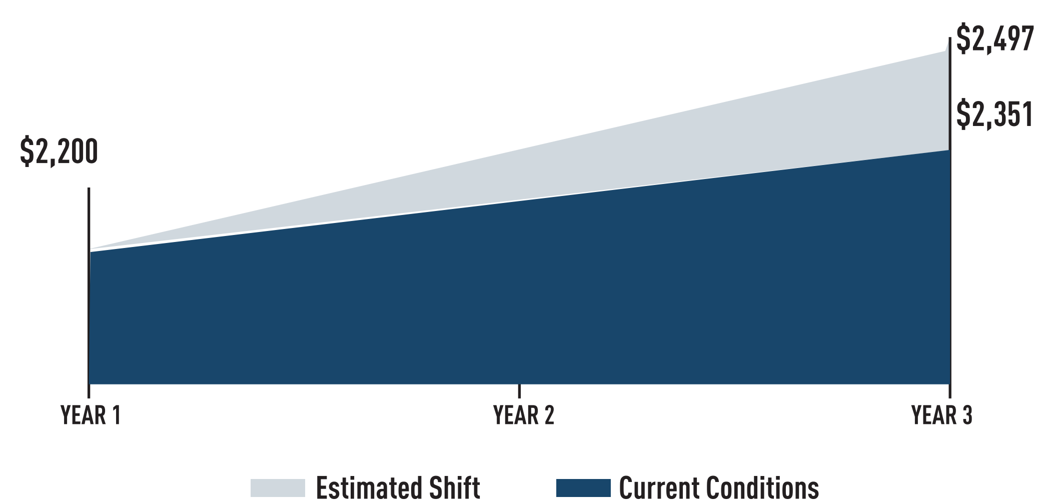
TYPOLOGY	EXPEDITED PROCESS	36-MONTH PROCESS	CHANGE	PERCENTAGE CHANGE
Midrise	$2,371	$2,608	+$237	+10%
High-Rise	$3,053	$3,275	+$222	+ 7%

On a citywide scale, over a 3-year period (if all projects took a 36-month process):

- 600 fewer units (6%)
- An estimated 4% increase in overall rents
- An 6% increase in cost burdened households

On a citywide scale, an increase can in the predevelopment timeline can have a substantial impact on overall production and rents. Our model conservatively estimates a 6% reduction in units built over a three-year period (a decrease of 600 units to the average production of 9,800 units per three-year period) and an increase in rents by 4% over three years over the current conditions that can be attributed to the increase in timeline. For an existing apartment that rents for $2,200 currently, that translates to a $300 increase in rent over three years, compared to $151 in current conditions. This shift is also estimated to increase the number of cost-burdened households by 6 points, from 40% to 46%.

FIGURE 10: ESTIMATED SHIFT FROM CURRENT CONDITIONS



2.4 ALTHOUGH EACH POLICY SEEMS SMALL IN ISOLATION, THE CUMULATIVE IMPACT OF POLICIES CAN BE SUBSTANTIAL

The costs of policies often compound and substantially increase rents. If a project faced all the policy shifts highlighted below, rents may need to increase by 10%–12% to maintain a constant return, and development feasibility will drop by 55 points.

This is the difference between a new midrise apartment being affordable to a two-person household earning about $88,500 annually, to only being affordable to a household making more than $98,000

As one of the key issues facing Seattle residents, the city should consider evaluating policies based on two key questions:

- What is the **direct result** of this policy on future rents? How would this policy shift change required rents for units currently in the pipeline?
- What is the **indirect effect** on overall housing affordability? How will this policy change the number of households in the region that can afford an apartment?

FIGURE 11: CUMULATIVE IMPACT OF INCREMENTAL POLICY SHIFTS

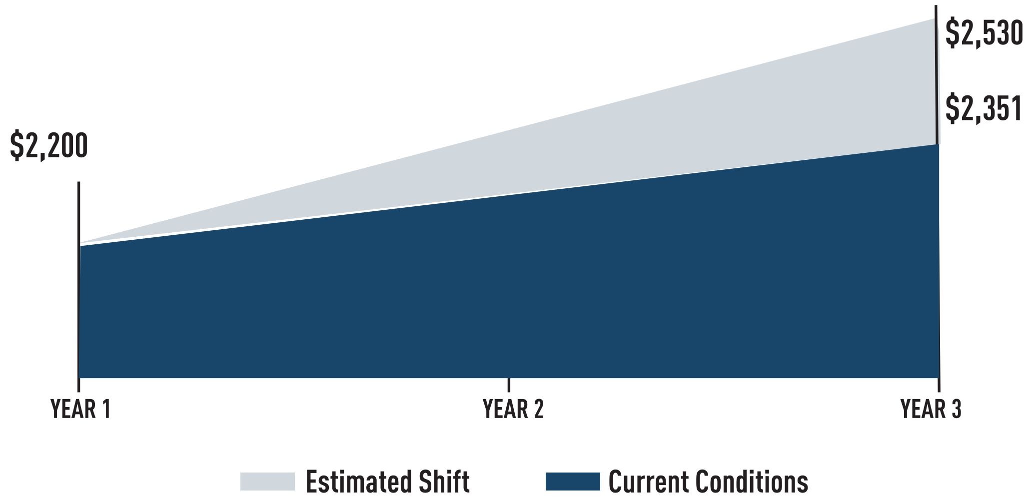
Rent Shift	11%	$265	
CURRENT CONDITIONS RENT		**$2,460**	**POLICY SHIFTS**
Annual Property Tax Increase		+ $55	Annual tax increase of 6% (from 4%)
Green Factor Requirements		+ $23	Green Factor Score of 1 (versus 0.5)
Additional Development Requirements		+ $19	$1.2M Exaction for Park
State Real Estate Excise Tax		+ $20	REET increase from 1.28% to 2.5% (As per SB 5582)
Energy Code Requirements		+ $48	Aggressive Scenario for new energy reqs
Timeline Costs		+ $100	9-month delay in entitlements

On a citywide scale, over a 3-year period (given all the added policies and hurdles)

- 700 fewer units (7%)
- An estimated 4.5% increase in overall rents
- An 7% increase in cost burdened households

On a citywide scale, the cumulative impact of these policies can have a substantial impact on overall production and rents. Our model conservatively estimates a 7% reduction in units built over a three-year period (a decrease of 700 units to the average production of 9,800 units per three-year period) and an increase in rents by 4.5% over three years over the current conditions that can be attributed to the increase in timeline. For an existing apartment that rents for $2,200 currently, that translates to a $330 increase in rent over three years, compared to $151 in current conditions. This shift is also estimated to increase the number of cost-burdened households by 7 points, from 40% to 47%.

FIGURE 12: ESTIMATED SHIFT FROM CURRENT CONDITIONS



III METHODOLOGY

3.1 APPROACH

Housing models are inherently imperfect predictive tools that try to calculate equilibrium conditions given an almost infinite number of exogenous variables and internal interactions. They simplify the market and lose important relationships between variables that can lead to a misrepresentation in analysis. Despite these imperfections, models provide the best tool to inform the design of effective policies and are a necessary — and underused — tool to guide conversations on how to address affordability challenges.

We hope that this model can serve as a tool to support thoughtful discussion in communities about local policies and affordability. Additionally, we hope that this model can serve as a framework that can be challenged and improved upon. Our goal is to provide the most useful model currently possible to inform housing policies in markets across America, and this iteration is meant to serve as the first step towards more fruitful conversation.

3.2 PROJECT-BASED MODEL

To evaluate the factors contributing to the increasing housing costs in the Seattle region on a project-specific scale, we engaged in the following methodology:

- Interviewed local real estate development experts and analyzed real estate and demographic data to identify the factors contributing to the rising rents in Seattle;
- Built representative proformas for typologies common for midrise and high-rise projects currently being built in Seattle using developer proformas and third-party financial assumption sources;
- Identified the set of key policies affecting the cost of housing development or operations; and
- Used representative financial models to test the impact of potential policy shifts on the financial performance and required rent of the two building types.

Interviews with real estate development experts and data analysis

We identified a range of real estate experts with insight into the local real estate market to help identify the factors contributing to rising rents in Seattle. These interviews informed the financial model's default assumptions along with the potential impacts of each of the regulations that were tested. We collected financial assumptions used by Seattle-area developers to understand recent and planned new development.[27]

To supplement this data, we conducted a targeted multifamily market scan in Seattle. We used a variety of proprietary data sources[28] to source rent, vacancy, construction cost, operating cost, and other assumptions to ensure that the pro formas were representative of the broader Seattle market and not beholden to parcel- and project-specific considerations.

[27] All of the financial assumptions received from developers were from projects completed after 2017 or planned as of January 2019.

[28] CoStar, RCA Analytics, Zillow (2018).

Development of prototypical multifamily projects

To test how various policies could impact the cost of developing new housing, we created proformas modeling two prototypical 250–350-unit multifamily developments. These projects represent multifamily development typologies currently seen in the regional Seattle market. The two typologies modeled are midrise developments (Type 3 development) and high-rise tower development (Type 1 development). The objective of the models was to measure the relative impacts of current and proposed Seattle regulations as accurately as possible. In practice, each real-world project's financing structure can differ widely based on return requirements, holding periods, and other project-specific factors. To standardize these models, we modeled these projects with a targeted levered-internal rate of return (IRR) of 16%.[29] This IRR is based on converting various return metrics found in developer proformas (unleveraged-IRR, yield on cost, basis spread, equity multiple, etc.) into a consistent cashflow return metric that allows future comparisons across project typologies and future potential cities. These returns were benchmarked with proprietary HR&A metrics for new development in stable high-performing markets.

FIGURE 13: BUILDING TYPOLOGIES STUDIED

PRODUCT TYPE	PODIUM / DECK	HIGH-RISE
Construction Cost (Hard and soft costs)	$245/SF	$390/SF
Parking Ratio	0.70/unit	0.60/unit
Total Units	250 units	360 units
Market Rents (Monthly NSF)	$3.41/SF	$3.98/SF
Average Monthly Rent	$2,460/ mo.	$3,120/ mo.
Annual Operating Expenses	$4,480/unit	$5,760/unit
Annual Taxes	$3,100/unit	$4,000/unit

Identifying and testing policies affecting the cost of development and operation

Using the prototypical multifamily models, we then evaluated the impact of the policies on the representative midrise and high-rise projects. We sourced a list of policies — ranging from increases in property taxes to potential new impact fees — from local policymakers, developers, and secondary sources.

Each regulation tested was modeled through the project-specific cashflow and yielded a new IRR (representing a deviation from the default 16%). This new scenario-IRR was used to yield two key output metrics:

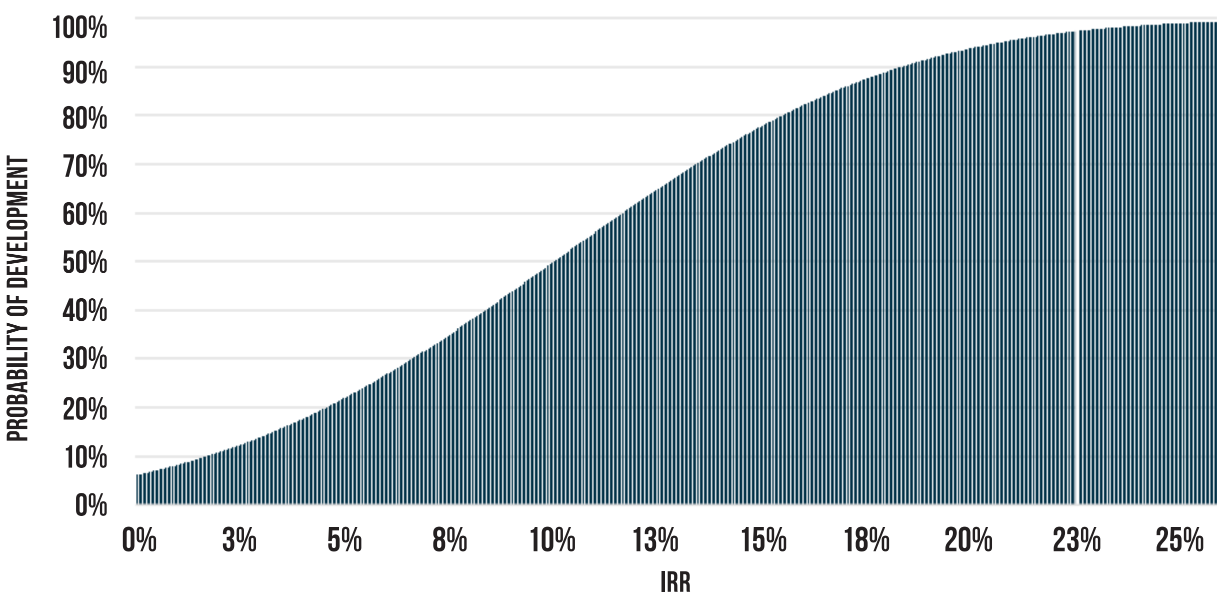
- The probability of development
- The new rent required if the project were held to the default 16% IRR

[29] Due to standard errors in Excel and PHP 'goalseek' functions, default IRRs were modeled between 15.70% –16.10%.

The probability of new development

The probability of new development was calculated using a cumulative normal distribution in which the default state of a project with a 16% IRR resulted in a 77%–82% likelihood of development. The normal distribution assumes that 50% of all projects with an IRR of 12% are developed, with a standard deviation of 5% based on the risk tolerance for average equity investors from the PriceWaterhouseCooper 2018 Survey.[30] This probability distribution is modified from a calculation in a project by Graham MacDonald, for the Terner Center for Housing Innovation in 2016.[31] As seen in Figure 6, the probability of development increases as the modeled scenario IRR increases along the cumulative normal distribution. These assumptions will be refined in future iterations of our model to match empirical data in local markets.

FIGURE 14: DISTRIBUTION OF DEVELOPMENT PROBABILITY AND INTERNAL RATE OF RETURN



The "new rent required" metric is calculated to answer the following question: "If the return metrics were held constant despite a change in the policy environment, what would be the new minimum rent required to clear the default 16% IRR threshold?" This is calculated by solving for the rent of a prototypical apartment given user-input regulatory conditions. The difference between the scenario rent and the current conditions rent is then further decomposed into the policy shifts that led to the shift in rent. In this example, requiring a $20,000 impact fee per unit for a prototypical midrise development would result in an increase in average rent from $2,460 per month to $2,555 per month, an increase of $70 per month.

In reality, the distribution function for development as a function of financial returns is based on the idiosyncratic and systemic risks involved with the parcel and development conditions for each city. Risk can be calculated as a function of **development spread**: the difference in basis points between the returns and the risk-free return (modeled as the return on a 10-year treasury note). The probability serves as an illustrative indicator of development risk inherent in different regulatory environments. The function is an abstraction built off the work by Linneman (2017)[32], MacDonald (2016)[33], and Holland et. Al (1995)[34] and calibrated to the Seattle market though developer interviews and the PriceWaterhouseCooper Real Estate Survey from the fourth quarter of 2018.[35]

[30] PriceWaterHouseCooper, 2018. "Real Estate Survey: Q4 2018".

[31] Graham McDonald for the Terner Center for Housing Innovation at UC Berkeley in May 2016. Conditions were adjusted for an IRR-metric based discounted cash-flow model.

[32] Linneman and Pfirsching. (2017). "Evaluating the Decision to Own Corporate Real Estate." Zell/Lurie Real Estate Center, Wharton.

[33] MacDonald, Graham. (2016). "The Effects of Local Government Policies on Housing Supply." Terner Center for Housing Innovation, UC Berkeley.

[34] Holland and Ott. (1995). "Uncertainty and the Rate of Commercial Real Estate Development." Real Estate Research Institute.

[35] PriceWaterHouseCooper. (2018). "Real Estate Survey: Q4 2018"

Development probability and market structure

A future empirical study should adjust return expectations to consider the change in new starts or the number of developers active in a market. We hypothesize that the policy environment of each city affects the shape of the curve that models the relationship between return expectations and likelihood of development — with "normalish" curves for cities with lower policy hurdles and a more binomial-shaped distribution for cities with higher hurdles.[36] This is because policy hurdles serve as a high barrier to entry to potential developers, and therefore decrease producer competition and inflate return expectations.

Developing a cumulative distribution function (CDF) that accurately models the viability of a development is a long-term goal for this project. The data for projects that "fail" or projects that are never developed due to regulatory barriers are difficult to quantify. Future versions of this model will explore solutions such as creating a Bayesian model that develops updated predictions on development potential based on simulations through a Bayesian A/B test.[37]

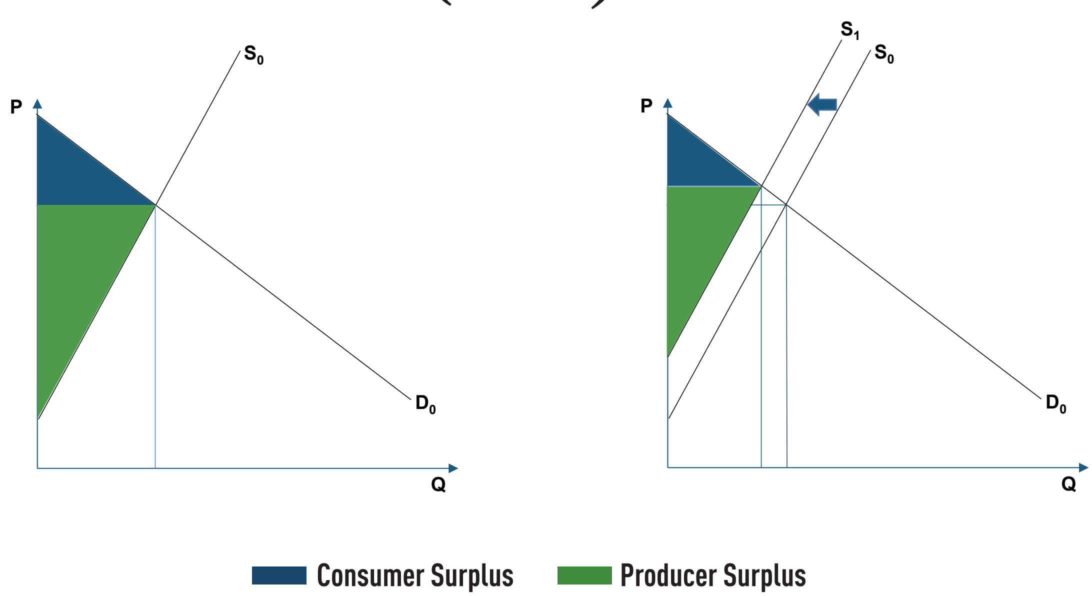
Modeling the new rent required and the distribution of supply-side costs

A limitation in previous iterations and of many existing housing calculators is the distribution of regulatory costs. In a previous iteration, **all added were costs are borne by the renter** — indicating that the supply shock does not result in any reduction of developer surplus. In high-cost cities since 2010, this may often seem to be the case, where high levels of demand are able to absorb most price shocks and demand is inelastic — especially for high-end luxury apartments. However, in different markets and at different parts of the business cycle, this relationship likely does not hold true.

The 2006 HUD guidebook on calculating the impact of regulations by Dacquisto and Rodda (2006) provides a useful starting point for calculating the change in price using a classical model that assumes straight-line demand and supply functions in a perfectly competitive environment. In this case the change in price ***P*** is a function of the change in cost ***C*** and a coefficient of the demand and supply elasticities ***Es*** and ***Ed.***

FIGURE 15: CLASSICAL MODEL FOR CHANGE IN PRICE

$$\Delta P = \left(\frac{Es}{Es - Ed}\right) * \Delta C$$



[36] Based on our conversation with Peter Linneman, March 2019. Linneman Peter, and Bruce Kirsch (2018). *Real Estate Finance and Investments: Risks and Opportunities.*

[37] Frasco, Michael. (2018). "The Power of Bayesian A/B Testing." Convoy Tech.

Using derived supply and demand elasticity coefficients (method detailed in the following section), we can calculate the pass-through rate:

$$\Delta P = \left(\frac{0.22}{0.22-(-0.77)}\right) * \Delta C = 0.22 \text{ or } 22\%$$ the costs are passed through to the consumer.

We find that a low proportion of costs are passed through because of the relative inelasticity of supply compared to demand in the Seattle market. However, we know that this supply inelasticity is a function of a market with a highly regulated environment with high barriers to entry, and therefore does not represent a perfectly competitive environment.[38]

To estimate a pass-through ratio that properly accounts for an uncompetitive environment, we use an abstraction from a 2014 whitepaper by RBB Economics that examines cost pass-through and policy implications for different markets. The paper argues that the curvature of the demand graph at different points of equilibrium has a large effect on the pass-through ratio. If demand is **convex** (i.e. if "the rate at which demand is reduced by successive price rises slows as price increases"[39]), then pass-through will be higher. This can be modeled in the following function:

$$\frac{\partial p}{\partial t} = \Delta P = \left(\frac{Es}{\theta(Es - Ed)}\right)$$

Where $\frac{\partial p}{\partial t}$ is the change in price at each stage on the curve and is varied by the coefficient θ. As θ approaches 0, the market is in a perfect monopoly and the pass-through rate can be greater than 100%: that is, as the cost of production increases, there is an equilibrium where consumers pay more than the full increase of the supply shock. As θ approaches 1, the market represents perfect competition with a pass-through cost that approaches the previous model of perfect competition at $\left(\frac{Es}{Es - Ed}\right)$. We assume that the housing market is like a model of a monopolistic competition with a θ value between 0.2 to 0.4. Assuming a coefficient of 0.3, we find that the pass-through rate is 74%. In discrete terms — in a simplified pricing model — if a supply shock increases costs by \$100, \$74 is borne by the renter and \$26 by the producer (developer).[40]

Note that this model measures the immediate short-term equilibrium effects of these changes. In the longer term, land prices will also likely change[41] as a result of changes in zoning and other policies, as the residual value of land shifts and project returns will shift to a new equilibrium based on the perceived risk of new development. However, we assume that only returns shift in the short-term to simplify the model. In practice, this simplification should not affect our overall rent as both land returns and project return in this case are a subset of a smaller overall producer surplus

$$\mathbf{R}_0 = f(C_0, l_0\, \pi_0) \text{ and } \mathbf{R}_1 = f(C_1, l_1\, \pi_1)$$

$$\text{where } C_0 < C_1,\; l_0 = l_1, \text{ and } \pi_0 > \pi_1$$

3.3 CITYWIDE MODEL

The citywide model provides a forward-looking estimate of **how a city's aggregate housing production and housing price levels would be affected** by the same policy regulations tested in the project-based model if they were applied to future development in a city.

This model extends the project-based model by approximating the cumulative effects of project feasibility and by demonstrating how lower levels of housing increase rents and housing cost-burden for households citywide. This

[38] Gyuorko and Molloy (2014).

[39] RBB Economics. (2014). "Cost pass-through: theory, measurement, and potential policy implications." Prepared for the Office of Fair Trading.

[40] We use the simplifying assumption that the model is monotonic for the change in costs.

[41] Quigley and Rosenthal. (2005). "The Effects of Land Use Regulation on the Price of Housing." Urban Policy at UC Berkeley.

model applies a **stabilized-year residual land value (RLV) analysis** across all the developable parcels in a city and estimates the number of potential new units.

The model attempts to quantify three key metrics:

- The total number of units that are expected to be built in a city as a deviation from the long-term average baseline;
- The effect of the rental market's supply shifts on rents; and
- The impact of a price change on household cost burdens.

To establish a dataset of all developable parcels in the city, we relied on local datasets to analyze the current use, zoning, physical development potential for each parcel in the city, and the total number of additional residential units that could be built in the city. We filtered this dataset to isolate parcels that were judged to have redevelopment potential for multifamily development and assigned each remaining parcel to a development typology (low-rise, podium/midrise, or high-rise) based on the site's existing zoning and size.[42]

This analysis provided a physical residential capacity analysis for the city, which was then further filtered to evaluate how many parcels could be developed given existing market conditions. Thus, the model was designed to answer the question: "Given current market conditions, how many additional units could be developed?"[43]

The expected level of additional housing production is calculated as a weighted probability using the following formula[44]:

$$E(X) = \sum_i x_i P(x)$$

Where E(X) is the expected estimated total production of new units in the city, x_i is the total potential additional units that can be developed on each parcel in the city, and P(x) is the probability function of parcel development.

The probability function used in the model was built to replicate the function used in the project-based model $(\aleph(\mu,\sigma^2))$, adjusted to estimate the probability of development based on the ratio of residual land value (RLV) to market land value (MLV)[45].

The total potential additional units (x_i) for each parcel was calculated using a residual land value analysis modeled using the following formula:

$$RLV = \frac{NOI}{r} - TDC - S_c - \pi$$

Where NOI is the Net Operating Income of a property, r is the capitalization rate, TDC is the total development cost, S_c is the total cost of sale, and π represents developer profit and capital returns.

Net Operating Income (NOI):

The NOI of each parcel was calculated based on potential gross rents for each parcel, less vacancy, taxes and operating expenses based on its assigned development type. Rent was calculated as a function of 2018 residential rents per square foot for the zip code that each parcel was within and the deviation of the parcel's market land value to the average land value for residential land citywide. While we would prefer more granular data at a census tract or block level, the most current data was available only at the zip-code level. Other NOI assumptions and the project's capitalization rate were calculated using assumptions based on the parcel's assigned project typology. These are identical to the assumptions used in the project-based model.

[42] Only parcels with capacity for 5+ additional units were evaluated.

[43] To simplify this analysis, HR&A held the time horizon for this analysis constant, only evaluating parcels based on current market conditions – impacts were calculated as if all of the units were being redeveloped in the short term. This is akin to the methodology used by Bellisario et al. (2018)

[44] This methodology builds off previous HR&A Analysis, as well as several macroeconomic housing studies that develop estimates outcomes based on parcel-specific data including Saiz (2010), McDonald (2016), Egan (2016), and Larson et. al (2019)

[45] Market land value was calculated using the assessor's appraised land value for each parcel, provided by local city datasets.

Total Development Cost (TDC):

The TDC of each parcel was calculated based on assumptions (per square-foot) for construction, financing, and timeline costs. The cost of sale S_c was assumed as a constant 4% of gross project value $\left(\frac{NOI}{r}\right)$ and developer profit (π) was assumed as 15% of gross project value.

Using the assumptions developed for the baseline, the citywide model then estimates the additional number of units of housing that could be developed in the city over a three-year horizon based on long-term deliveries in Seattle since 2000.

Expected Change in Price (price shift)

As modeled scenarios change the potential housing supply, so do housing rents. **A decrease in supply raises rents for both new and existing apartments, as households compete for a more limited quantity of housing.** The extent to which pricing is affected by housing supply is modeled by the following formula[46]:

$$\Delta P\% = \frac{\Delta Q\%}{\varepsilon_s - \varepsilon_d}$$

Where $\Delta P\%$ is the percentage change in housing prices, $\Delta Q\%$ is the percentage change in housing supply, ε_s is the supply elasticity of housing (the sensitivity of price increase to overall supply production), and ε_d is the demand elasticity of housing (the sensitivity of price increase to overall housing demand).

The difference between the baseline number of units estimated and the expected number of units (from the previous calculation) solves for $\Delta Q\%$. The model estimates ε_s as -0.17, based on a comparative 2016 Trulia report[47.] ε_d is calculated separately for each city, calculated using a methodology from Egan 2015 described below.

Solving for Price Elasticity of Demand (ε_d):

ε_d was calculated using the following formula:

$$Q = \alpha p^{\beta 1} y^{\beta 1}$$

Where Q is the "quantity" of housing demanded, p is housing price, and y is household income. Egan modifies this formula to solve for pQ or household housing expense — creating the following formula:

$$ln(pQ) = ln(\alpha) + (1 + \beta_1)\ \ ln\ (p) + \beta_2\ ln\ (y)$$

Where ε_d *is* $(1 + \beta_1) - 1$

- pQ (monthly housing costs) is derived from the Public Use Microdata (PUMS) for the city for the last six years (2012–2017 for the first iteration) for households who moved to the area in the last 12 months.
- y (household income) is similarly obtained from the PUMS dataset and inflation adjusted to 2017 dollars.
- p (housing price) is created using a Zillow time-series price index from 2012–2018. We developed four different price indexes — for single-family (rental and ownership) and multifamily (renter and ownership) respectively.

[46] Ted Egan, City of San Francisco Office of the Controller, 2015
[47] Trulia, 2016. Other reports have reported similar figures

Weighted regressions were run at for **four discrete income groups** following a hypothesis that **changes in supply affect lower-income households disproportionately more.** The results of this study were inconclusive to validate this hypothesis — R values were between 0.4–0.6 and a regression with more independent variables is required to further test this hypothesis. Nevertheless, we found a weak relationship to suggest that **demand elasticity decreases as income increases.** For example, the table below shows the price effect felt by each income group for a 1% change in supply in the City of Seattle. These were not used in the final price calculation — but are used to estimate individual household price sensitivities for the cost-burden calculation.

FIGURE 16: CHANGE IN PRICE BY HOUSEHOLD INCOME IN SEATTLE

HOUSEHOLD INCOME	DEMAND ELASTICITY	CHANGE IN PRICE
< $40,000	-0.496	1.46%
$40K-$60K	-0.719	1.10%
$60K-$120K	-0.830	0.98%
$120K +	-1.019	0.83%

Expected Cost Burden Shift (change in overall affordability)

As a final step, we use the shift in prices to calculate overall shift in cost burden using 2017 1-year PUMS microdata to answer the question: "How many additional households are cost burdened as a result of the price shift"?

The change in cost burden is calculated by finding the difference between the baseline housing-cost burden rate (households paying more than 30% of gross household income)[48] and a new calculated housing-cost burden rate calculated by applying the simulated change in housing price to each household in the city. The degree of this housing price increase is determined by the household's income-determined demand elasticity, as previously calculated.[49] The change in price is used to estimate their housing costs as a percentage of overall income. Every additional household that is paying more than 30% of their gross income on housing as a result of the price increase is considered a household that is newly cost burdened as a result of regulatory shifts, and vice versa.

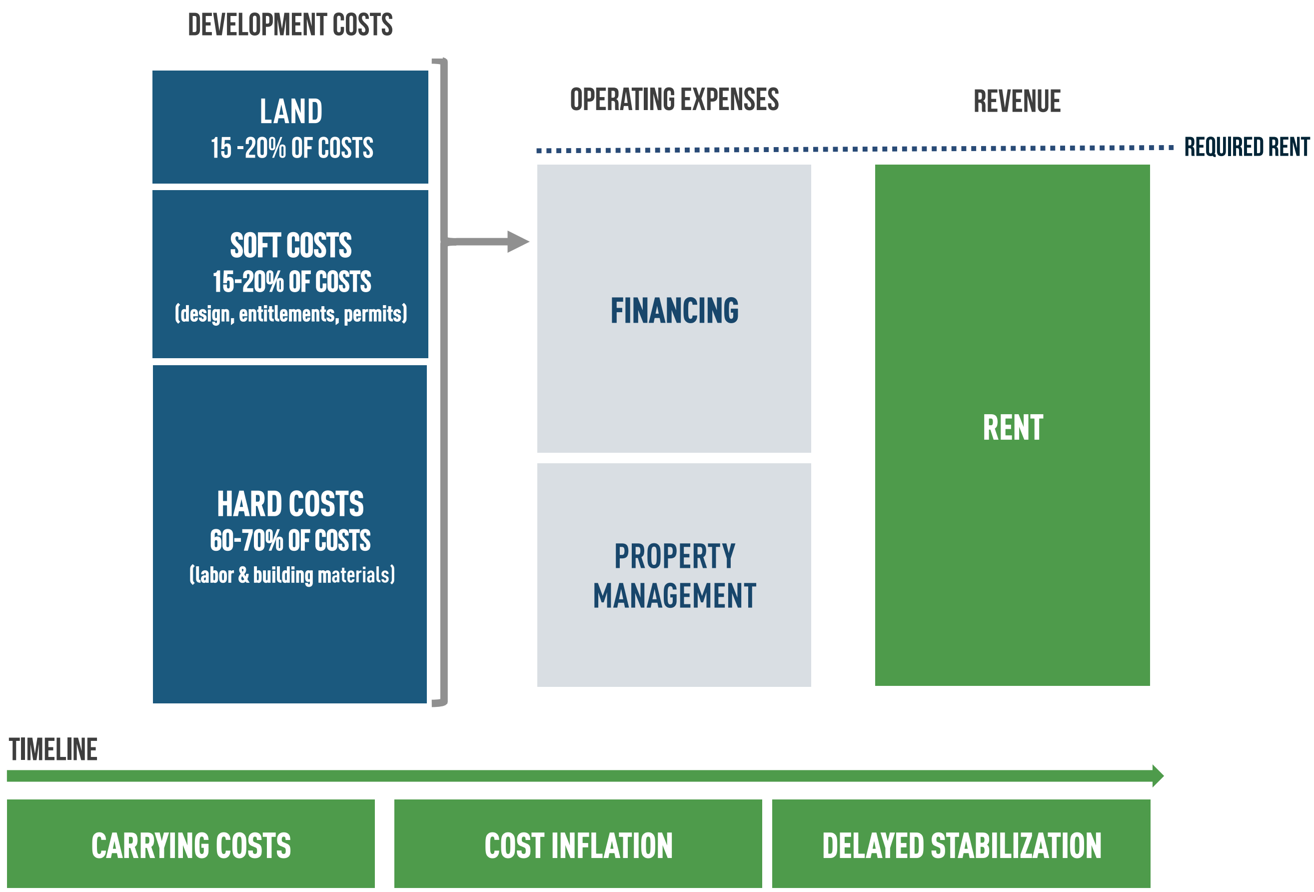
[48] ACS 2017 1-year

[49] Methodology based on impact calculations by the Bay Area Council for Economic Growth (Bellisario et. al 2018)

IV APPENDIX

APPENDIX A: PROJECT-BASED CALCULATIONS AND SENSITIVITIES

The Housing Policy and Affordability Calculator was developed based on a proforma framework with the understanding that changes in development costs affect the operating costs for a property, which in turn determine the rent required for a project to be feasible. Constructing new apartments incurs **development costs** — land costs, hard costs (labor and building materials) and soft costs (design, entitlements and permitting) that are largely paid for with external financing. As development costs increase, more financing is required to cover these costs — increasing overall **operating expenses.** In turn, these operating expenses are supported by the revenue that a project can generate through rent. As operating expenses increase, the rent increase in tandem to support the project and maintain feasibility.



Changes in policies that impact development creates changes in the required rent, raising costs when policies increase costs and reducing costs when policies reduce overall costs. For the purposes of this analysis, we analyzed the impact of changes to thirteen policies. **These policies can be grouped into the four basic categories of Timeline, Development Costs, Operating Costs, and Revenue. Although most policies have multiple impacts,** these are the overarching categories which impact project feasibility.

- Changes to timeline change cost based on carrying costs for a longer or shorter period of time and changes to inflation of hard and soft costs. Cost inflation is modelled such that costs for those services increase by a portion of the annual basis on a monthly basis. When a project takes longer to build, it opens and stabilizes later which leads to higher construction costs and more delayed revenue, raising required rents from that revenue.

- Changes to development cost directly add to or reduce from hard or soft costs in the development stage.
- Changes in operating cost policies change the Net Operating Income resulting from operations of the project after opening.
- Changes in policies which impact revenue impact either the number of units which may be built by a project, revenue resulting from the sale of a project in the exit year, or operating income of the project.

FIGURE 17: CLASSIFICATION OF POLICIES BY TYPE

TIMELINE	DEVELOPMENT COST	OPERATING COSTS	REVENUE
COMMUNITY OUTREACH REVIEW	MHA Fees	Tax Abatement	Affordability Set-Aside
DESIGN REVIEW	Additional Development Requirements	Annual Property Tax Increase	Affordability level
PERMITTING TIMELINE	Energy Code Requirements Green Factor Requirements Prevailing Wage Requirements Impact Fees Parking Ratio	Energy Code Requirements	Floorplate Restriction State Real Estate Excise Tax Open Space Requirements

Policy Calculations

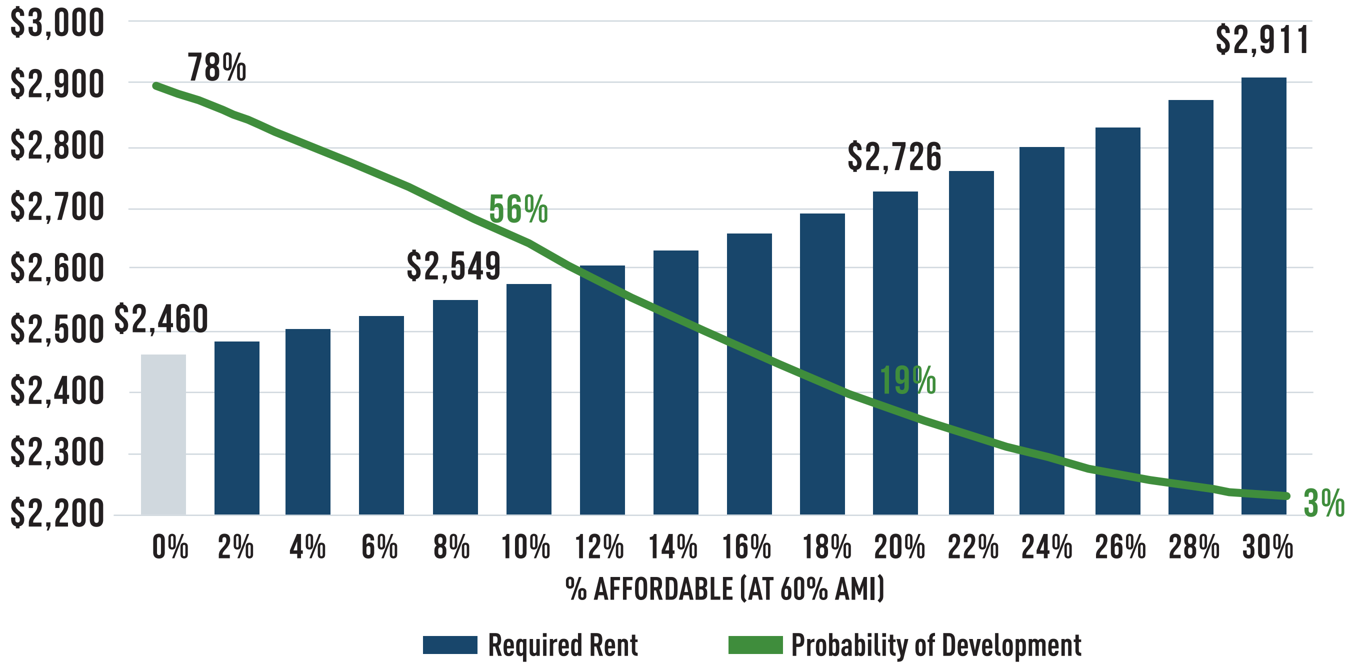
Affordable Housing

Cities often want to increase the supply of housing affordable to lower income households and use incentive or requirements to ensure that affordable housing, housing with an income restriction, is produced for households with lower incomes. In Seattle, the existing policies focused on affordable housing include the Mandatory Housing Affordability (MHA) and the Multifamily Tax Exemption.

- **Affordability Set-Aside.** Mandatory Housing Affordability (MHA) is a policy to increase affordable housing options. While implementing MHA, the City increased allowable zoning in areas where it required MHA[50]. Developers may meet the requirements in zones which require MHA through providing a percentage of units (currently between 5% and 11%) at 60% Area Median Income or pay a fee in-lieu of between $5 and $32 per square foot.
- **Affordability level.** The Mandatory Housing Affordability policy requires rent-restricted homes to be affordable to households at 60% of area median income (AMI) levels. These income levels are set by HUD each year, based on the local metro area's AMI. For example, in 2018, a two-person household at 60% AMI earned $48,150, and a home that is affordable to this household could charge no more than about $1,200 in rent.
- **MHA fees** are fees that developers can choose to pay to support affordable housing, in lieu of setting aside a certain number of affordable homes in the project. The City invests these fees into additional rent-restricted homes that address displacement, create housing in areas of high opportunity, and serve households with the greatest need. If the property meets their requirement with affordable units on-site, no MHA fee is required.

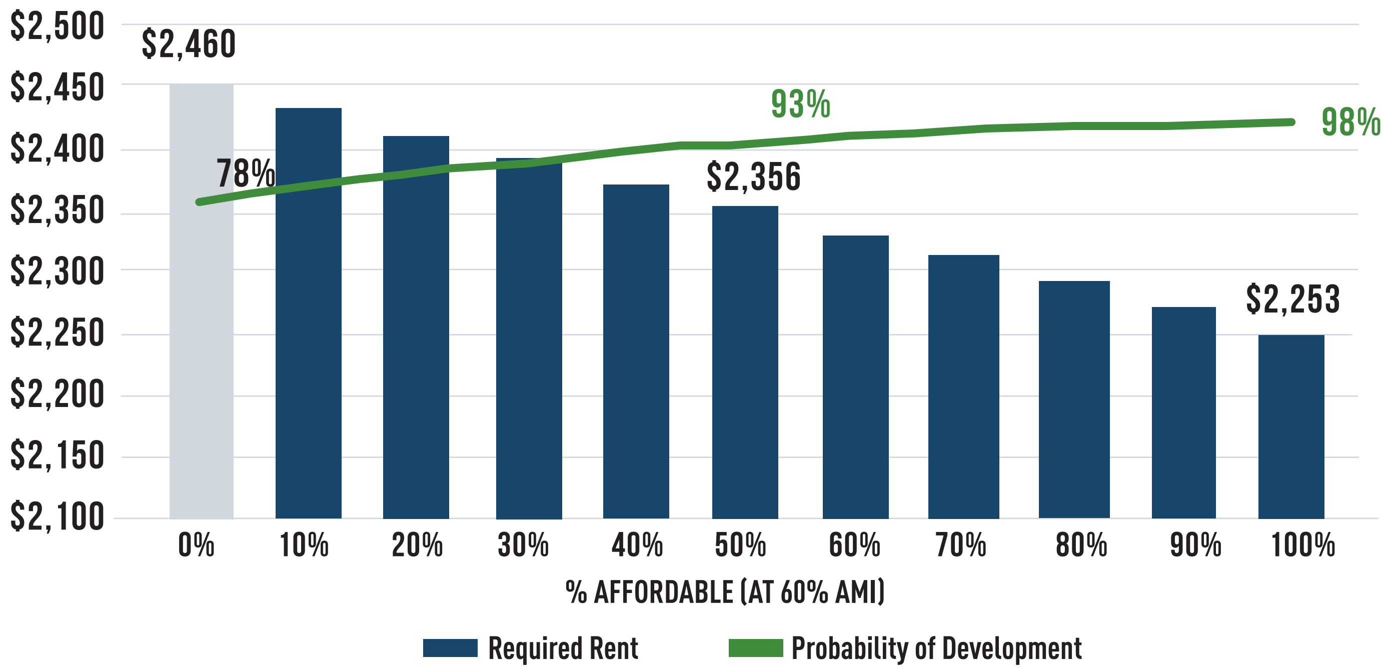
[50] City of Seattle, 2019. Mandatory Housing Affordability. Accessed at http://www.seattle.gov/hala/about/mandatory-housing-affordability-(mha)

AFFORDABILITY SET-ASIDE



- **Tax Abatement.** The percentage of property tax which is not required to be paid. This directly decreases operating costs for a project. A tax abatement may range from 0% to 100% where a 100% tax abatement removes all property taxes a project would otherwise pay. The current opt-in Multifamily Tax Exemption program is a 100% tax abatement in exchange for providing 20% to 25% of units affordable at 80% AMI[51].

TAX ABATEMENT

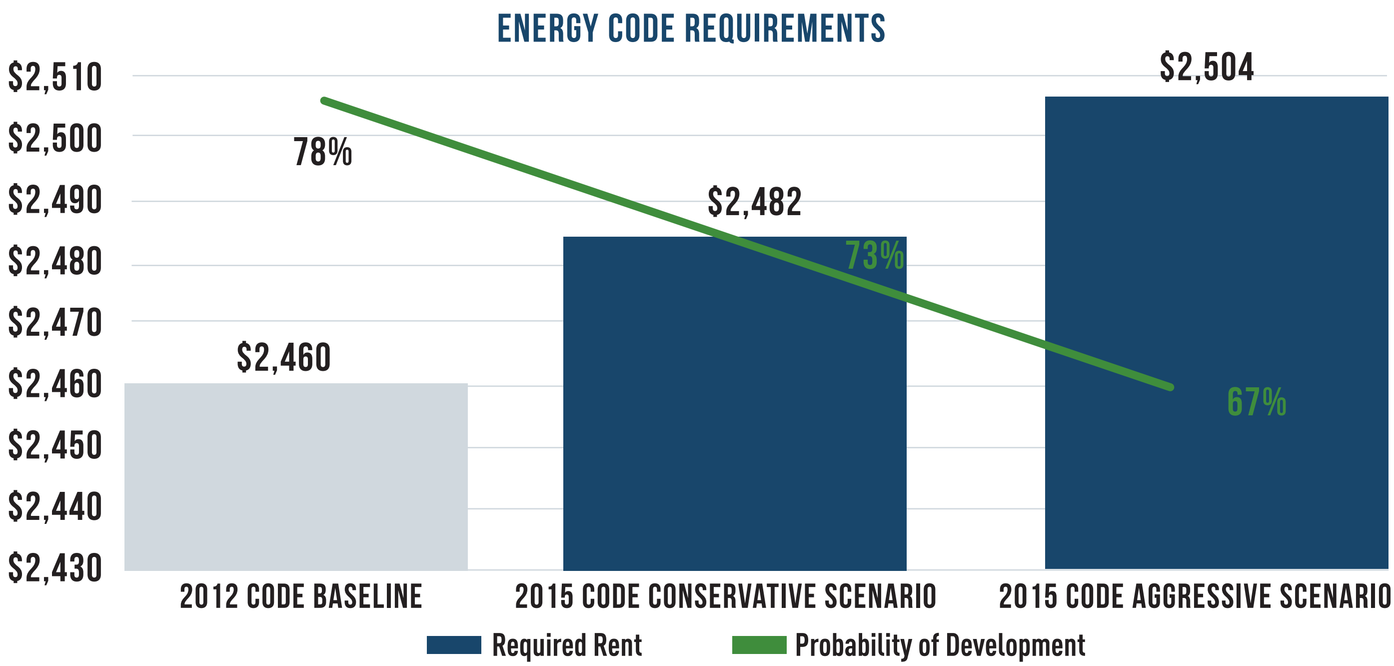


[51] City of Seattle, 2017. Multifamily Tax Exemption. Accessed at http://www.seattle.gov/housing/housing-developers/multifamily-tax-exemption

Environmental Impact

Cities are increasingly taking the lead in addressing climate change and other environmental issues. As a leader in sustainability practices, Seattle holds their buildings to high environmental standards through their Energy Code and through Green Factor Requirements.

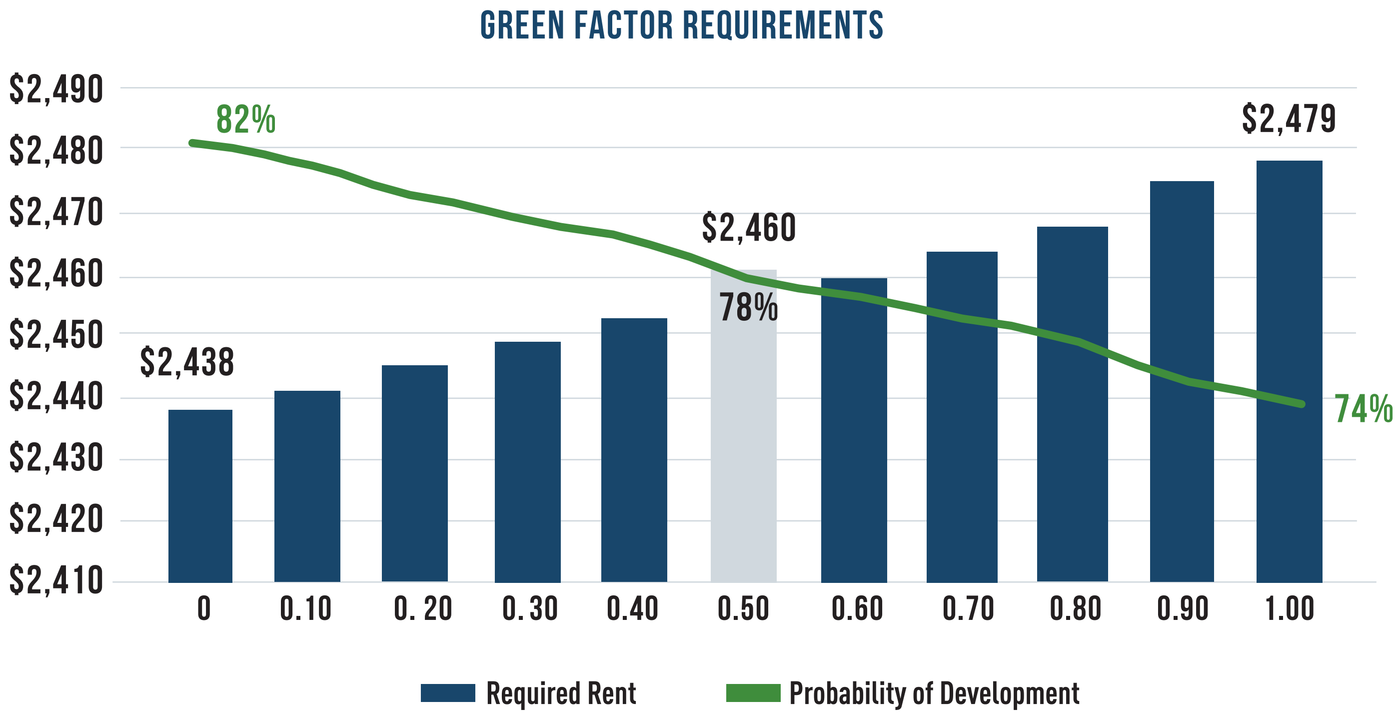
- **Energy Code Requirements**. The Energy code is intended to improve the efficiency of new and renovated buildings in the City. Energy Code Requirements can increase hard costs by up to 12%, with annual operational expense savings of up to 9%. Different levels of energy efficiency correspond to varying levels of hard cost increase and operational savings over the life of the project. As operational expenses decrease based on energy efficiency, there is an increase in Net Operating Income which is reflected in the project's annual performance as well as exit price. The relationship is a balance and is highly dependent on site-specific conditions. Seattle's 2015 energy code fully enforced as of January 2015 is relatively stringent[52] and has significant hard cost implications primarily based on impacts to HVAC systems and exterior glazing[53].



[52] American Council for an Energy-Efficient Economy, 2019. Energy Code Stringency. Accessed at https://database.aceee.org/city/energy-code-stringency

[53] Sellen, PAE, and MacDonald-Miller Facility Solutions, 2018. Seattle's 2015 Energy Code & Its Impacts on High Rise Construction, 2018. Accessed at http://macmiller.com/wp-content/uploads/2018/03/2015-SEC-White-Paper_Version-2_03-2018.pdf

- **Green Factor Requirements.** Landscaping requirements which increase the number and quality of planted areas[54]. A Green Factor of 1.0 typically costs $8.34/GSF on a prototypical high-rise project and is reflected in the model on a hard cost per square foot basis. In practice, this relationship is not linear as the marginal cost of meeting a fraction of Green Factor increases as the targeted factor increases — it is more expensive to go from a factor of 0.9 to 1.0 than it is to go from 0.3 to 0.4.



Community Impact and Design

Cities can establish opportunities in the development approval process for community members to review and influence plans for new development. In Seattle, this is primarily the Early Community Outreach and Design Review processes. These usually occur in the predevelopment period — which is when proposed projects gain public approval before construction can begin. It allows government agencies, local review boards, and community members to determine if proposed buildings comply with local guidelines and meet community standards. At the same time, streamlining the predevelopment period makes development less expensive by limiting the ongoing holding costs of property and decreasing the project will be blocked, reduced in scale or additional costs added. Seattle residents also have two additional tools that regulate urban design and form of new midrise and highrise developments — Open Space Requirements and Floor Plate Restrictions.

- **Predevelopment Timeline**. The length of time required for early community outreach[55], design review[56], and permitting[57]. The default review values for mid-rise and high-rise construction were based on developer interviews. When a project spends more time in predevelopment, the housing units take longer to deliver and the project finances carrying costs of the land and services required in predevelopment.

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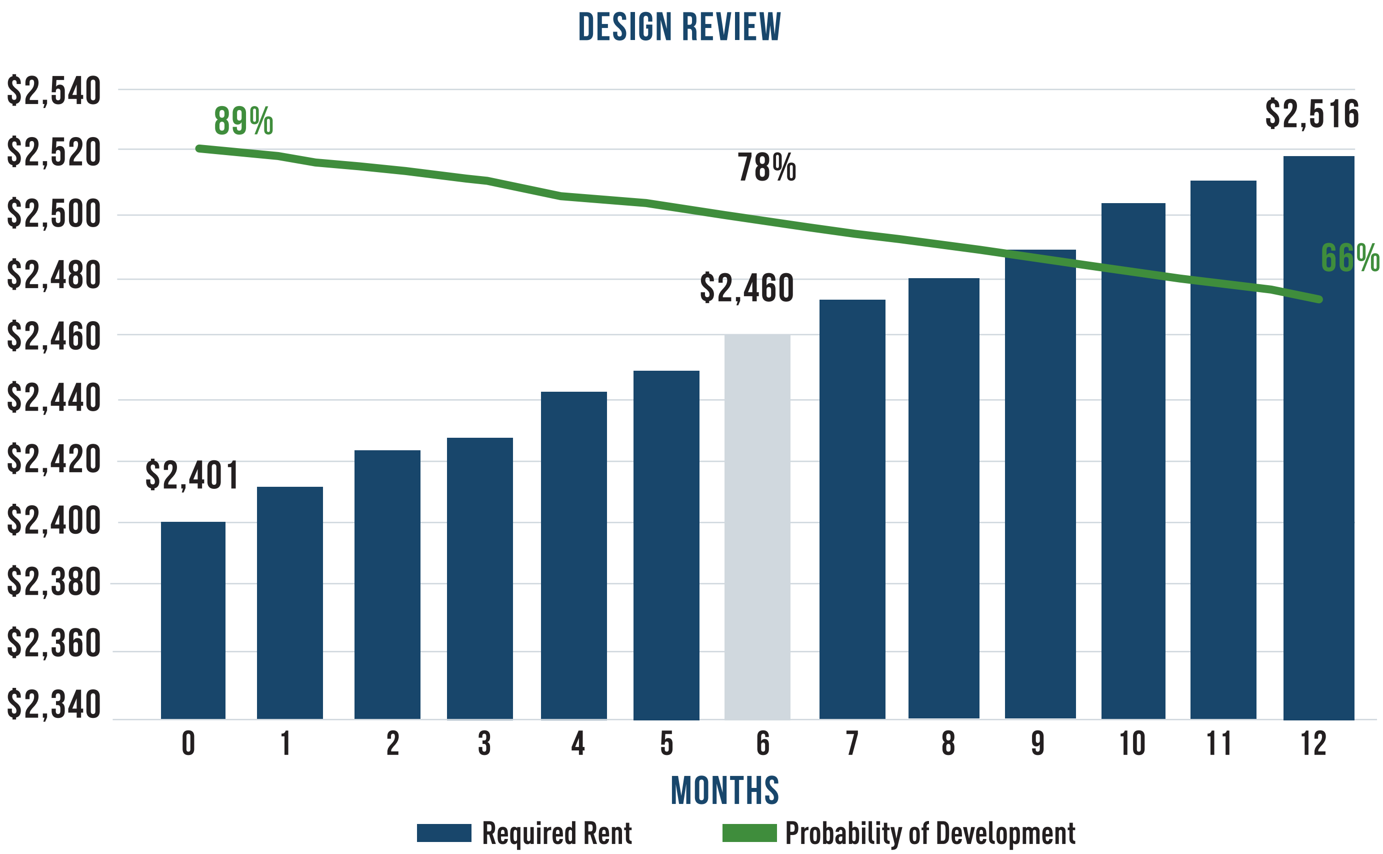
[54] City of Seattle, 2019. Seattle Green Factor. Accessed at https://www.seattle.gov/sdci/codes/codes-we-enforce-(a-z)/seattle-green-factor

[55] City of Seattle, 2019. Early Community Outreach for Design Review. Accessed at: https://www.seattle.gov/neighborhoods/outreach-and-engagement/design-review-for-early-outreach

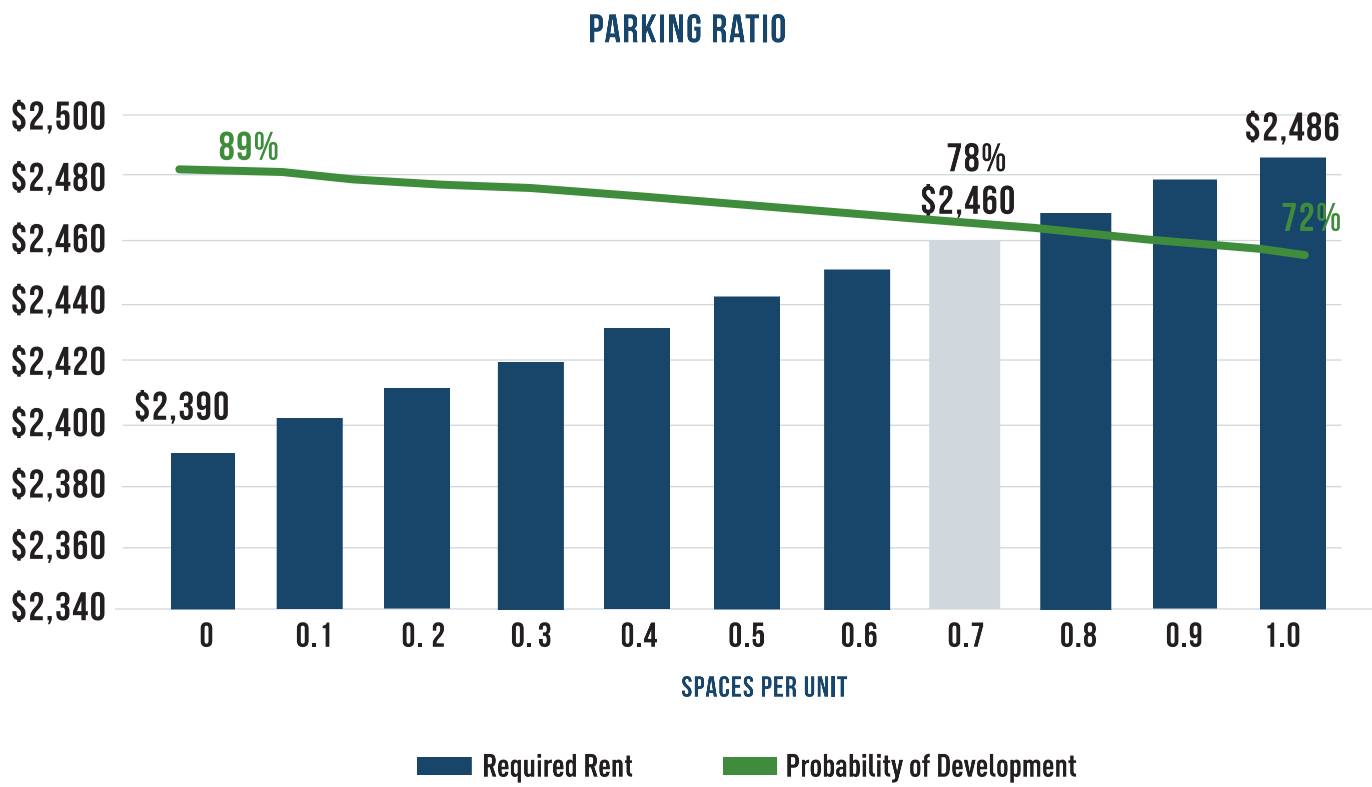
[56] City of Seattle, 2019. Design Review. Accessed at: http://www.seattle.gov/sdci/about-us/who-we-are/design-review

[57] City of Seattle, 2019. Land Use/Master Use Permit – Overview of MUP. Accessed at: http://www.seattle.gov/sdci/permits/permits-we-issue-(a-z)/land-use-/%C2%A0master-use-permit---overview-of-mup

The model does not evaluate the potential for early community outreach our design review to reduce the size of a building but does include costs associated with inflation and financing. Based on developer proformas in the area, we found that each month of additional predevelopment time adds approximately 0.3% to total project costs in addition to costs associated with inflation of hard, soft, and financing costs.



- **Parking Requirements**. Parking requirements aim to ensure that buildings provide enough parking. In many cities, parking requirements are higher than what the market needs, leading to higher development costs and unnecessary parking. In Seattle, however, most multifamily buildings are located in "parking flexibility zones" that do not require large amounts of parking because they are located near public transit[58]. Lowering parking in projects can significantly impact costs. As Seattle continues to transform into a walkable city with a variety of transportation options, the development and lending community can provide parking-lite and free projects. Due to these low minimums, parking built for projects is driven by developers and lenders rather than City requirements.

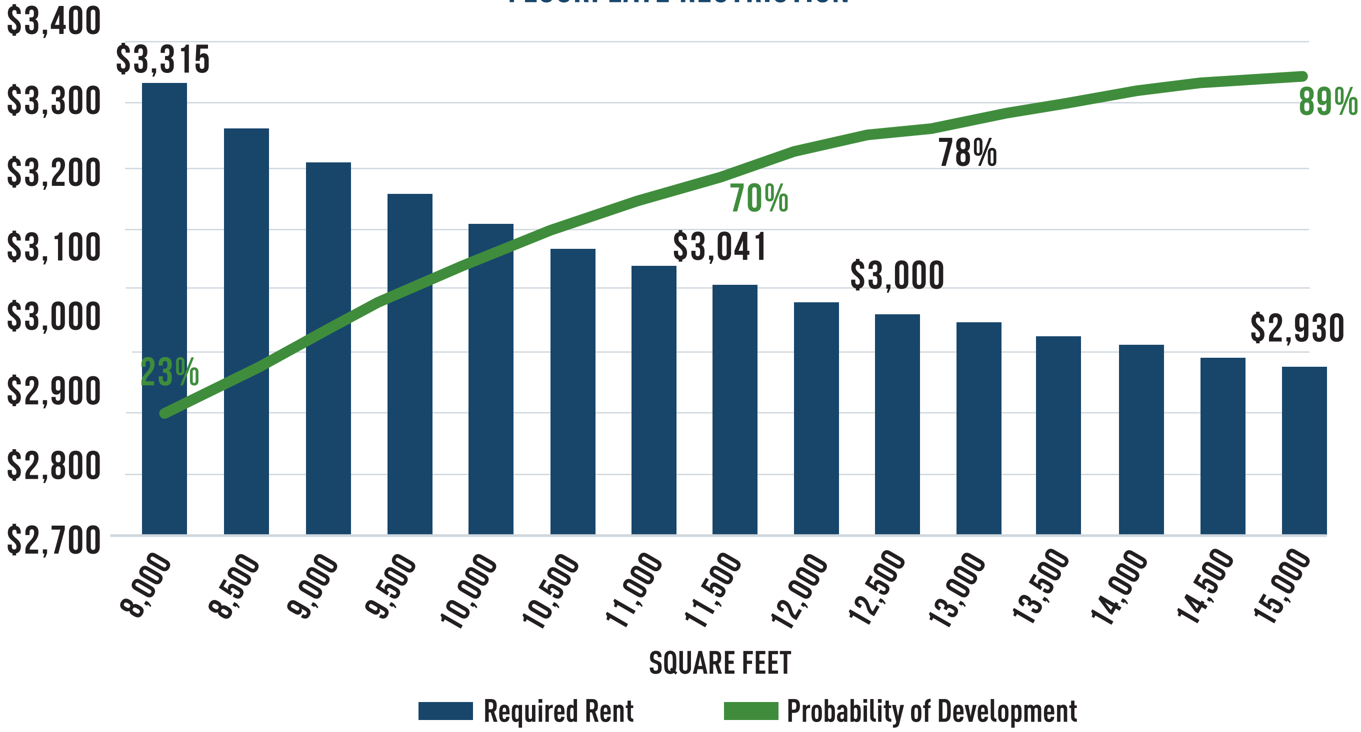


- **Floorplate Restriction**. A policy which limits how large a single floor of a high-rise or tower can be, which can impact viewsheds and shadows[59]. Given height limits, restricting floorplate sizes directly restricts the number of units which can be built on a site. The change in total units is calculated as the difference in the maximum floorplate of 12,500 square feet multiplied by a factor of 0.05 — that is, every additional SF of max floorplate leads to an additional 0.05 units. This relationship was derived based on case study examples and a sensitivity analysis based on a tower model built with the maximum floor area. In practice, **this relationship is not linear** as the number of units which can be built on a floorplate depends on a variety of project specific factors including unit size, unit mix, and construction efficiency, and only serves for the bounds presented in the analysis. Given elevator requirements for tower construction and the height of a building, smaller floorplates increase the percentage of each floor which can be used for rentable area. As a floorplate gets bigger, a smaller share of space can be used for non-leasable space such as hallways, elevators, and amenities. The simplified linear relationship addresses these elements though the relationship could be improved with more in-depth analysis and more case studies over a larger range of floorplate restrictions.

[58] CityC of Seattle, 2017. Seattle SDCI – Proposed Flexible Parking Areas Map. Accessed at: http://www.seattle.gov/dpd/cs/groups/pan/@pan/documents/web_informational/p3494120.pdf

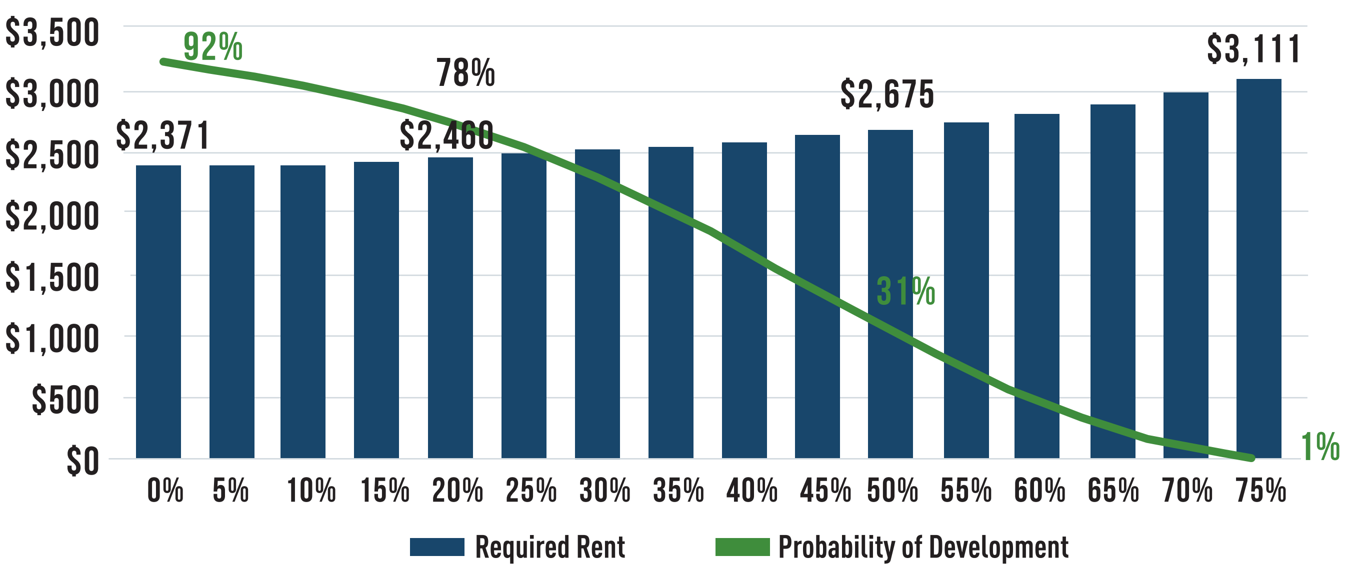
[59] Seattle Municipal Code, 2019. 23.45.516 – Additional height and extra residential floor area is MR and HR zones. Accessed at:https://library.municode.com/wa/seattle/codes/municipal_code?nodeId=TIT23LAUSCO_SUBTITLE_IIILAUSRE_CH23.45MUMI_23.45.516ADHEEXREFLARMRHRZO ermits/permits-we-issue-(a-z)/land-use-/%C2%A0master-use-permit---overview-of-mup

FLOORPLATE RESTRICTION



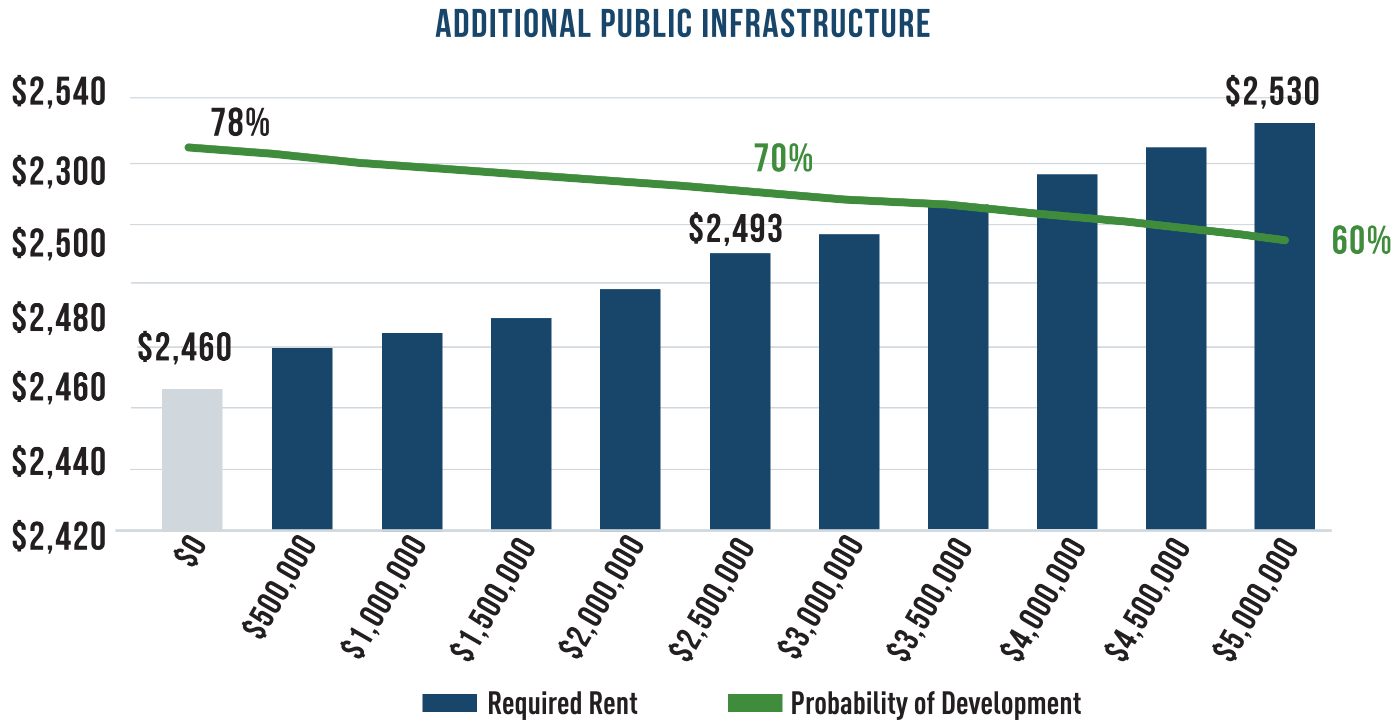
- **Open Space Requirements.** The percentage of a building which is required to be open space and not taken up by any building structure[60]. Increasing the percentage of open space reduces the number of units which can be built on a site. Open space requirements change the total number of units that can be built on site — this was modeled by holding the total height of the building constant so that units which, could not be built due to changes in required open space cannot be put back into the building by making the building taller. In practice, without height restrictions, a five story building with 20 units per floor and 20% open space requirements would be relatively equivalent to a six story building with 17 units per floor and a 35% open space requirement. This is not always the case as taller buildings, especially at the boundary of podium and high-rise, tend to have higher construction costs per foot so increasing open space required cannot always be made up with building taller.

OPEN SPACE REQUIREMENTS

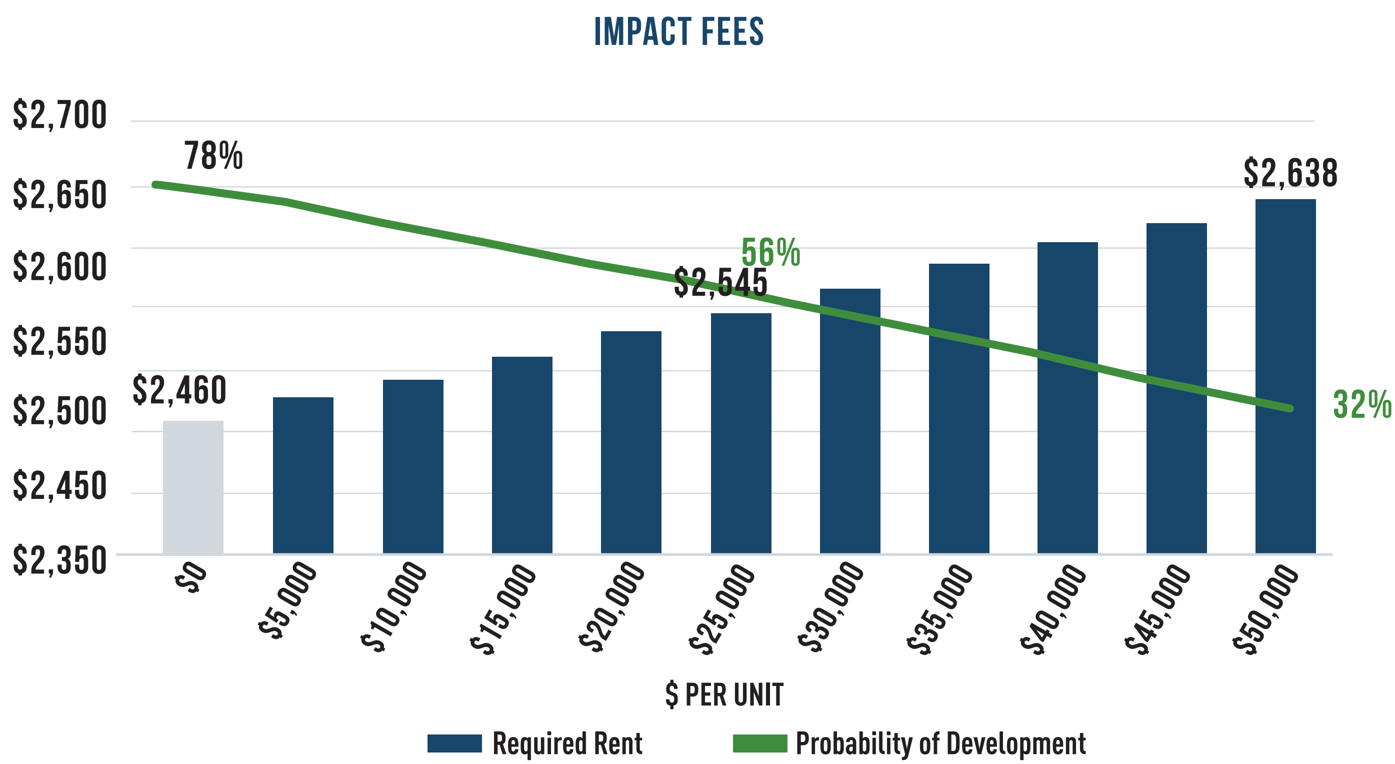


[60] Ibid

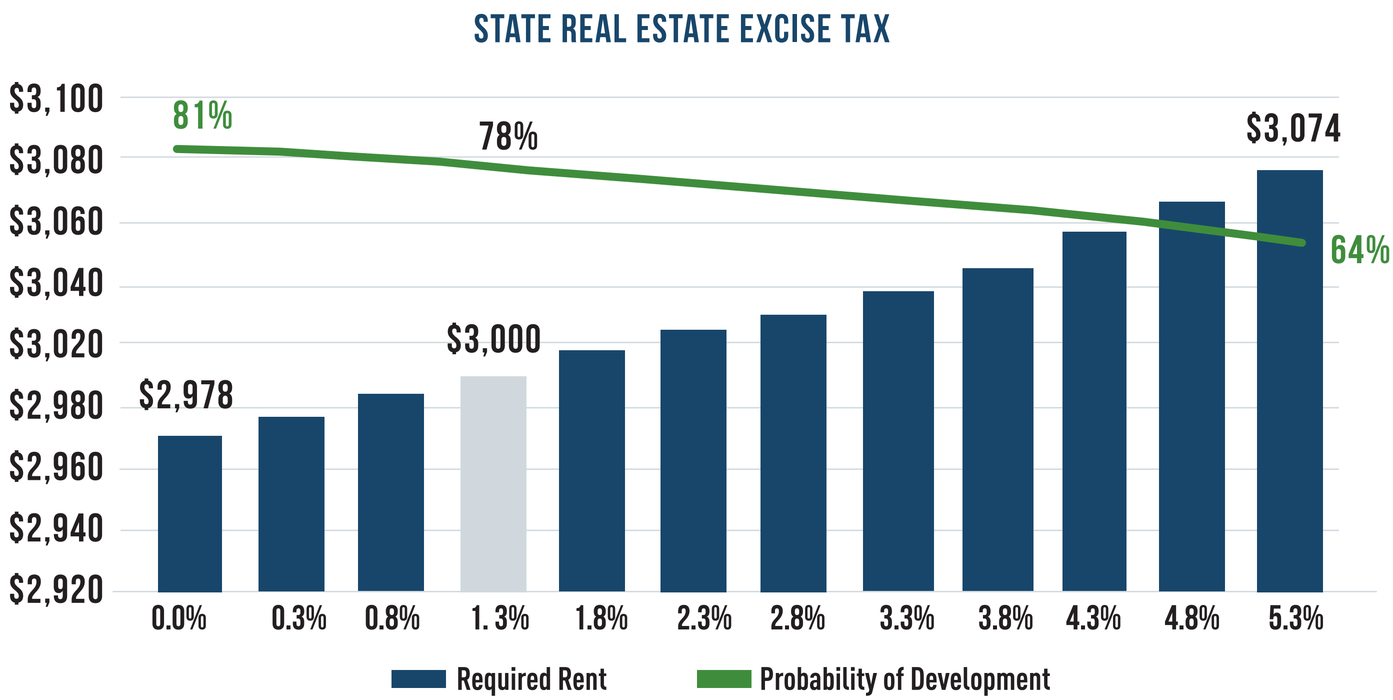
- **Additional Public Infrastructure**. Costs associated with development which result from unique project features of project-specific requirements. May include utility relocations, mandatory curbside changes, and other items which enhance public infrastructure but are tangential to the specific project. The costs are added to soft costs on a per square foot basis.



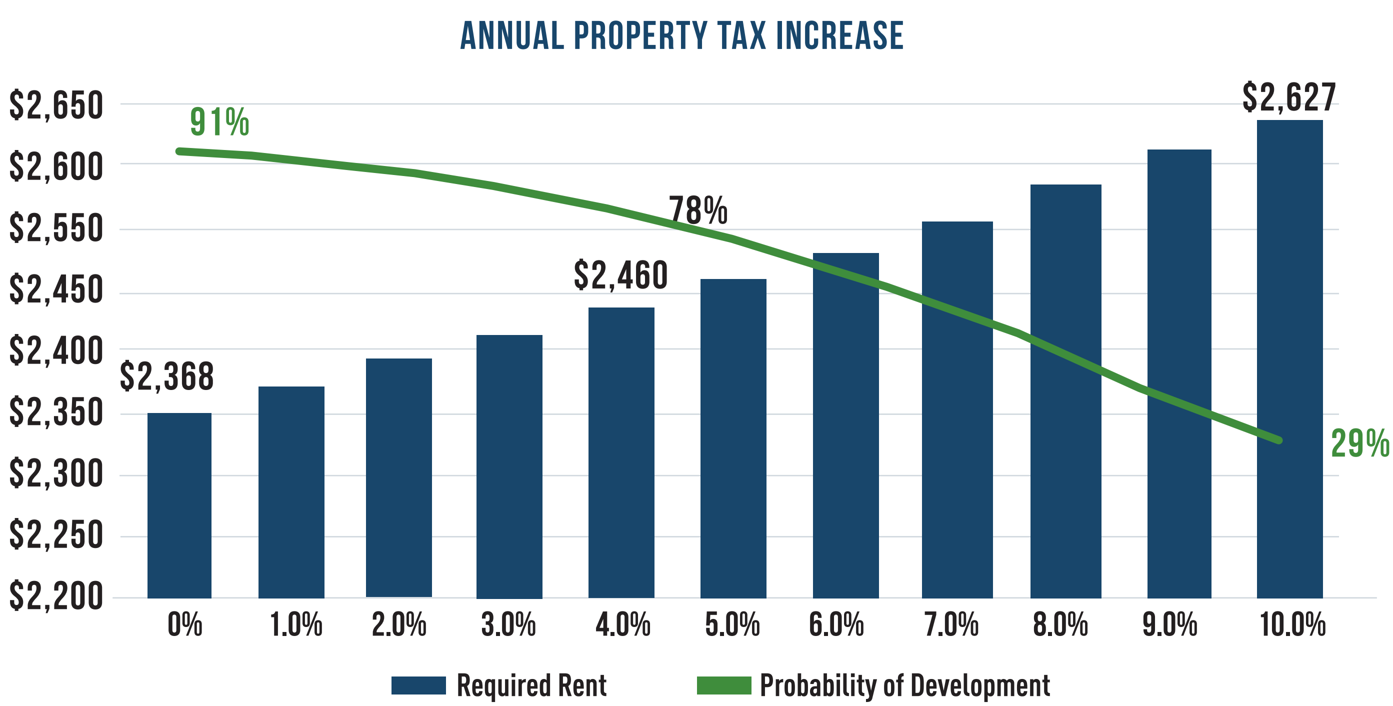
- **Impact Fees**. Impact fees are fees that are meant to pay for a portion of the infrastructure that supports a new housing project. These fees, which are currently under consideration in the City of Seattle, are one of several ways to fund important infrastructure projects — along with measures such as sales taxes and user fees. The costs are added directly to soft costs.



- **State Real Estate Excise Tax**. An excise tax based on the value of transacted real estate. As of March 2019, the statewide tax is 1.28% of transacted value. There are currently two bills (Senate Bill 5582[61] and House Bill 1921[62]) within the state legislature which would change the statewide tax rate. Costs associated with the excise tax are added to the Exit cost of sale.



- **Annual Property Tax Increase**. Property taxes for multifamily structures are paid annually based on assessed value. As assessed values have increased in Seattle, so have property taxes. In recent years property taxes have increased by about 4% per year.



[61] Washington State Legislature, 2019. SB 5582 – 2019-20. Accessed at: https://app.leg.wa.gov/billsummary?BillNumber=5582&Year=2019&initiative=

[62] Washington State Legislature, 2019. HB 1921 – 2019-20. Accessed at: Accessed at: https://app.leg.wa.gov/billsummary?BillNumber=1921&Year=2019&initiative=

Program Assumptions

- **Total Units**. Calculated as a function of the average for the typology, and the user inputs for floorplate restrictions and open space requirements as defined in the regulation functions. At the baseline, total units are estimated to be 250 units for mid-rise and 360 units for high-rise.
- **Total Net Square Feet**. Total number of units multiplied by the average square feet per unit.
- **Total Gross Square Feet.** Net square feet divided by the Gross Square Foot ratio of 0.80.
- **Exit Month.** The month when a developer sells a building to another owner. Represented as the lease up month plus 24 months which is similar to the sales timeframe of many "merchant builder" apartment developers.
- **Lease-Up Period.** The number of months from the end of construction required to fully lease an apartment building to stabilization (typically 95% occupancy). Assumed at 9 months for podium and 10 months for high-rise based on the typical lease-up pace in Seattle by product type.
- **Net/Gross SF Ratio.** Percent of total building square footage which is rentable within a unit. Assumed at 0.80 based on typical multifamily construction ratios in the Seattle market.

Construction Assumptions:

- **Construction Period**. The number of months required to build a building. Assumed at 20 months for podium and 22 months for high-rise based on developer interviews and construction schedules.
- **Construction Loan to Cost**. The percentage of construction cost which is paid for by a loan. Assumed at 65% based on typical construction loan limits.
- **Construction Interest Rate**. The interest rate paid on the construction loan. Assumed at 4.75% for podium and 4.7% for high-rise based on developer interviews and proformas.
- **Hard Costs.** Costs to purchase tangible items used for construction before the impacts of regulations. Total hard costs are assumed at $188/SF for podium and $293/SF for high-rise based on baseline policy calculations. Hard costs are increased by 20% where prevailing wage requirements apply and are multiplied by 3% per year of predevelopment to account for inflation.
- **Soft Costs.** Costs to purchase services required for construction. Total soft costs are assumed at $57/SF for podium and $96/SF for high-rise based on baseline policy calculations and interviews with developers. Total soft costs include Impact Fees, Additional Development Requirements, and MHA Fees divided by total gross square feet of the project. Soft costs are multiplied by 4% per year of predevelopment to account for construction cost inflation.
- **Land Costs.** The cost of acquiring land to build a building. Assumed at $85/GSF for podium and $69/GSF for high-rise based on developer pro formas for each typology.
- **Parking Costs.** Cost to build a parking space. Assumed at $50,500/space for podium and high-rise based on typical costs for underground parking construction.
- **Developer Fee.** A percentage paid to the developer during the construction period to manage the project. Assumed at 3% based on a typical pro forma.

Net Operating Income (NOI) Assumptions:

- **Affordable Units.** Income from affordable units is based on the rent which may be charged for a unit based on Area Median Income. This rent, multiplied by number of affordable units in the project, are added to the gross potential revenue of the project.
- **Stabilization Month.** The month when the project is fully leased to a its long-term occupancy — typically 95% or 96%. Based on a typical lease up period, this is expected to be nine months plus the construction and predevelopment periods for podium and ten months plus the construction and predevelopment periods for high-rise.
- **Less Vacancy/Turnover.** Percent of an apartment building which is expected to be unoccupied due to units which undergoing turnover or otherwise assumed to be vacant. Assumed at 5% for podium and 4% for high-rise based on typical stabilized occupancy rates in Seattle.
- **Market Rents.** Average rent per square foot. Assumed at $3.41/SF for podium and $3.98/SF for high-rise before any rent escalations.
- **Rent Escalation.** The percentage which rents are expected to increase per year. Assumed at 3.75% based on average effective rent growth in the Seattle market since 1996.
- **Operating Expenses.** The annual cost per unit to maintain and operate a building. Assumed at $4,670/unit for podium and $6,000/unit for high-rise before utility savings based on Energy Code Requirements.
- **Initial Taxes.** Property tax per unit before the impacts of tax abatements or annual tax increases. Assumed at $3,100/unit for podium and $4,000/unit for high-rise.

Financing Assumptions:

- **Exit Cap Rate.** The rate of return which the building is valued at during the anticipated sale year. Assumed at 4.87% for podium and 4.5% for high-rise based on recent sale cap rates.
- **Cost of Sale.** Transaction costs when selling the building. Assumed at 1.72% before the statewide Real Estate Excise Tax. Changes in the statewide Real Estate Excise Tax impact the cost of sale.
- **Loan to Value**. Ratio of the permanent loan to the value of the building. Assumed at 65% based on a typical pro forma.
- **Debt Service Coverage Ratio**. The ratio of cash available for debt service over the total operating income. Assumed at 1.4 based on average proforma survey results.
- **Term**. Length of the permanent loan. Assumed at 30 years based on a typical permanent loan term.
- **Permanent Loan Interest Rate**. Interest rate of the permanent loan. Assumed at 4.91% for podium and 4.70% for high-rise based on developer proforma survey results.

APPENDIX B: WORKS CITED

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Up for Growth National Coalition is a 501(c)(3) organization that represents a vibrant, diverse and growing coalition of stakeholders who believe that communities should growth for the benefit of every person. Our mission is to improve the quality of life for working families and individuals and to create communities that are accessible and affordable for all by producing research and providing education that supports policymaking that results in more housing close to jobs, efficient transportation, and in high opportunity neighborhoods.

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HR&A Advisors, Inc. (HR&A) is an industry-leading consulting firm providing services in real estate, economic development, and program design & implementation. HR&A has served a diversity of clients — real estate owners and investors, hospitals and universities, cultural institutions, community development organizations and governments — since 1976. Up for Growth National Coalition partnered with HR&A Advisors to build the economic model and documentation underlying the Housing Policy and Affordability Calculator.

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