

# **Datascapes: Revealing the Potential of Data to Design Neighborhoods For the Future**

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A thesis submitted in partial fulfillment of the requirements for the degree of:

Master of Architecture

University of Washington 2014

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Program Authorized to Offer Degree: Department of Architecture

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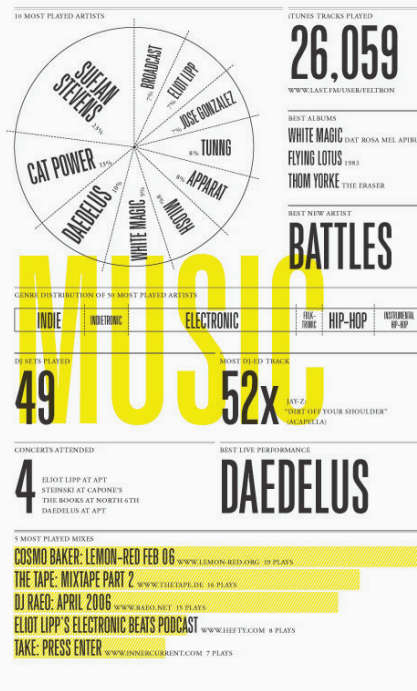


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**Data is everywhere.**





## CHAPTER ONE

# Introduction: The Problem with Data

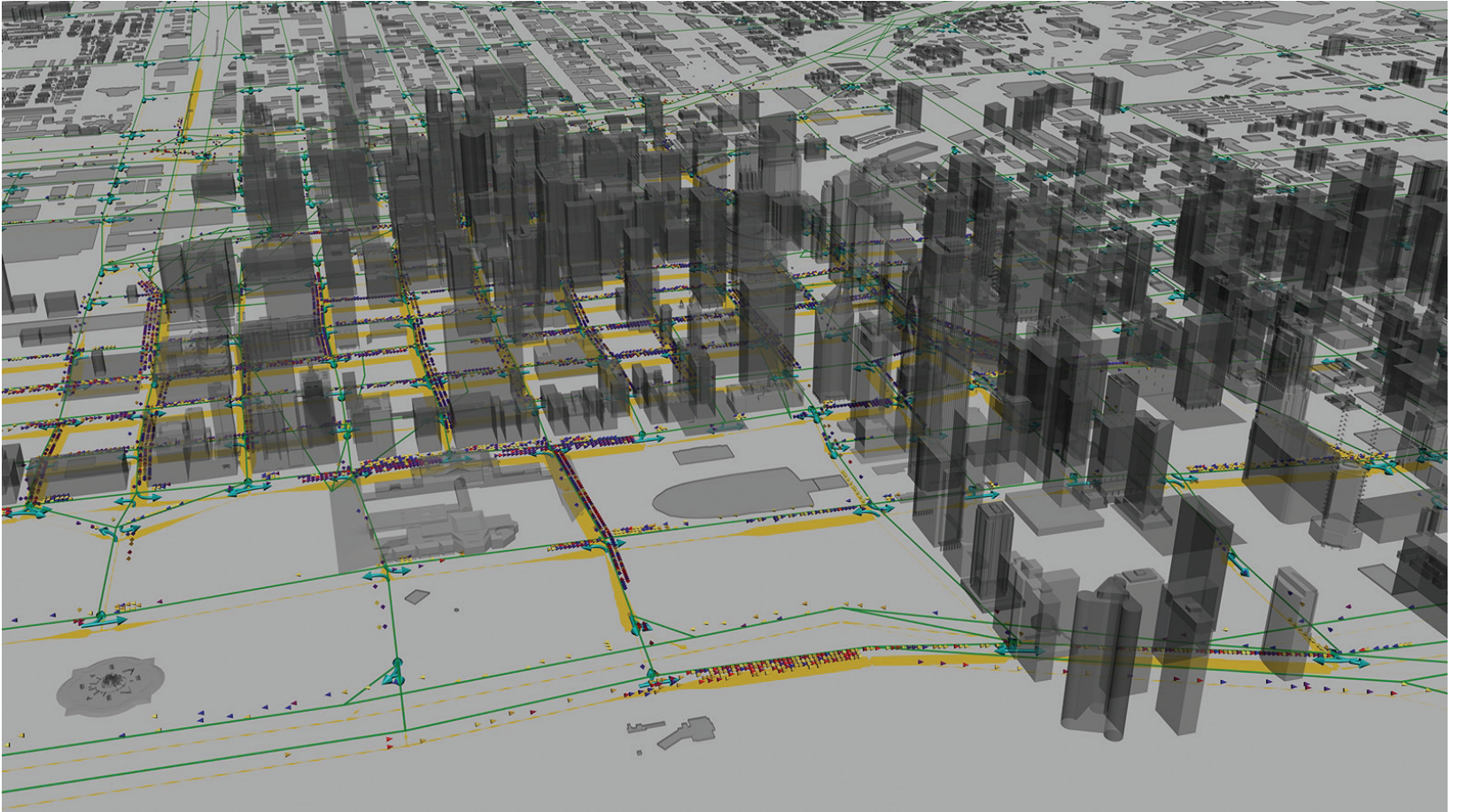
## Urban Land Data

Data is everywhere. We are surrounded by a wealth of information collected and stored from every aspect of our daily lives. Information from credit card purchases, cellphone calls, Internet browsing, and many other activities is being collected and stored indefinitely. Much of this data is collected and aggregate totals are made available through a variety of web sites and other sources. Our vast array of data about cities includes; transportation patterns, land values, zoning, weather statistics, demographics, and population projections. All are tracked and collated. Activities with the contemporary built environment produces new data every day.

**FIGURE 1** The Feltron Report

Compiled by New York graphic designer Nicholas Feltron, The Feltron Report is a yearly chronicle of his life from movies watched, to emails sent, to miles walked.





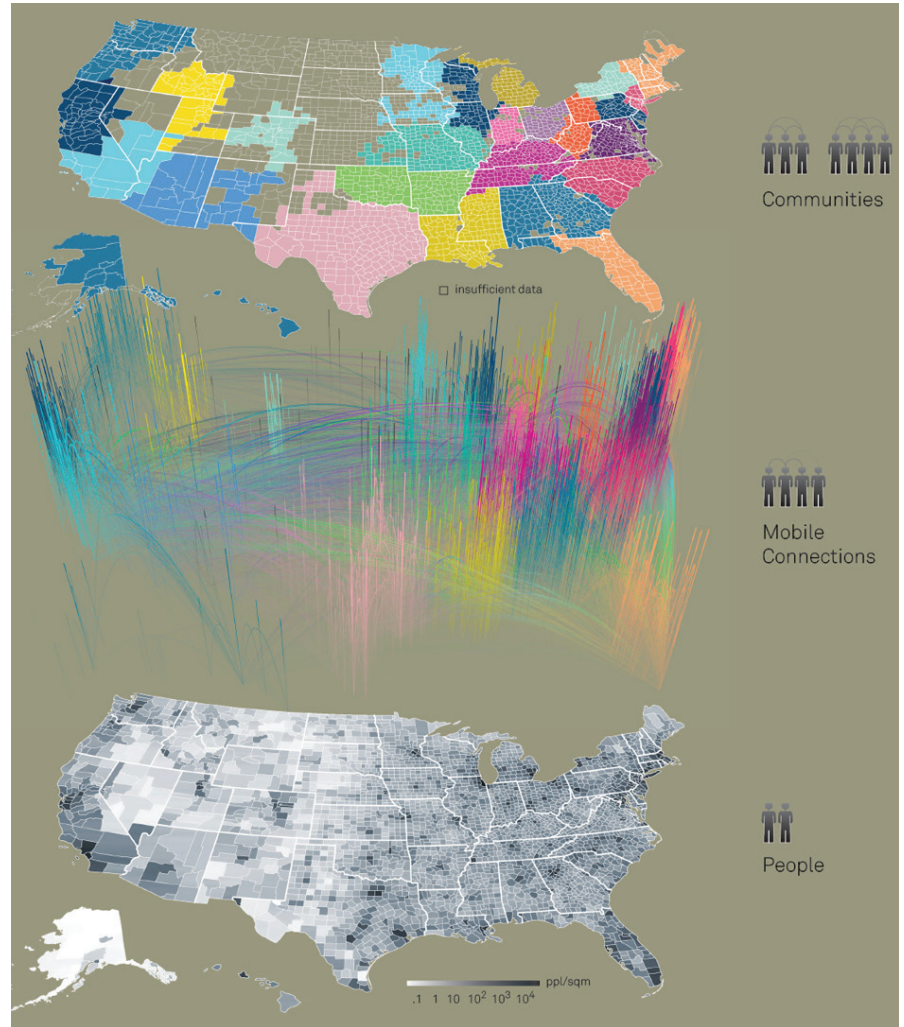
**FIGURE 3** Car Traffic Patterns - Chicago, IL

## Problem Context: Cities in the 21st Century

It's a very sad thing that nowadays there is so little useless information.

– OSCAR WILDE

Architects are becoming increasingly aware of the wide array of data about cities that is available. Networks of data and information have become superimposed onto the city. Technological advances in computing have enabled vast sets of information about the urban environment to be gathered and shared. Some critics have condemned designers who confuse the use of data as a means to create architectural form or leverage its mere presence as empirical justification to operate.<sup>2</sup> The designer's challenge has been to mobilize data to inform design projects in a useful way.

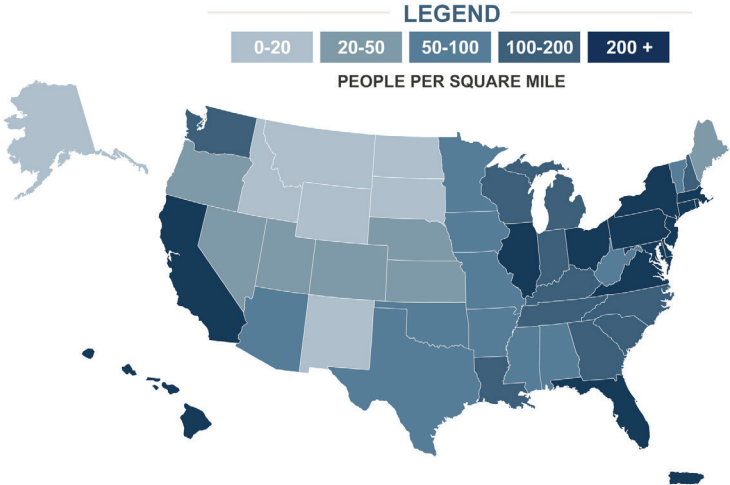
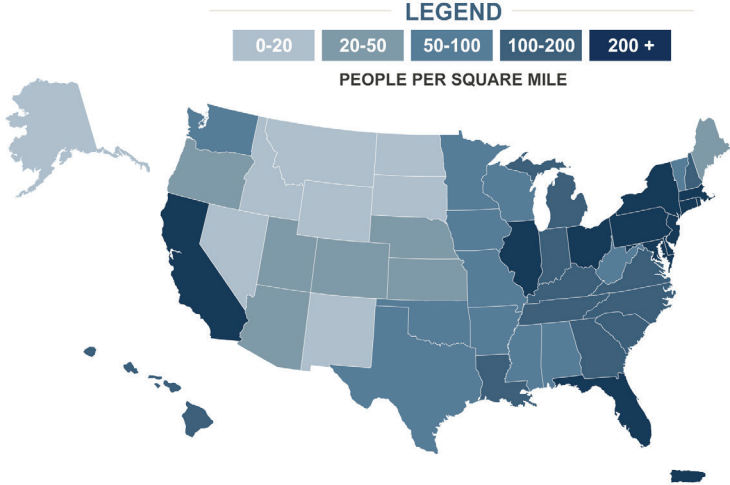


**FIGURE 4** United States Cellphone Data

The rate at which new data has been produced in the twenty-first century has been accelerated by the burgeoning growth of the world population. The world is increasingly urbanizing. In 2010, it was estimated that 80 percent of the population in the United States lived in urban areas.<sup>3</sup> People throughout the world are moving to cities as opportunities for work and life become more plentiful. The benefits of denser cities are many – productivity, sustainability, and innovation – increasing density is becoming the global condition.

As the world urbanizes, conditions of urban sprawl must be addressed. Density can only be a solution insofar as societies are able to provide enough housing, employment, and services to support a growing population.

<sup>3</sup> *Census 2000 Population Statistics*. U.S. Department of Transportation. Web. Mar. - May 2014



**FIGURE 5** 2000 Census Data

**FIGURE 6** 2010 Census Data

Derived from numbers, quantities, facts, and pure data, they [datascares] have great persuasive force in the hugely bureaucratic decision-making and management aspects of contemporary city design. They differ from the quantitative maps of conventional planning in their imaging of data in knowingly rhetorical and generatively instrumental ways. They are designed not only to reveal the spatial effects of shaping forces (such as regulatory, zoning, legal, economic, and logistical rules and conditions) but also to construct an eidetic argument in space-time geometry.<sup>4</sup>

- JAMES CORNER, landscape architect and theorist

4 Corner, James.  
*Recovering  
Landscape:  
Essays in  
Contemporary  
Landscape  
Architecture.*  
Sparks, NV:  
Princeton  
Architectural  
Press, 1999. 165.

## Datascapes

This thesis uses the term “datascape” to refer to maps, drawings, and renderings that integrate data into spatial manifestations. And, this thesis defines the term “datascape methodology” to mean the process of selecting, gathering, and aggregating data to make datascapes and design.

Datascapes are spatial representations of information. Designers generate datascapes in part to extend information from the three static Cartesian coordinates and integrate the temporal dimension of time.<sup>5</sup> The translation from data to visualization exposes new types of spatiality and proposes new architectural typologies that begin to abstract the built form, resulting in a blurring between the “abstract and concrete, information and form, and real and unreal.”<sup>6,7</sup> A datascape shows and exposes the “urban invisibles,” the

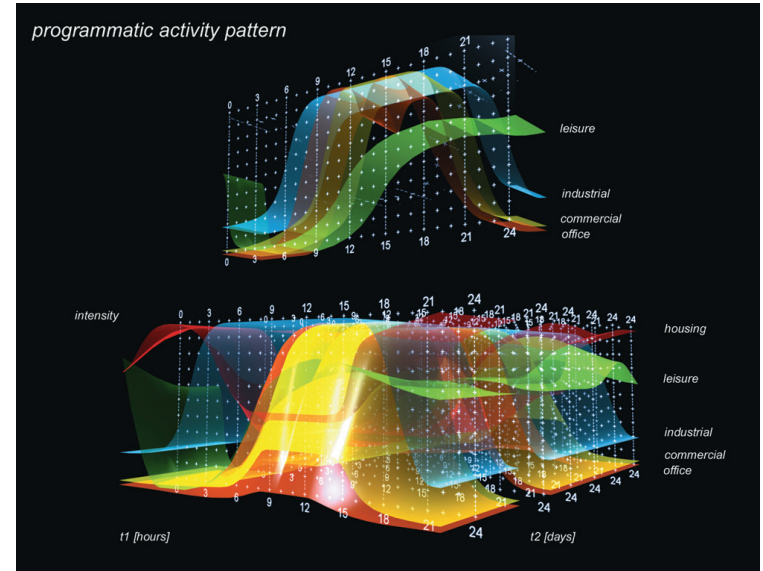
5 Burry, Jane and Mark Burry. *The New Mathematics of Architecture*. New York: Thames & Hudson, 2012. 210.

6 Betsky, Aaron. “MVRDV: The Matrix Project.” *Reading MVRDV*. Ed. Véronique Patteeuw. Belgium: NAI Publishers, 2010. 17.

7 *Urban Diagrams*. Karen J. Lewis. Web. Mar. - Dec. 2014.

8 Amoroso, Nadia. *The Exposed City: Mapping the Urban Invisibles*. New York: Routledge, 2010. 68.

9 *ibid.*



abstract information that reveals unknown aspects of the city.<sup>8</sup> Datascapes can offer a complex depiction of place, allowing architects to quickly identify the inherent constraints and advantages of a site.<sup>9</sup>

This thesis argues that architects should design with data and more importantly datascapes. Winy Maas, principal of MVRDV states that datascapes

FIGURE 7 UN Studio Activity Datascape

make “visible aspects and opportunities of the regulatory matrix that were never intended. They merge out of an apparently arbitrary extension of its logic, point to the arbitrariness of the rules themselves and at the same time, produce something unexpected.”<sup>10</sup> This thesis seeks to understand how designers can use datascape to design buildings and neighborhoods within the urban fabric.

Data can now be accessed and used for many purposes. However, in dealing with large amounts of data, one has to be wary of the tendency to “take everything at face value.”<sup>11</sup> Computers cannot make sense of data; only people can. Well-designed datascape bring the story of data to life and have the potential to serve as a challenge to designers to conceptualize information into meaningful architectural designs.

The integration of data within the design process allows for the creation of a realized environment augmenting the critical relationship between the virtual and the real. This thesis uses the datascape methodology to expose the invisible variables of the contemporary city and displays these implications in the design of a building in Seattle.

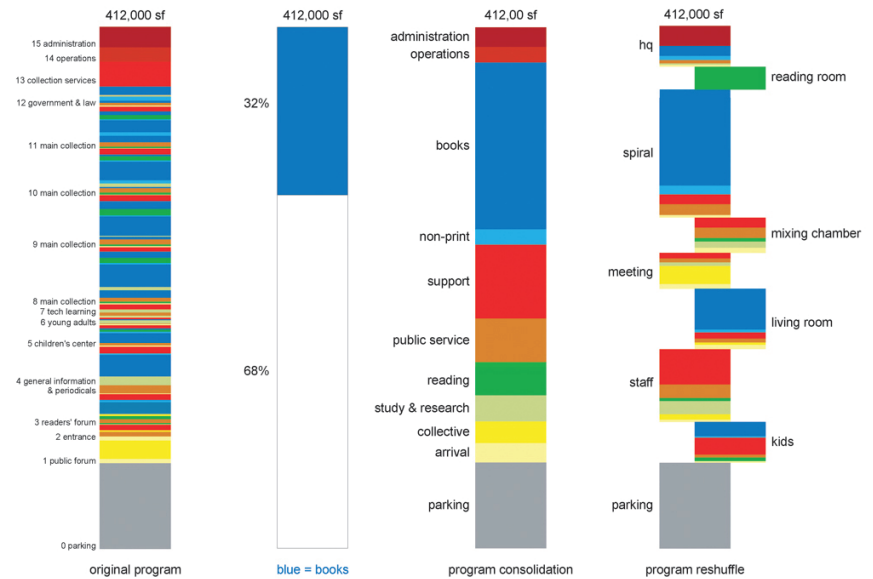


FIGURE 8 OMA's Datascape of the Seattle Public Library

## Urban Density in the United States

Density is now the global condition, as more people move from rural areas and settle in cities. Cities in the United States are becoming increasingly urbanized. Dense urban spaces are more energy efficient, requiring less hard infrastructure in the form of transportation, power lines, and roads. It is clear that the age of suburbia and commuter freeways is no longer sustainable anymore, especially in the United States.

In the year 2040, it is estimated that the population in the United States will grow to 380 million people, up 18.3 percent from current levels.<sup>12</sup> In the year 2040, King County will grow to 2.4 million residents, a growth of 26 percent from the current population.<sup>13</sup>

Within Seattle, zoning designations divide the city into areas in which growth in density is

allowed. Key areas of growth are called Urban Villages. These areas provide a strategy to locate more residents and jobs within a small area to reduce transportation emissions and make public transportation more accessible to a greater number of people.<sup>14</sup> This thesis explores the possibilities of using datascares to design an urban mixed use building in Seattle in one of these Urban Villages.

<sup>12</sup> *Population Projections.* United State Census Bureau. Web Mar - May 2014.

<sup>13</sup> *About Seattle.* City of Seattle. Web. Mar - May 2014.

<sup>14</sup> *Seattle 2024 Comprehensive Plan.* City of Seattle Department of Planning and Development. Web. Mar - May 2014.

Data provides the means by which science progress, legislation changes, and society advances; data is the enemy of witch hunts, bigotry, and ignorance (not to mention Creationism). But data is always gathered at a certain time with a certain purpose; and to be useful it must be mined, parsed, and presented.<sup>15</sup>

- PETER HALL, design writer and critic

## The Solution Comes from Data

Hall organizes data visualizations into a three-part taxonomy: scientific, journalistic, and artistic practice. According to Hall, scientific visualization is typically a tool of discovery through the scientific method. Journalistic visualizations are driven by the desire to “edit, condense, and reduce”; the goal is to make information accessible to the broadest audience.<sup>16</sup> Both scientific and journalistic visualizations aim to answer well-

defined questions. In contrast, however, artistic visualizations, are more open-ended.<sup>17</sup> The goal of an artistic visualization is to “bring to light and challenge the prevailing assumptions behind the rhetoric.”<sup>18</sup> This thesis aims to utilize components from all three of these approaches (scientific, journalistic, and artistic) to establish a visualization methodology applicable to the design of a building.

<sup>15</sup> Hall, Peter. “Bubbles, Lines, and String: How Information Visualization Shapes Society.” *Graphic Design: Now in Production*. Ed. Andrew Blauvelt and Ellen Lupton. Minneapolis: Walker Art Center, 2011. 170-185. 171.

<sup>16</sup> *ibid.*

<sup>17</sup> Cheng, Karen. “Designing Data.” *Arcade*. Fall 2013: 31-50. 33.

<sup>18</sup> Hall, Peter. “Bubbles, Lines, and String: How Information Visualization Shapes Society.” *Graphic Design: Now in Production*. Ed. Andrew Blauvelt and Ellen Lupton. Minneapolis: Walker Art Center, 2011. 170-185. 175.

This thesis posits that the datascape methodology can help address the need for accommodating an exponentially expanding population in Seattle by exposing invisible relationships and adjacencies in the city, thereby resulting in unexpected solutions for accommodating density. The objective of this thesis is to investigate how data can be used through graphic representation as an element of an iterative design process to visualize potential future development in a much denser Seattle.

## CHAPTER TWO

# The City Based on Data

### Datascape Case Studies

One of the earliest versions of datascares are the 1922 drawings by Hugh Ferriss of the 1916 New York City Zoning Ordinance referred to as the Evolution of the Set-Back Building or more typically the “Four Stages” Drawings.<sup>19</sup> New York City enacted these regulations to govern the uneven development of Manhattan as developers and landowners built structures as large as their permits and budgets allowed. Advancements made in steel technology and elevators allowed for taller buildings and meant lucrative payouts for owners. The 1920s would prove highly influential in establishing the skyline for New York City.

Ferriss, an artist and architect, was commissioned to illustrate the section of the

setback ordinance restricting building height and volume. His intent was to illustrate these new invisible volumetric limits and provide visual evidence of alternative ways architects could interpret and build within the design code.<sup>20</sup>

Ferriss’s drawings were revelatory for architects and prophetic of the changes happening in New York during this time. The contrast of the chiaroscuro technique between the light and the dark created a scenic effect emphasizing the depth of the setbacks as mandated by the new ordinance. Ferriss wrote “from the renderer’s point of view a building is, in the first place, a material mass... the renderer must realize the presence of mass before he can fully realize the presence of any appurtenant form.”<sup>21</sup> A prevalence of unadorned masses without historical styles throughout the built work of the late 1920s and 1930s reveals how

<sup>19</sup> Amoroso, Nadia. *The Exposed City: Mapping the Urban Invisibles*. New York: Routledge, 2010. 4.

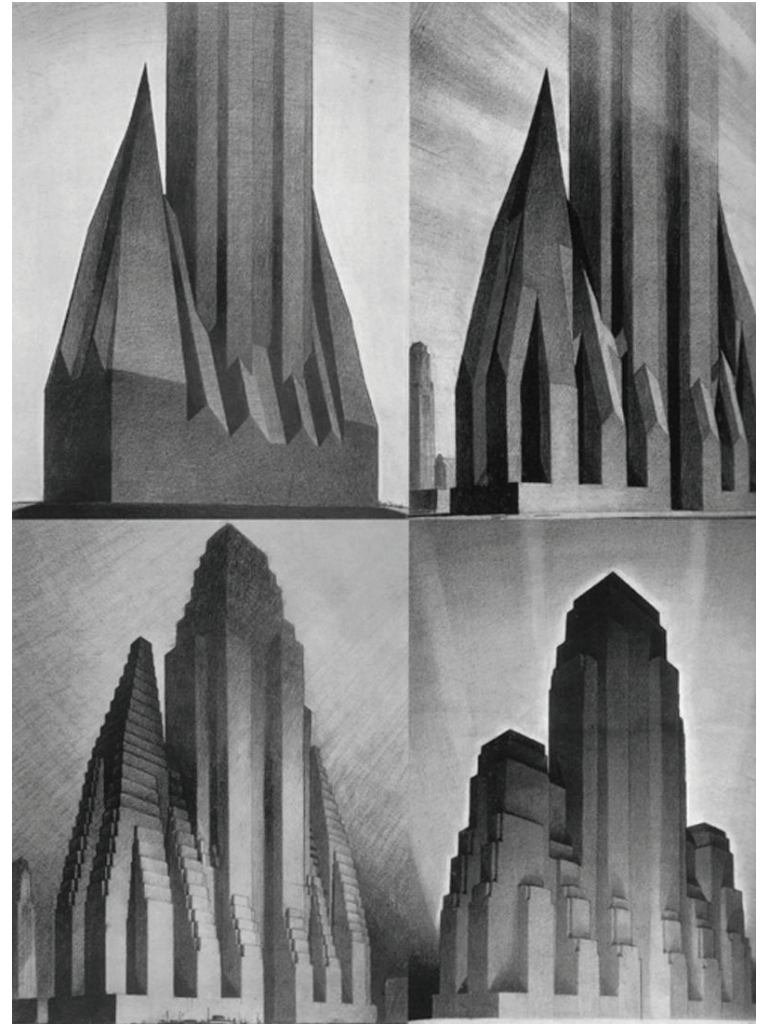
<sup>20</sup> *ibid.* 22.

<sup>21</sup> *ibid.* 24.

influential the Four Stages Drawings datascapes were for architects.

Datascapes can also present the complexities of cities in a visually simulating manner. Kevin Lynch wrote extensively about the well-imaged city. Through a series of interviews, Lynch generated maps of cities through verbal descriptions by users. He described the five elements of cities as “paths, edges, districts, nodes, and landmarks.”<sup>22</sup> These elements are used to mentally conceive of the city. A city that generates and programs these sensory elements is a well-imaged city. Lynch maintained that these five elements help to really “see” the city and its arrangement – not only depicting important relationships between the city and its people, but also showing the ways that the city evolves.<sup>23</sup>

The core of Lynch’s research focused on



22 Lynch, Kevin. *The Image of the City*. Cambridge: MIT Press, 1960.

23 Amoroso, Nadia. *The Exposed City: Mapping the Urban Invisibles*. New York: Routledge, 2010. 63.

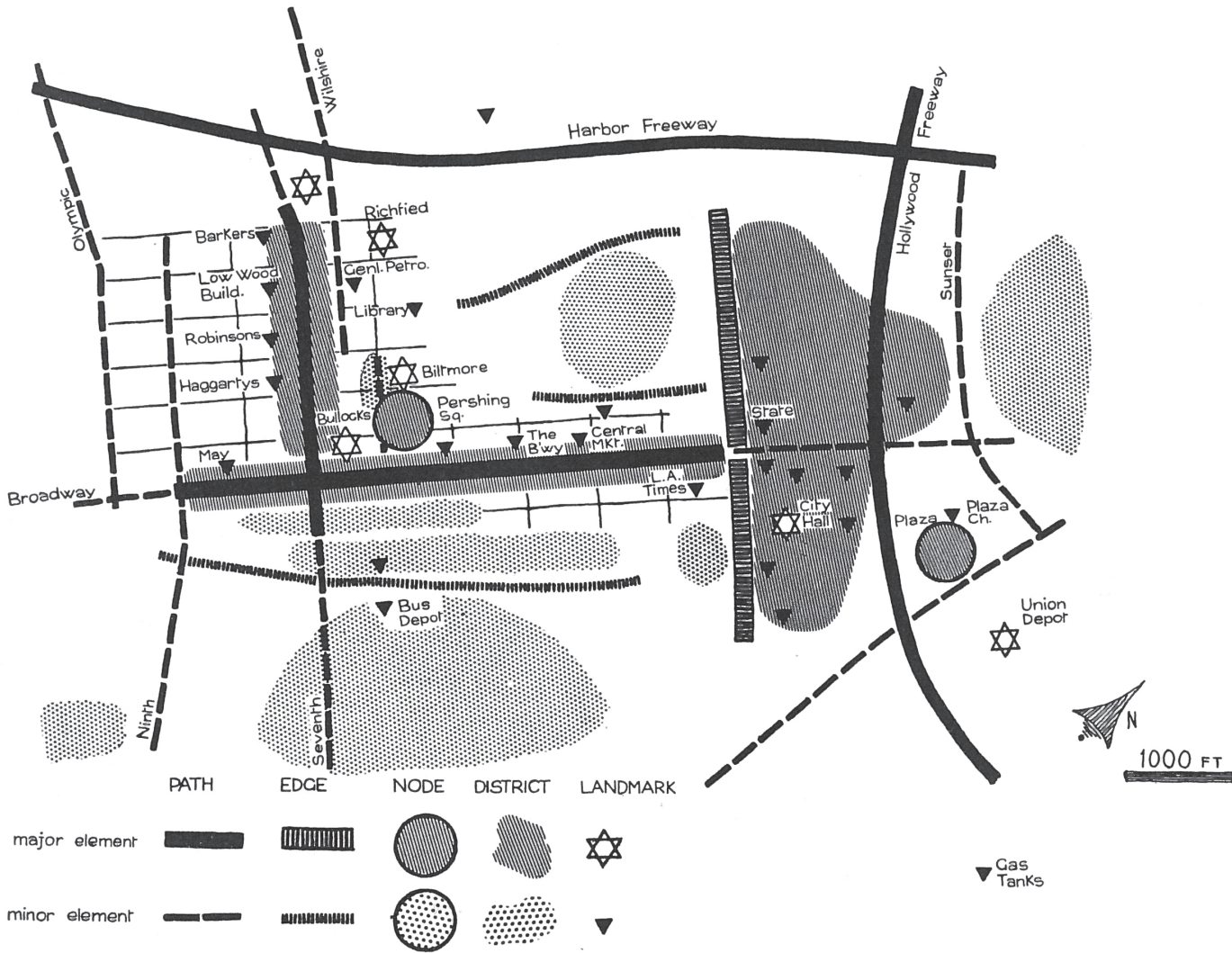


FIGURE 10 City Analysis Diagram by Lynch

placemaking in an urban context. Imageability constitutes the ability that users of the urban environment have to create vivid mental images of cities. Through his research, Lynch was able to show that these sketches constructed from memory can communicate rich information about cities. Furthermore, these datascares begin to reconstruct eidetic, vivid mental images, of cities.<sup>24</sup>

Contemporary cities have become less analog and more digital. GIS/GPS technology has connected cities with constantly updated and updating maps and digital representations. The role of maps and visualization is changing. Google Street View allows designers to experience and learn about sites and places with ease, requiring only a computer and an Internet connection. Physical maps have been replaced by moving

24 Corner, James. *Recovering Landscape: Essays in Contemporary Landscape Architecture*. Sparks, NV: Princeton Architectural Press, 1999. 165.



pins and dots on the screens of smartphones. Designers need a new hybrid type of map that incorporates technological advances and acknowledges the near instantaneous changes that can have an effect on the contemporary city.

**FIGURE 11** Google Street View Vehicle

## Datascapes: The Works of MVRDV

To better understand datascapes, one may consider the work of Dutch firm MVRDV. MVRDV is based in Rotterdam and was founded by Winy Maas, Jacob van Rijs and Nathalie de Vries in 1993. The firm's projects range from mixed-use housing to large-scale master plans. MVRDV's work is notable for its experiments mapping data and urban phenomena through new digital means.<sup>25,26</sup>

By using datascapes, MVRDV is able to translate information about cities from seemingly disparate fields to investigate and critique urban situations, and in turn offer solutions to urban problems. The firm is interested in the spatial manifestations of data as a pursuit of both form and physical solutions in the built environment.<sup>27</sup>

When visualized, data has the potential to offer solutions to urban constraints. MVRDV is

interested in how datascapes can be used to solve larger urban scale problems.<sup>28</sup> It is this pragmatism that distances MVRDV from the "formulaic rehearsal of convention."<sup>29</sup> These types of practices allow relationships and adjacencies between program and site components to naturally form using the information as a tool for "clarification, augmentation, simulation, and revelation."

In 1999, MVRDV published the book *Metacity/Datatown*, a catalog of a video installation of the same name that was exhibited at The Stroom Centre for the Visual Arts in The Hague, the Netherlands.<sup>30</sup> *Metacity* takes data as it relates to the whole world, while *Datatown* zooms in specifically on the Netherlands. *Metacity/Datatown* explores the implications of a city described only by data and posits a numerical approach to the

25 Betsky, Aaron. "MVRDV: The Matrix Project." *Reading MVRDV*. Ed. Véronique Patteeuw. Belgium: NAI Publishers, 2010. 35.

26 Amoroso, Nadia. *The Exposed City: Mapping the Urban Invisibles*. New York: Routledge, 2010. 68.

27 Allen, Stan. "Artificial Ecology." *Reading MVRDV*. Ed. Véronique Patteeuw. Belgium: NAI Publishers, 2010. 83.

28 Betsky, Aaron. "MVRDV: The Matrix Project." *Reading MVRDV*. Ed. Véronique Patteeuw. Belgium: NAI Publishers, 2010. 27.

29 Allen, Stan. "Artificial Ecology." *Reading MVRDV*. Ed. Véronique Patteeuw. Belgium: NAI Publishers, 2010. 83.

30 Maas, Winy. *Metacity/Datatown*. Rotterdam: MVRDV/010 Publishers, 1999. 5.

design of architecture and the urban environment.

Metacity focuses on habitable space of the entire world (Figure 12). How much land is left on earth after bodies of water, mountains, deserts,

jungles, and polar zones are subtracted?<sup>31</sup> Given

that the world population within the past few decades has exploded beyond comprehension how much land is usable space for living, industry, or

31 Maas, Winy.  
*Metacity*  
Datatown.  
Rotterdam:  
MVRDV/010  
Publishers, 1999.  
20.

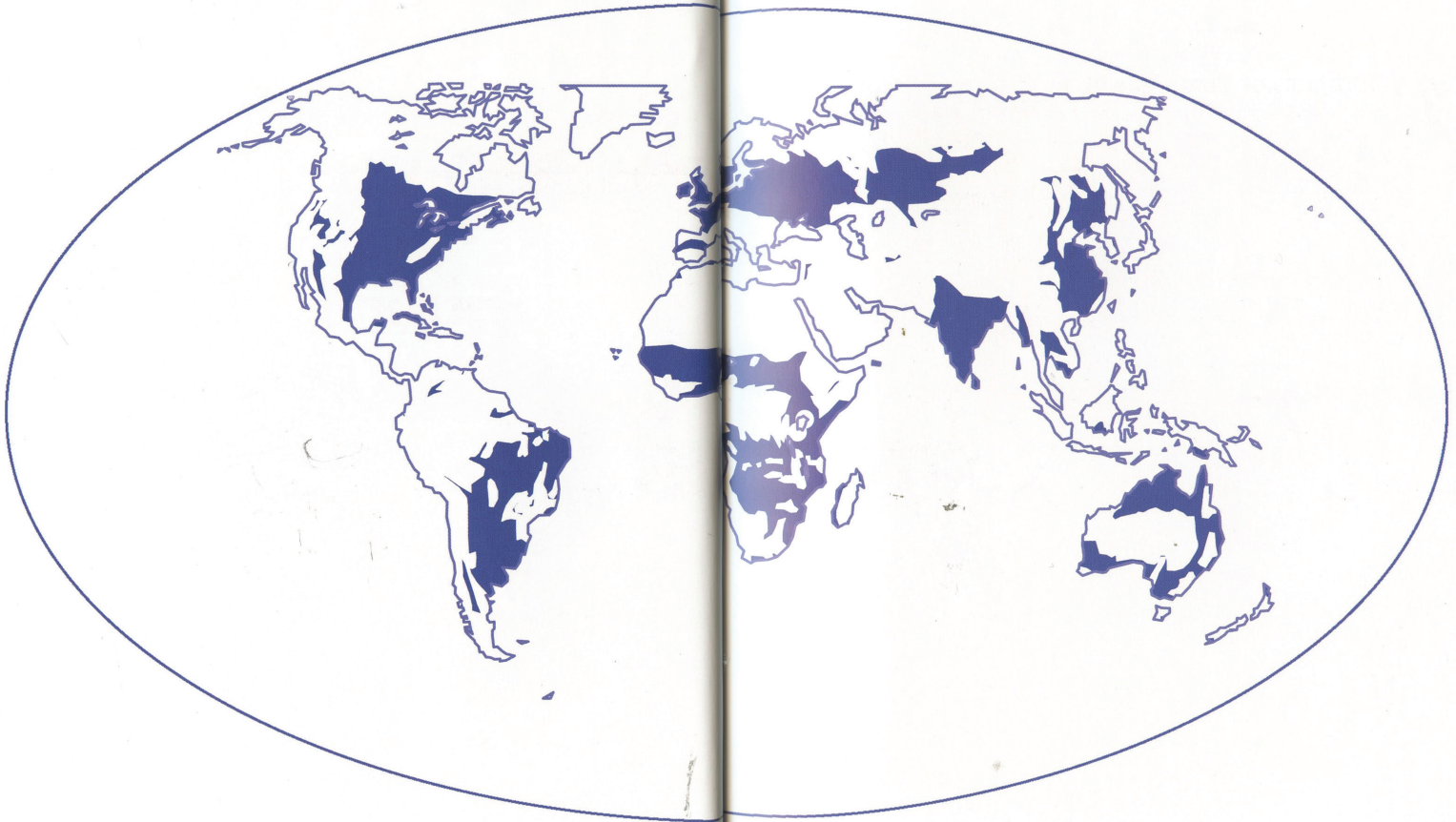


FIGURE 12 World Population from MVRDV's Metacity Datatown



FIGURE 13 Analysis of Liveable Land on Earth

World settlement envelope  
60,126,701 km<sup>2</sup>



**FIGURE 14** Amount of Liveable Land on Earth

production (Figures 13 + 14)? As a consequence, do humans need to begin thinking about alternative types of buildings to grow? Maas displays his findings in a series of two-dimensional maps and drawings aimed at critiquing our “[inability] to grasp the dimensions and consequences of our own data.”<sup>32</sup> The next section takes a leap in regards to mapping styles by integrating these consequences spatially.

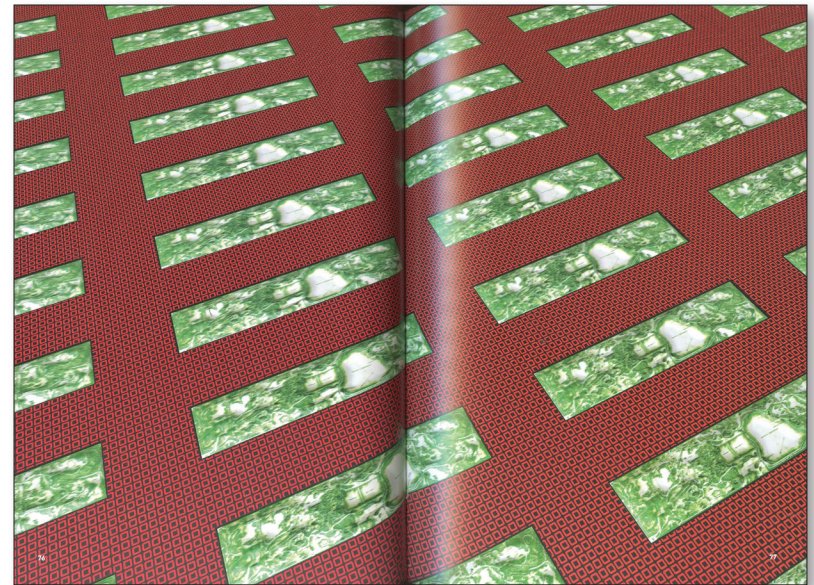
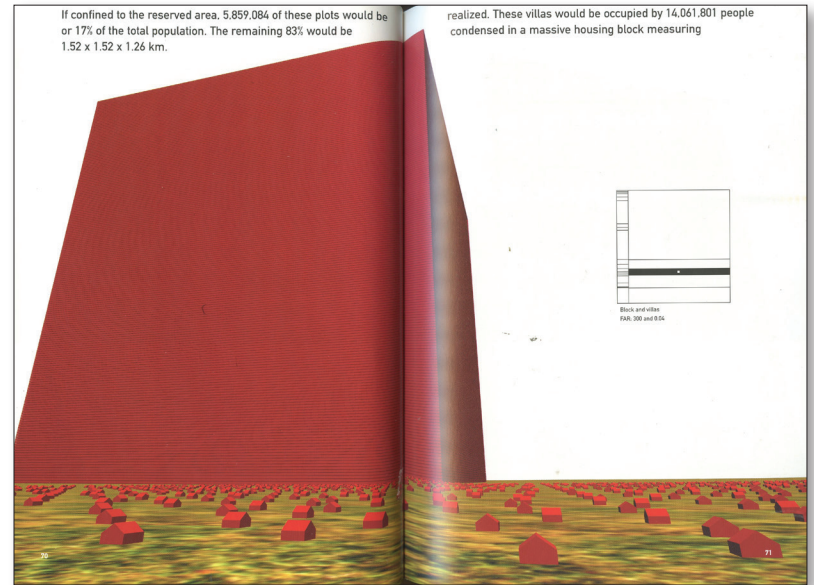
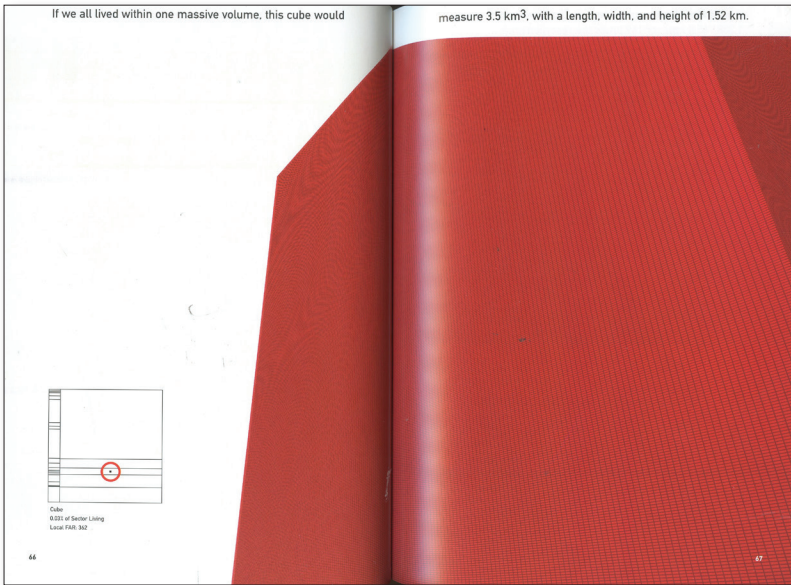
*Datatown* is based on the theoretical premise of a quadrupled population in the Netherlands. Maas creates visual representations of the country with the new population. He visualizes the architectural impact the population increase would have on six sectors within Datatown: waste, oxygen/carbon dioxide, agriculture, water, housing, and energy. Datascares provide an abstract graphic representation of the data.<sup>33</sup>

Of particular importance is the first section, the “Living Sector.” Maas uses housing density statistics and building types from Hong Kong and Barcelona and compares them to the Netherlands. He juxtaposes a massive 1.5-kilometer by 1.5-kilometer housing block that could house every person in Datatown with thousands of tiny single-family houses (Figure 15). The intent of this image is to shock. By spatializing the data into built form, Maas draws attention to the dire housing situation faced by this larger population (Figure 16).

Like Hugh Ferriss’s Four Stages drawings, the *Metacity/Datatown* datascares depict and map data to their extremes. Both rendering types provide a conceptual framework to understand the urban realm in quantitative means. Ferris shows regulatory envelopes, MVRDV shows

32 Maas, Winy. *Metacity Datatown*. Rotterdam: MVRDV/010 Publishers, 1999. 19.

33 Amoroso, Nadia. *The Exposed City: Mapping the Urban Invisibles*. New York: Routledge, 2010. 83.



**FIGURE 15** If all of the Netherlands Lived in One Volume

**FIGURE 16** If all of the Netherlands Lived in Barcelona Style Full Block Courtyard Housing Units

needs for volume given an assumption of growth per household.<sup>34</sup> The aim of these drawings is to illustrate the cause and effect of the data in particular situations to guide designers.

These datascares are graphic representations of urban statistics. Datascares have the quality of simultaneously being rational, because they are derived from data, and surreal, because of their juxtapositions between both program and function. The datascape methodology is an experimental process, governed by “what if” questions that push situations to the extreme. This methodology merges the “polarity between art and instrument through the hand of the datascape and his/her computer” using digital means to create maps that define spatial parameters.<sup>35</sup>

Datatown is conceived of as a city only to be explored through information and big data.<sup>36</sup> The

final architectural proposals for each of the six sectors are data-driven realizations (Figure 17).<sup>37</sup> Each image provides a graphic representation of spatial outcomes from data. This allows for an immediate recognition of a topological structure to aid in understanding its visualized importance.<sup>38</sup>

Throughout these practices, the diagram does not operate as an abstract machine, nor as a set of iterative formal steps. The information diagram performs as a tool for clarification, augmentation, simulation and revelation, linking the method of data visualization with the agency of practice.<sup>39</sup> New generations of designers are leveraging datascares in ways that are neither spatial nor indexical, but are gathering information and designing data as a way to resolve and compress complex and conflicting sets of information.

34 Amoroso, Nadia. *The Exposed City: Mapping the Urban Invisibles*. New York: Routledge, 2010. 73.

35 *ibid.* 84.

36 *ibid.* 11.

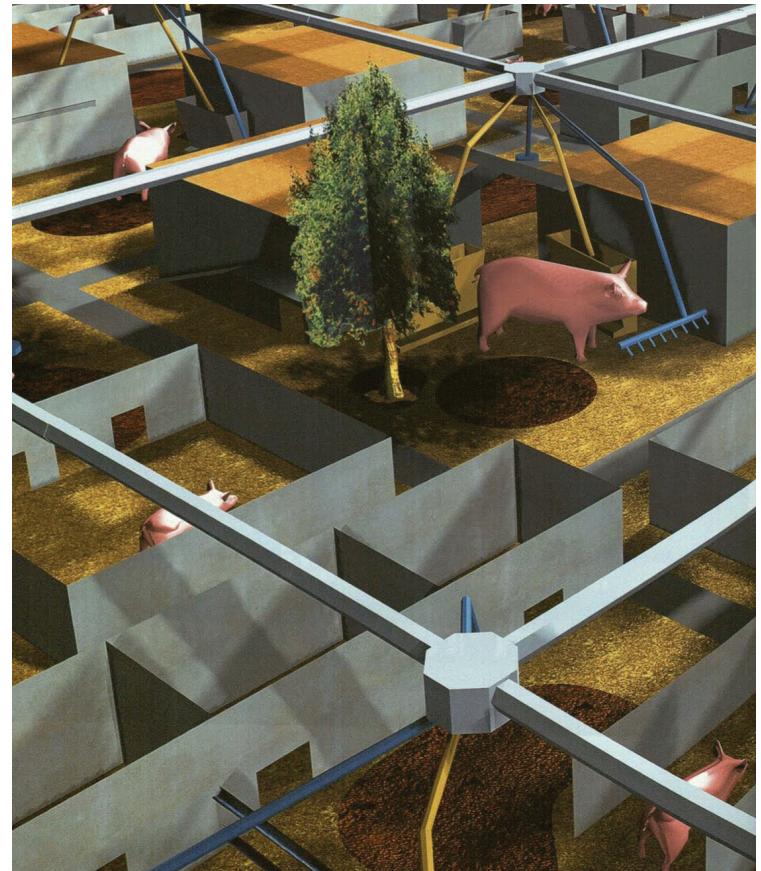
37 *ibid.* 18.

38 *ibid.* 18.

39 *Urban Diagrams*. Karen J. Lewis. Web. Mar. - Dec. 2014.

Our knowledge about the complexities of urban, landscape and building systems is growing. With this knowledge comes responsibilities towards absorbing and addressing many different scales of spatial issues from global healthcare, economic and landscape networks, and even shrinking cities. Furthermore, we must absorb these multi-scaled sets of knowledge into increasingly complex systems of collection, representation and proposal.<sup>40</sup>

40 *Urban Diagrams.*  
Karen J. Lewis.  
Web. Mar. - Dec.  
2014.



**FIGURE 17** Pig City

As a solution for food production for a quadrupled future population of the Netherlands, MVRDV proposed self-contained skyscrapers for pigs.

## Data: An Approach to Design

### Scope

This thesis explores how designers can use datascares as a design methodology for creating buildings that integrate relationships among their users and programs and the larger neighborhood while adapting to an increasingly urban and dense environment. It evaluates the use of datascares in a growing neighborhood in Seattle that is currently or will soon be well served by public transit. By beginning at a larger scale, this thesis shows how buildings can work together to achieve and satisfy urban densification. This thesis suggests how this type of development can be applied to other areas of the city and other cities facing similar population growth.

### Goals + Objectives

A primary goal of this thesis is to explore how datascares can be utilized as a design tool for architects and designers. The datascare methodology is used to inform the design of a mixed-use urban building in the University District of Seattle. The goal of this thesis is not to alter the building code, but to push the limits of current zoning designations to extremes and show how datascares can help design a building with new spatial implications for building occupants, program, and a larger neighborhood population. This thesis is not limited to a single final solution; if necessary and applicable, multiple solutions can be proposed. This thesis explores both visually and architecturally how one can design using data. The end goal is not simply to satisfy a generic set of guidelines and program square footages, but tailor

the program using data to address current and future needs of the site.

## Design + Site Approach

According to the U.S. Census Bureau, since 2010, Seattle has had the eighth-fastest population growth in the country. In 2013, Seattle recorded the largest population growth in the entire country for any major city.<sup>41,42</sup> The Growth Management Act, passed in 1994, mandates the addition of 47,000 units in Seattle for a total of 315,000 housing units by the year 2024. Double-digit housing growth within the past decade has meant that Seattle has likely already surpassed the future growth target. In 2010, Seattle had 308,516 housing units accounting for 98 percent of the 2024 growth target. Future buildings in Seattle must address this continuing and exponential growth.

41 Balk, Gene. "Seattle Growing Faster than Suburbs, First Time in 100 Years." *The Seattle Times*. 24 Feb. 2014.

42 Balk, Gene. "Census: Seattle is the Fastest Growing Big City in the U.S." *The Seattle Times*. 22 May 2014.

43 O'Toole, Randal. "Ten Reasons Portland Transit Is Not a Model for Other Cities." *Cato at Liberty*. Web. Mar - May 2014.

To test the datascape methodology, the site selection criteria requires a site with a growing population and the potential for transit integration. The site must be a location where growth is currently occurring, meaning it is a desirable place to live, and where growth is projected to increase within the coming years, meaning there is opportunity to design to respond to growth. Census data, projections, and extrapolations are used as design indicators of future growth.

Seattle's Urban Village Plan proposes that growth be accommodated where there is access to transit. To date, taxpayers have spent 4.2 billion dollars on Sound Transit light rail development and construction within the Seattle metropolitan area. Sound Transit Link Light Rail represents one of the largest infrastructural projects in the Pacific Northwest and is likely to be the most expensive

light rail system in the United States when it is complete.<sup>43</sup> With proposed and built stops at locations north, south and east of Seattle, this thesis recognizes the Urban Village Strategy that requires that growth should occur at or around transit stations.

### Seattle Current and Historic

Seattle is the largest metropolitan area in the Pacific Northwest. The city had its roots from the boom of the lumber industry and within a few generations blossomed into a progressive hub for technology and international trade. These aspects have drawn people to this area and will continue to do so in the future.

Seattle's rapid growth within the past century has had a huge impact on the scope of its residential development. Currently, 49 percent of

Seattle's area is zoned for single-family detached housing.<sup>44</sup> This zoning allotment is one of the highest of any major urban city in the United States and has shaped the character and fabric of the city. In Seattle, it is possible for a typical family to live in a house with a backyard, a dog or two, not to mention chickens, a garage, two cars and still be able to walk, bike, bus, or drive to work and access necessary and cultural amenities, like stores and restaurants within their own neighborhoods.

Emblematic of Seattle are distinct and individual single-family neighborhoods throughout the city. The neighborhoods of Seattle provide breadth and variety to its residents. However, for Seattle to grow some areas will need to become more dense. Seattle's Comprehensive Plan targets growth in dense Urban Villages and Centers

44 About Seattle.  
City of Seattle.  
Web Mar. - May  
2014.

leaving single family neighborhoods to evolve slowly. Growth is targeted for dense Urban Villages and Centers with access to transit, jobs, housing and schools.

The goal of the Seattle Comprehensive Plan is to create a sustainable city through its four core values: community, environmental stewardship, economic opportunity and social equality.<sup>45</sup> This plan integrates goals from the Growth Management Act which designates areas for urban growth within Washington. The plan establishes Urban Centers and Villages designated to absorb growth within the Seattle. In Seattle 86 percent of land is zoned for single-family, industrial, open space, or major institution leaving the remaining 14 percent to accept the majority of this growth.<sup>46</sup>

The Urban Centers and Urban Villages Strategy allows for greater building heights, density, and a

variety of zones, both commercial and residential throughout Seattle where there is good access to transit. Urban Centers offer the highest density with the greatest number of uses, and will accommodate the majority of Seattle's future growth. Hub Urban Villages are communities with many of the same programs of urban centers but with lower density. Residential Urban Villages focus on housing and support services for residents. This thesis focuses on the University Community Urban center, more specifically the University District.

## Program

This thesis explores and applies data in two categories as a baseline to determine growth and initial building types. The first is housing. By using numbers for current household growth in Seattle,

<sup>45</sup> *Seattle 2024 Comprehensive Plan*. City of Seattle Department of Planning and Development. Web. Mar - May 2014.

<sup>46</sup> Johnson, Matthew. "Re-Examining the Urban Village Strategy." *Seattle Transit Blog*. 20 October 2014. Web. Oct. - Dec. 2014.

it is possible to extrapolate housing target goals for the future. This can be visualized as the target extrapolated housing goal. Volumetric data about standard apartment units and sizes can be used as baselines to design housing units. The units and their respective layouts are not the focus of this thesis; however, the character of the units and their overall spatial relationship to each other and program is considered in developing building volumes and forms.

The next area is job growth. In order to determine the mixed-use program elements, this thesis takes into account the University District's proximity to the University of Washington (UW). The UW Seattle campus provides over 41,000 total jobs and is the largest employer in the district.<sup>47</sup> Currently the UW and a group of investors are beginning a multi-year initiative to transform the

University District into an innovation district.<sup>48</sup> Recently, the UW has renovated Condon Hall, a concrete building that formerly housed the School of Law, into Startup Hall. The renovation added rentable co-working space, conference rooms, desks, and lounges in the hopes of supporting a micro economy of small businesses and entrepreneurship.

Office space in this thesis design proposal considers lease-able floors that can be readily configurable as traditional office space, co-working space, and technology laboratories. Program components in the project are understood as malleable insofar as the data determines what is necessary in the University District neighborhood.

With the easy access to transit in the University District, it might be possible to propose that the

47 *University District Urban Design Framework Existing Conditions Report*. City of Seattle Department of Planning and Development. Web. Mar - May 2014.

48 Soper, Taylor. "Video: Inside the University of Washington Startup Hall." *GeekWire*. 16 Sept. 2014. Web. Sept. - Dec. 2014.

area become almost entirely a residential center. However, given the presence of the University of Washington, the University District is much more likely to be a mixed-use center with residential and work space. Further, providing for growth in residential and office spaces likely means that at least some residents in the University District Urban Village will live and also work in the district.



**FIGURE 18** Condon Hall

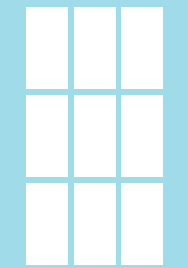
**FIGURE 19** Inside Newly Renovated Startup Hall

## **Datascape Methodology: Designing with Data in the University District**

This thesis proposes a development approach that uses data to design a mixed-use building in Seattle as a solution for increased density and population growth in the year 2050. The premise of this thesis centers on a theoretical proposition of increased density.

At the core of this approach is the datascape methodology. The datascape methodology is created as a means to use data to design neighborhoods and can be applied to growing cities throughout the world.

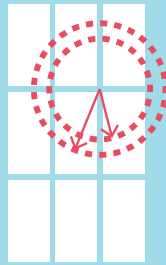
The ten step process integrates data to pick a site, evaluate its growth potential, design building typologies, create a masterplan, integrate more site specific data to determine program types and varieties, and finally select a site and design a building.



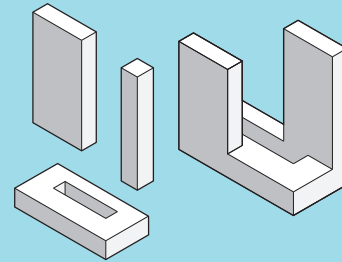
1  
PICK AN AREA



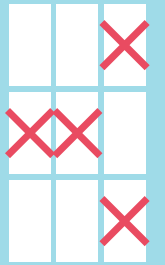
2  
RUN THE NUMBERS FOR  
THE TARGET YEAR



3  
IDENTIFY TRANSIT  
INFRASTRUCTURE



4  
IDENTIFY BUILDING  
TYPOLOGIES  
+ DEVELOP HYBRID PROTOTYPES



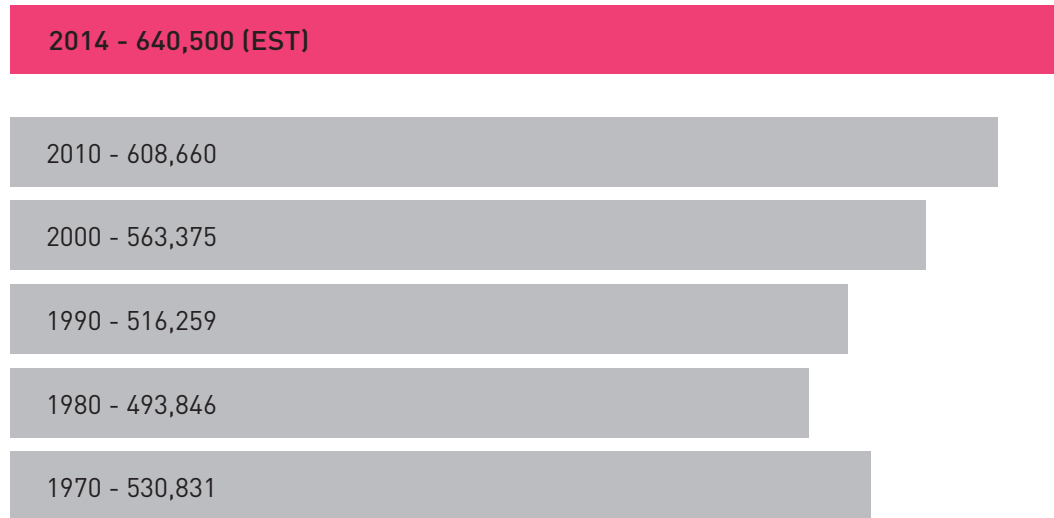
5  
EXCLUDE PARCELS  
FOR TARGET YEAR

FIGURE 20 Datascape Methodology



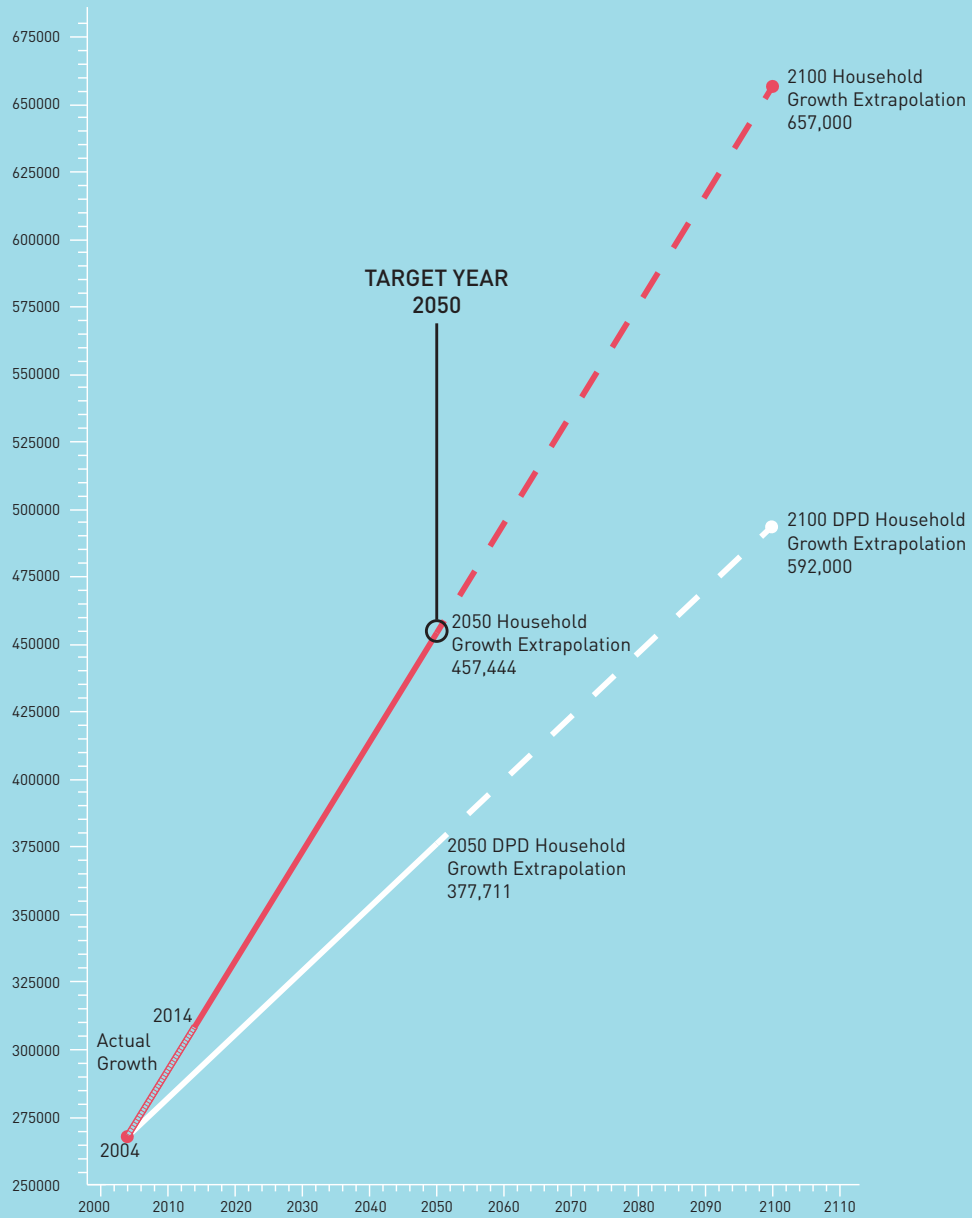
# 1 PICK AN AREA

From 2012 to 2013, Seattle grew 2.8%, the highest rate among the 50 most populous cities in the United States.<sup>49</sup> Seattle is focusing urban density development in Urban Villages and Urban Centers. These locations will begin to reflect urban densities that we see across the globe.



<sup>49</sup> Balk, Gene. "Census: Seattle is the Fastest Growing Big City in the U.S." *The Seattle Times*. 22 May 2014.

**FIGURE 21** Seattle Population Growth



**FIGURE 22** Seattle 2050 Growth Extrapolation

# Growth can only occur in 14% of Seattle (Commercial/Mixed Use and Multifamily) creating an artificial land scarcity.

## Seattle Data/Growth

The Seattle Comprehensive Plan determines the areas within Seattle designated for growth. Current land use goals are based on the target year 2024. A 2035 target year comprehensive plan is currently under consideration and will be implemented in 2015.

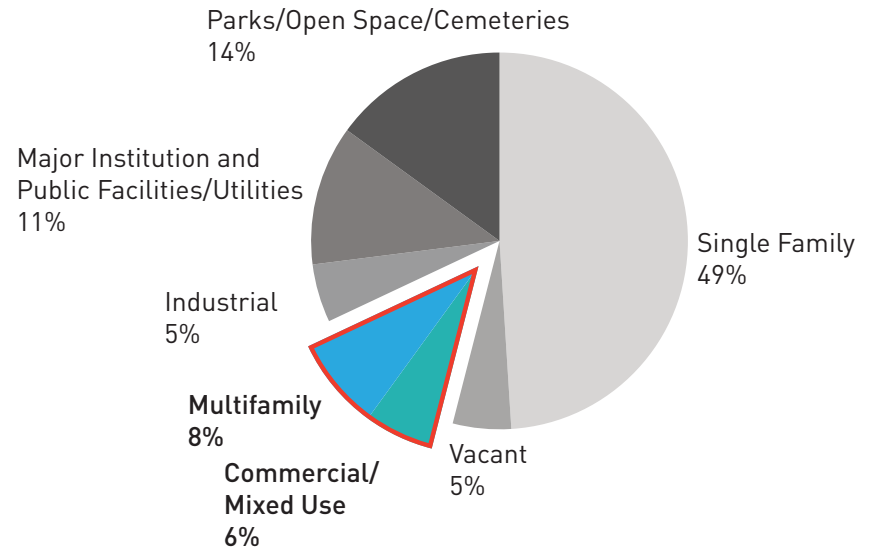
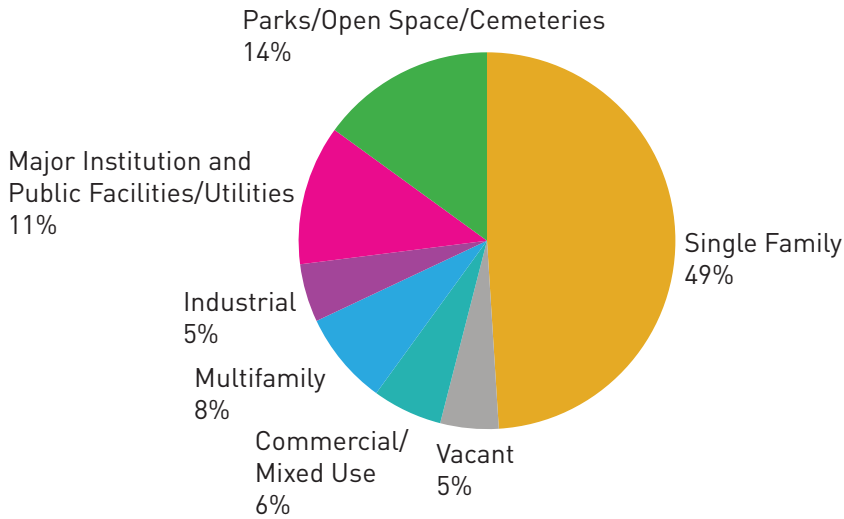
The Urban Village Strategy designates nearly eighty percent of Seattle's land (49% is Single Family - another 30% is Parks, Public Facilities, and Industrial) as nondevelopable for urban growth. This places pressure on the rest of the

land within Seattle, a mere 14% (Multifamily and Commercial/Mixed Use areas).

The Urban Village Strategy was created over twenty years ago as the primary means to address urban growth. The idea has been to focus growth where it can be served by transit.

Sound Transit is constructing a lightrail system (Link Light Rail) with stations throughout Seattle. Transit infrastructure costs billions of dollars to construct, takes many years to build, and is intended, at minimum, to last at least one hundred years. Tunnels and elevated railways more than a century old are used daily in cities throughout the world like Boston, New York, and Paris.

Single family areas cannot be developed. Mass transit is being built. Seattle will need to consider growth in urban centers and villages well beyond the current types of buildings and



the current targets of 2024 or even 2035. Based on the continuing use of transit facilities that are more than a century old, one can anticipate that the citizens of Seattle will continue to use light rail in 2050, 2075, and even 2100, especially as more connections are built linking together more neighborhoods and areas.

How much growth will occur by those years?

Where will these people live and work?

FIGURE 23 Current Seattle Landuse Strategy



**FIGURE 24** View north of the University District from the UW Tower

**FIGURE 25** View south of the University District from the UW Tower

**FIGURE 26** View east of the University District from the UW Tower

**FIGURE 27** View west of the University District from the UW Tower



## 2 RUN THE NUMBERS

Cities throughout the world have begun creating publicly accessible datasets with a wide variety of topics. The open data movement is changing the way citizens perceive and experience cities.

### Seattle Data/Growth

The open access of historically unavailable urban data allows for data to have the broadest access across society. Some of the data readily available about cities: residential population, workforce, transportation, greenspace, demographics, and zoning. This thesis uses these six sets of data to design.

The city of Seattle has open data ranging from crime statistics, neighborhood organizations, local weather, government finances and even real-time jail bookings. This data is available for everybody for free and is intended to inform citizens about many aspects previously unknown or available about cities.



RESIDENTIAL POPULATION



WORKFORCE



TRANSPORTATION



GREENSPACE



DEMOGRAPHICS



ZONING

**FIGURE 29** Data Forces



The University District comprises of only 1.41% of the total area of Seattle, yet the growth targets set by the Seattle DPD are much higher. The University District is going to grow.

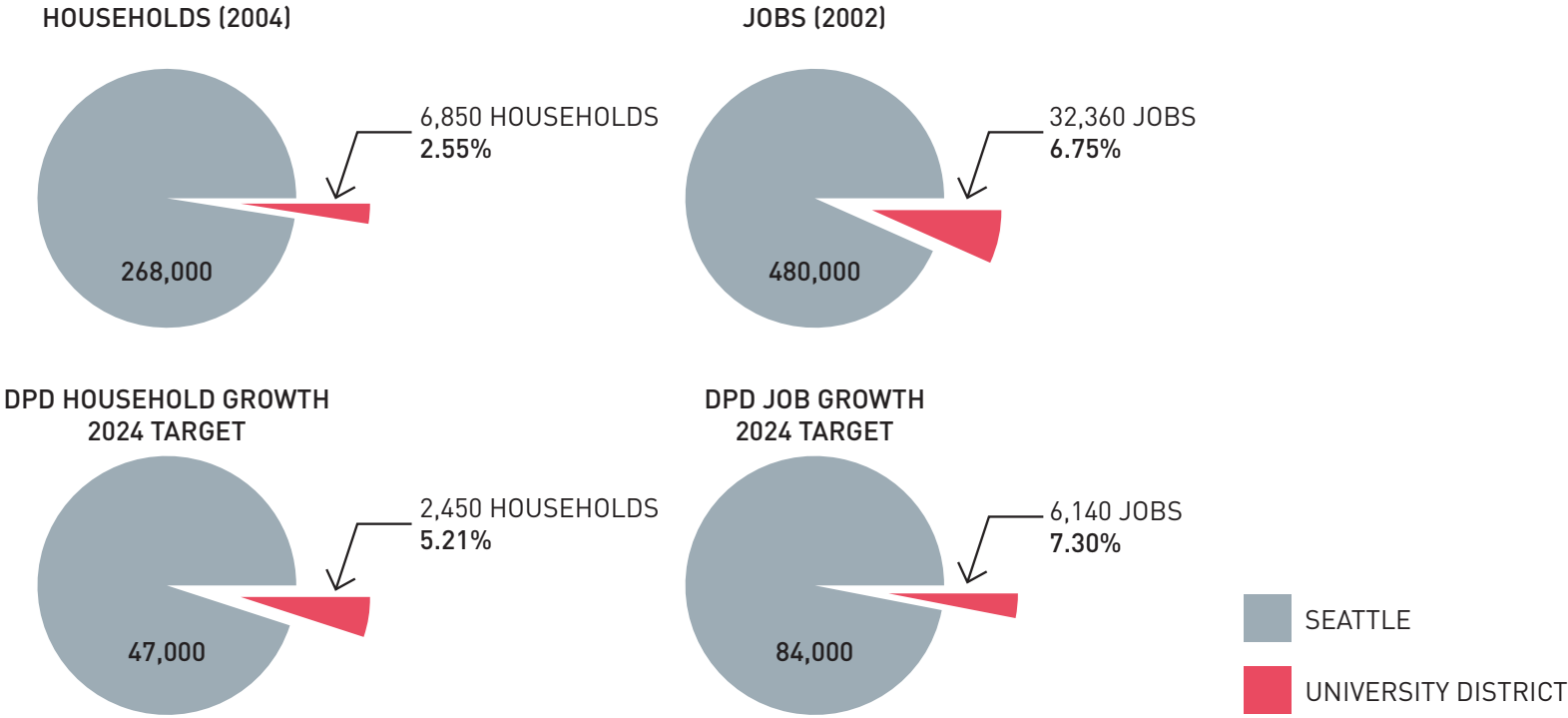


FIGURE 32 Seattle vs. University District

The target year is 2050. Current 2013 - 2014 growth numbers are extrapolated until the target year. The extrapolated numbers are much more than what is currently being planned for by the Seattle Department of Planning and Development.

Where will we house and employ the population of 2050?

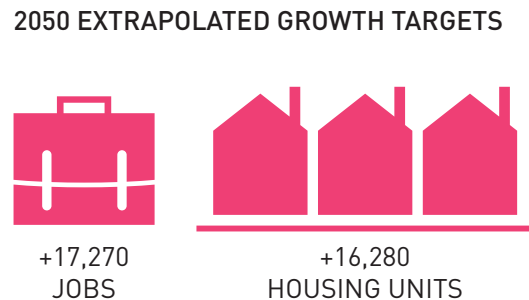
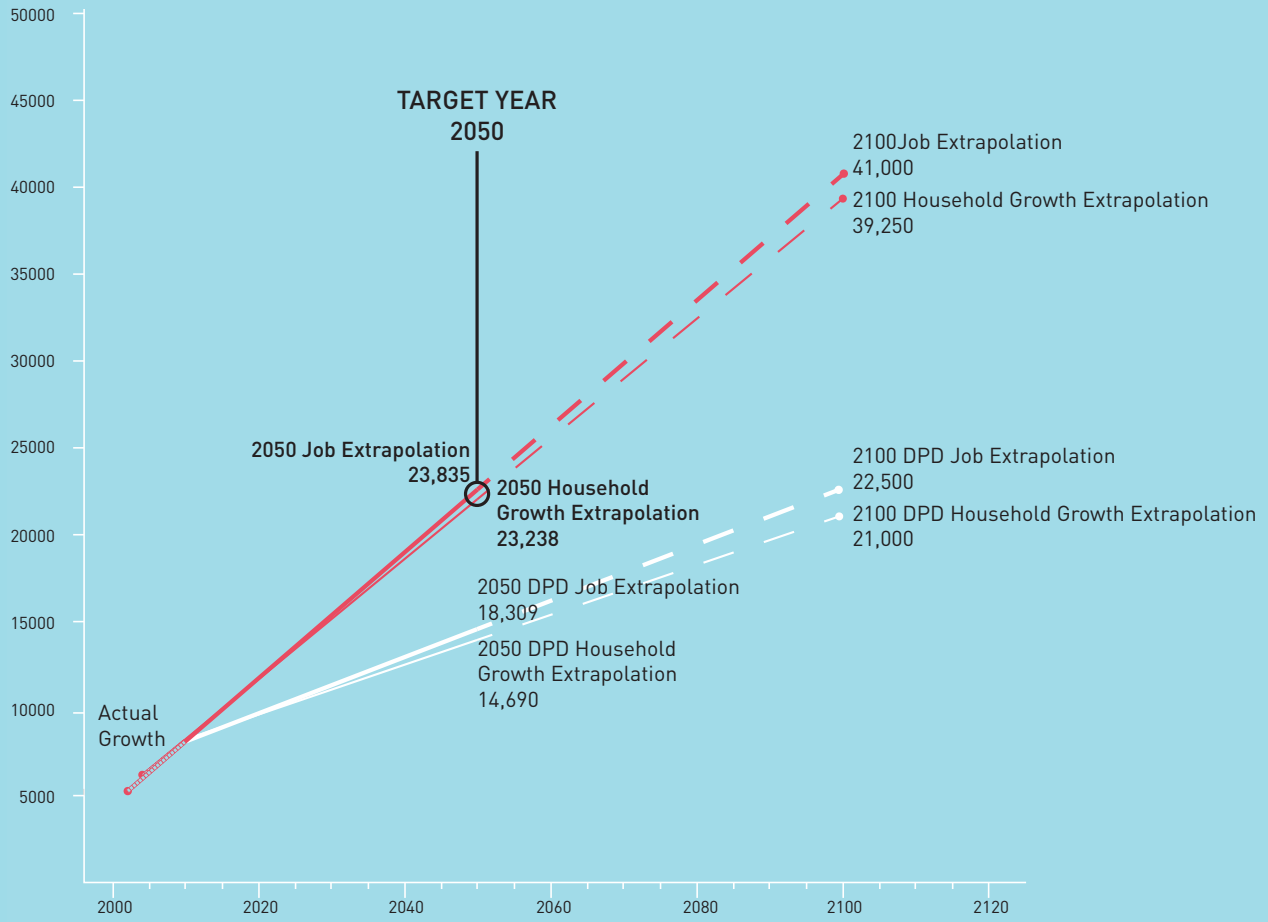


FIGURE 33 University District 2050 Growth Extrapolation



**FIGURE 34** 2050 Extrapolation Housing and Job Goals

# 3 DETERMINE TRANSIT INFRASTRUCTURE



FIGURE 35 Aerial of the University District



## 4 IDENTIFY BUILDING TYPOLOGIES + DEVELOP HYBRID PROTOTYPES



Typical global building typologies were selected as building types to design the final hybrid building to be used in the 2050 masterplan.

These typical building typologies must fit within the blocks of the University District, which typically measure 500 feet in the north-south direction and 250 feet in the east-west direction and predominantly have an alley in the middle. The highest concentration of buildings must be within the 5-minute walking diamond of the University District Light Rail Station.

**FIGURE 37** Conceptual Site Section



## ASSUMPTIONS

HOUSING - 850 SQ FT / UNIT

JOBS - 350 SQ FT / PERSON

OFFICE FLOOR TO FLOOR - 14'

HOUSING FLOOR TO FLOOR - 10'

HOUSEHOLD - 2.5 PEOPLE

FLOORS  
**20**

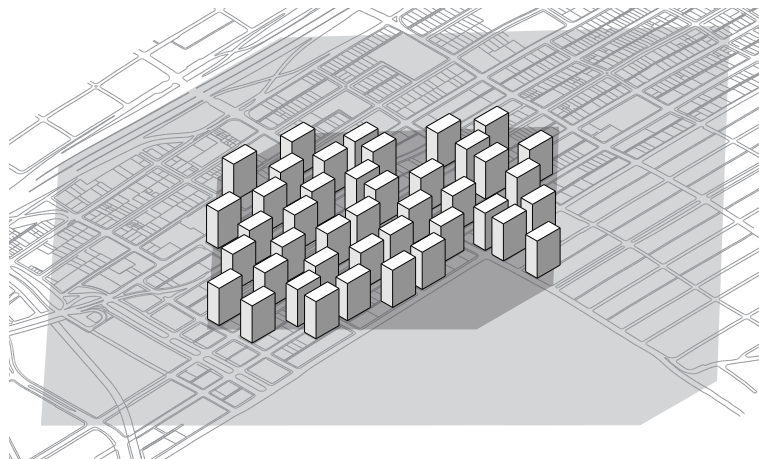
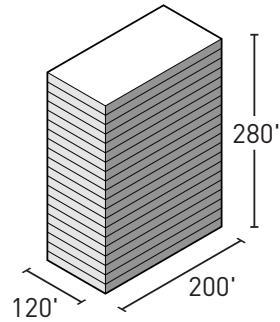
FLOOR AREA/BUILDING  
**480,000**

JOBS/BUILDING  
**1371**

JOBS WITHIN 1/4 MILE  
**57,582**

HOUSING/BUILDING  
**564**

HOUSING WITHIN 1/4 MILE  
**23,717**



## Typical American Office

A typical rectangular downtown American office building often measures 120 by 200 feet. Common throughout the United States, these buildings are built of concrete or steel and have 40 foot wide flexible open office spaces on both sides with a central core. The typical leasable floor area is 20,000 square feet, 19,200 square feet (deducting core). The structural frame is fairly shallow to ensure maximum height with a floor-to-floor height of 13 to 14 feet. The ground floor is taller to provide space for lobby, retail, and delivery/service.

Although American office buildings now take on a variety of shapes, the basic rectangular form is used here as a repetitive prototype to explore how a series of such buildings might accommodate projected employment growth in the University District.

**FIGURE 38** 100' x 200' Typical American Office Building

## Typical European Office

Recent European office buildings, and American buildings seeking to increase the use of daylight and natural ventilation are being constructed with a narrower width than the 120-foot wide American prototype. In the version explored here, the full width of the floor plate is only 60 feet, allowing daylight penetration deeper into the leasable office space. Because of the slenderness of this prototype, the floor area of each floor is 12,000 square feet. As a result, many more buildings of this type of building would be needed to accommodate projected employment growth in the University District. As shown in the diagram, 80 of these buildings can be constructed within a 5-minute walking distance of the Sound Transit light rail station.

FLOORS  
**20**

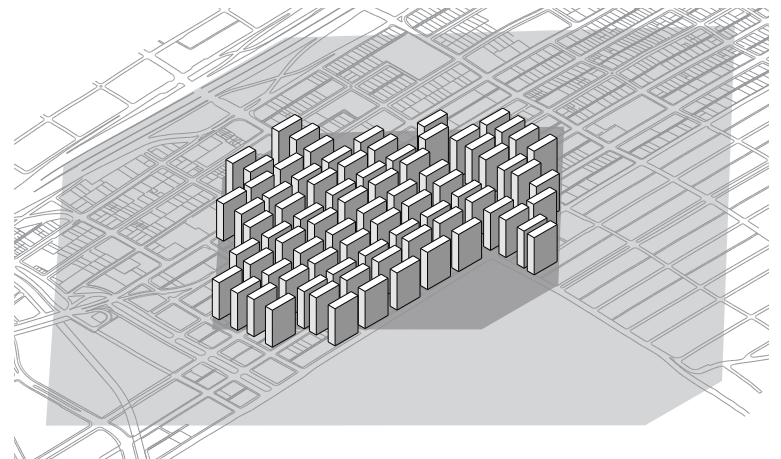
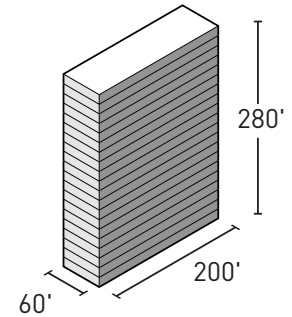
FLOOR AREA/BUILDING  
**240,000**

JOBS/BUILDING  
**686**

JOBS WITHIN 1/4 MILE  
**56,229**

HOUSING/BUILDING  
**282**

HOUSING WITHIN 1/4 MILE  
**23,124**



**FIGURE 39** 60' x 200' Typical European Office Building

FLOORS

6

FLOOR AREA/BUILDING

VARIES

JOBS/BUILDING

VARIES

JOBS WITHIN 1/4 MILE

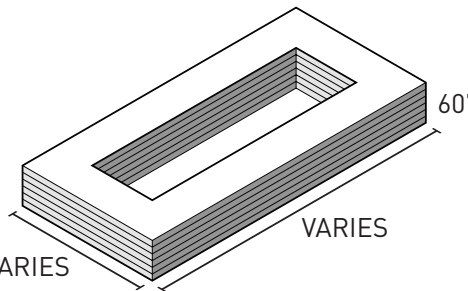
23,099

HOUSING/BUILDING

VARIES

HOUSING WITHIN 1/4 MILE

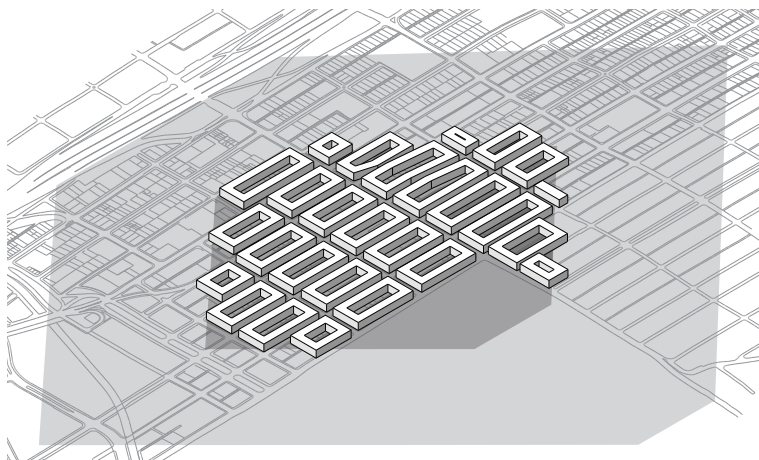
23,100



## Five-Over-One

One of the typical forms of multi-family residential construction found throughout Seattle is the five-over-one building that integrates a concrete ground floor with up to five floors of wood frame construction above. The ground floor is commercial retail space to activate the adjacent sidewalk space with parking and services typically provided underground.

This common low-rise residential building is called the “perimeter block” where the building adjoins the sidewalk on four sides of a block and encloses an outdoor space in the center. This outdoor space can be a shared private or semi-private courtyard or can even be divided into private garden spaces. The perimeter block form is found throughout the world in cities like Berlin and Barcelona.



**FIGURE 40** 5/1 Typical Seattle Five-Over-One Housing Block

## Housing Tower

Common throughout Europe and Asia, but somewhat less common in Seattle are residential towers. In residential towers the individual residential units are arrayed around a central core. Because these buildings exceed six stories in height, the Seattle building code requires the use of steel or concrete construction; concrete is commonly used as it allows a slightly smaller floor-to-floor height. Although narrow housing slabs are possible, the prototype shown here is a square tower. Given the relative slenderness of these residential towers, the number of units per floor is low, so many more buildings of this type would be needed to accommodate the growth in residential population in the University District.

FLOORS

**30**

FLOOR AREA/BUILDING

**216,750**

JOBS/BUILDING

**619**

JOBS WITHIN 1/4 MILE

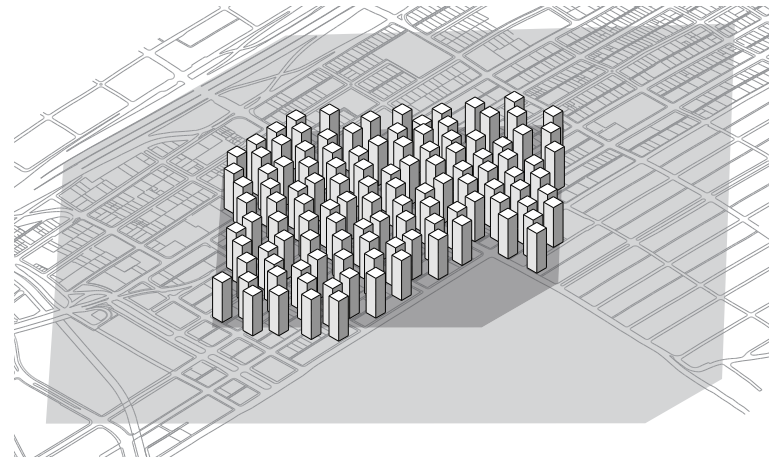
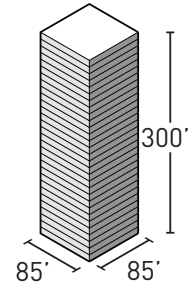
**60,043**

HOUSING/BUILDING

**255**

HOUSING WITHIN 1/4 MILE

**24,735**



**FIGURE 41** Typical Housing Tower

FLOORS  
**VARIABLES**

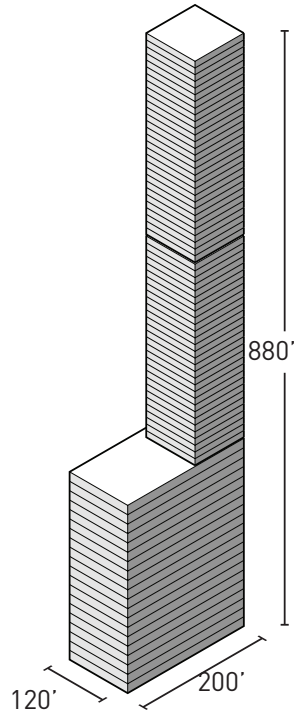
FLOOR AREA/BUILDING  
**913,500**

JOB/BUILDING  
**2,610**

JOB WITHIN 1/4 MILE  
**25,317**

HOUSING/BUILDING  
**1074**

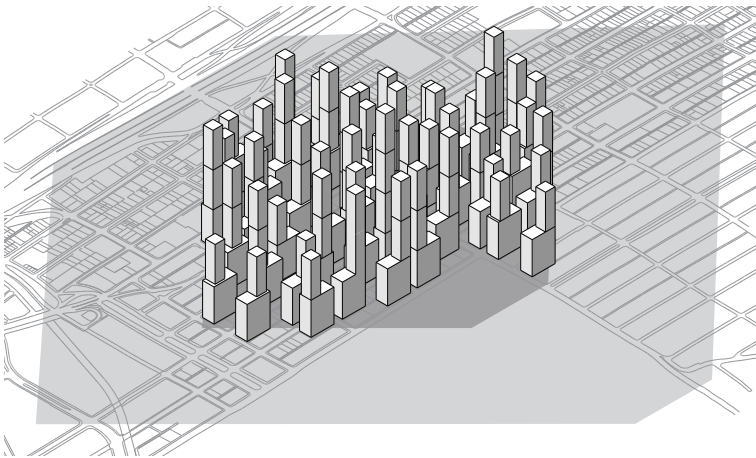
HOUSING WITHIN 1/4 MILE  
**10,417**



## Hybrid Building Typology 1

This hybrid integrates the first office typology with the prototype housing tower typology. The office building forms the podium which, in turn, supports a housing tower. Separate elevators would be needed for the housing and office floors to maintain privacy and security.

As applied to the area within a 5-minute walking distance of the University District light rail station (as shown in Figure 42), this hybrid can accommodate all the projected growth in both employment and housing for 2050.



**FIGURE 42** Hybrid Typology 1

## Hybrid Building Typology 2

This typology applies the second office typology on top of the low-rise residential type (based on the 5/1 building form, although this could not be constructed of wood). Because of its narrow office floor plate, this office typology dimensions can be also provide space for double-loaded corridor multi-family housing.

The podium needs to be adjusted to accommodate the towers above. As shown in this hybrid, the podium has both a 100 foot wide floorplate on one side and a 60 foot wide floorplate on the other to support a mix of both traditional offices and contemporary laboratories or other types of office workspaces (like co-working). The ground floor is leasable retail space and office and residential lobbies. The courtyard can be accessed midblock on all four sides of the block.

FLOORS  
**VARIES**

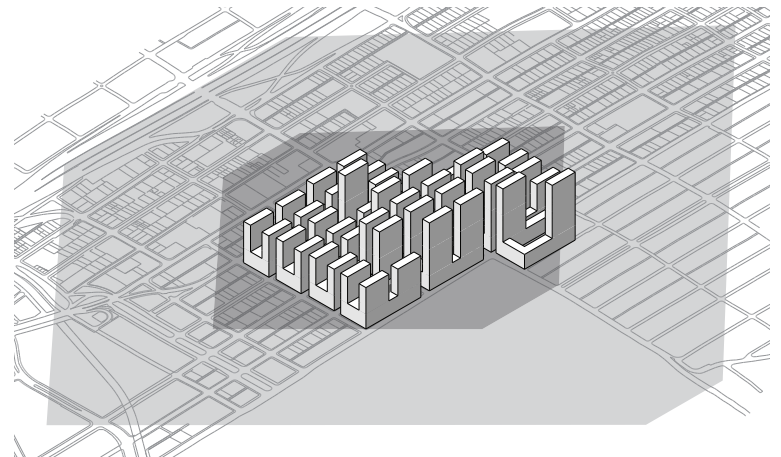
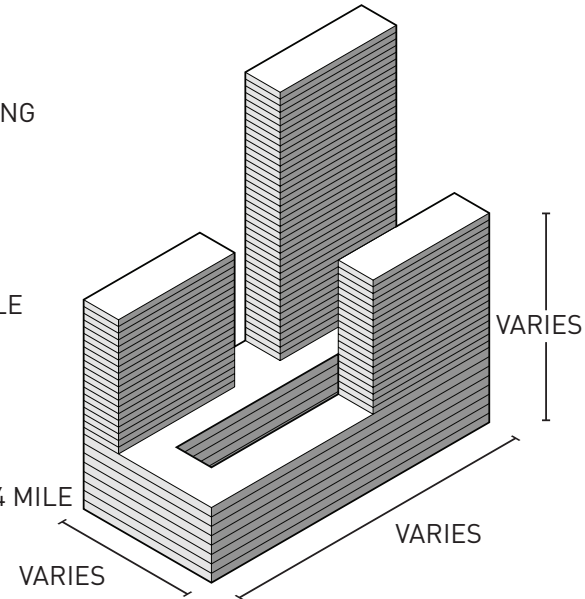
FLOOR AREA/BUILDING  
**1,403,350**

JOBS/BUILDING  
**4,009**

JOBS WITHIN 1/4 MILE  
**39,719**

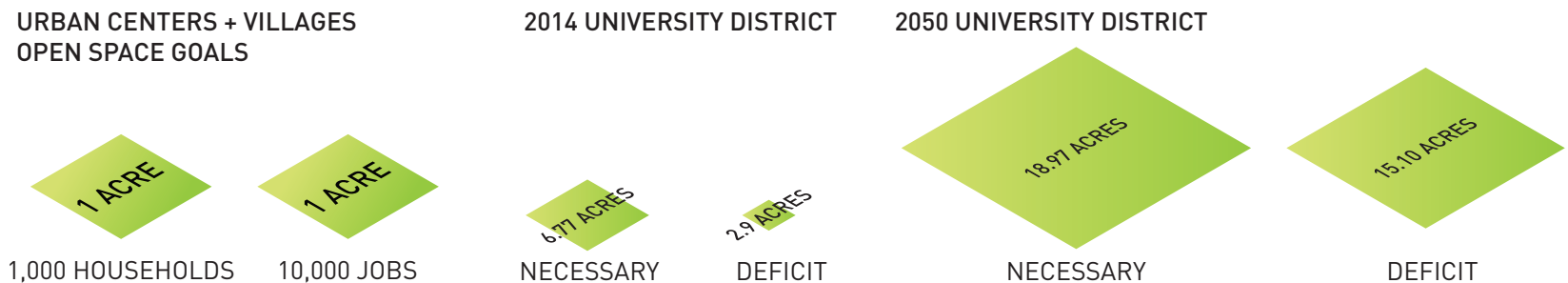
HOUSING/BUILDING  
**1,651**

HOUSING WITHIN 1/4 MILE  
**16,376**



**FIGURE 43** Hybrid Typology 2

Hybrid Building Typology 2 was selected as the typical building for the 2050 masterplan, but requires adjustment to provide needed public open space.

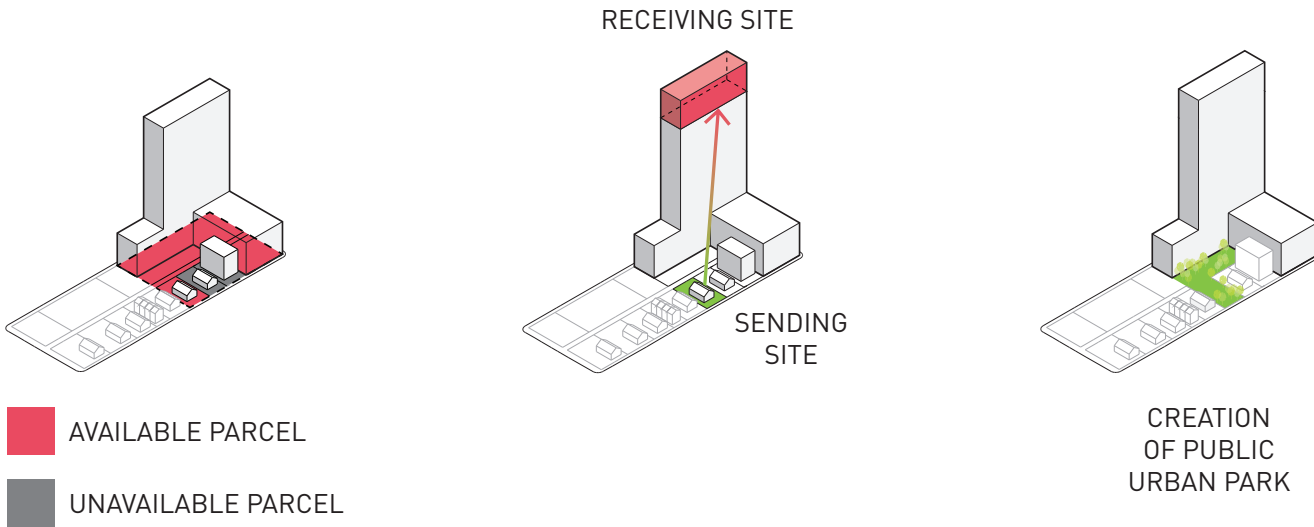


Seattle has a goal for the amount of public open space in Urban Villages and Centers. For every 1,000 households and 10,000 jobs there must be 1 acre of public open space.

The University District in 2014, is currently at a deficit of 2.9 acres. The 2050 extrapolated

growth targets drastically increase the number of residents and workers in the University District. By 2050, the University District will have a 15.10 acres open space deficit. The masterplan and the building design must address the open space deficit in the University District. Hybrid Building

**FIGURE 44** University District Open Space Needs



Typology 2 is a full block building scheme, therefore greenspace has to be integrated at ground (where available) and within and on the buildings themselves.



















Often, full block buildings are not built because of the difficulty assembling adjacent parcels. A

Transfer of Development Rights (TDR) can be implemented to help mitigate this by transferring additional building height from bought, but not adjacent parcels, which in turn must be turned into public street level urban parks.

**FIGURE 45** Transfer of Development Rights

## 5 EXCLUDE PARCELS FOR TARGET YEAR

Automatically excluded from 2050 development are parcels owned by the UW, organizations (e.g. churches), and landmarks. Everything else - parking lots, private homes, and other public buildings - are considered available for future development.

 OFFICE	 TRANS/UTIL/COMM
 RETAIL/SERVICE	 INSTITUTIONS
 HOTEL/MOTEL	 OPEN SPACE
 MIXED USE	 PARKING
 MULTI-FAMILY	 PUBLIC FACILITIES
 SINGLE-FAMILY	 SCHOOLS
 DUPLEX/TRIPLEX	 UNAVAILABLE OR UNKNOWN
 OTHER HOUSING	 VACANT
 ENTERTAINMENT	 INDUSTRIAL/WAREHOUSE

Source: Seattle DPD

The 2050 Excluded Parcels Plan is used as a device to determine available parcels for the target year. Available sites located close to the transit station (within a 5 minute walk) are most

valuable and most likely to be developed in the future. In order to create and foster a dense urban neighborhood, land must be available to build vertically.

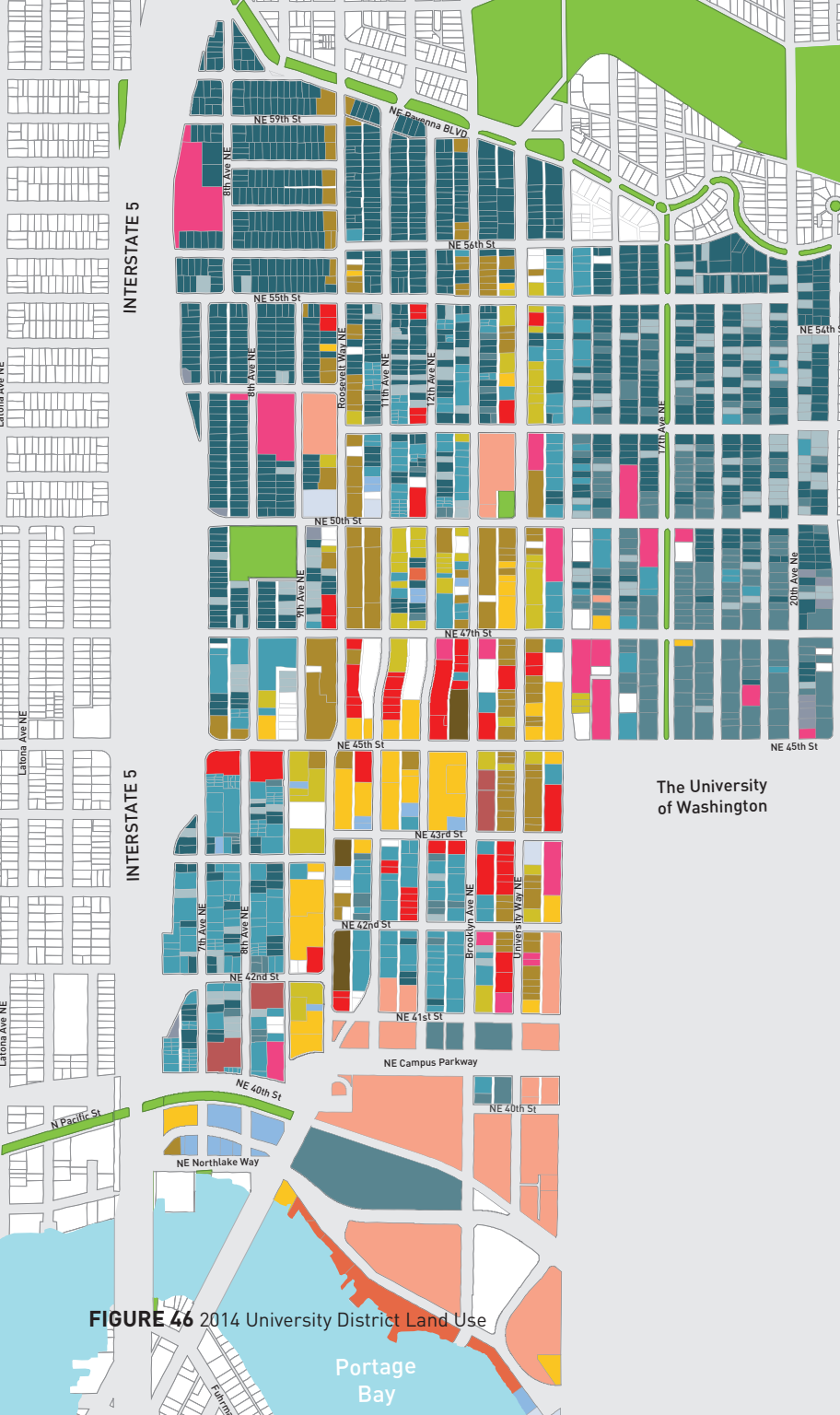


FIGURE 46 2014 University District Land Use

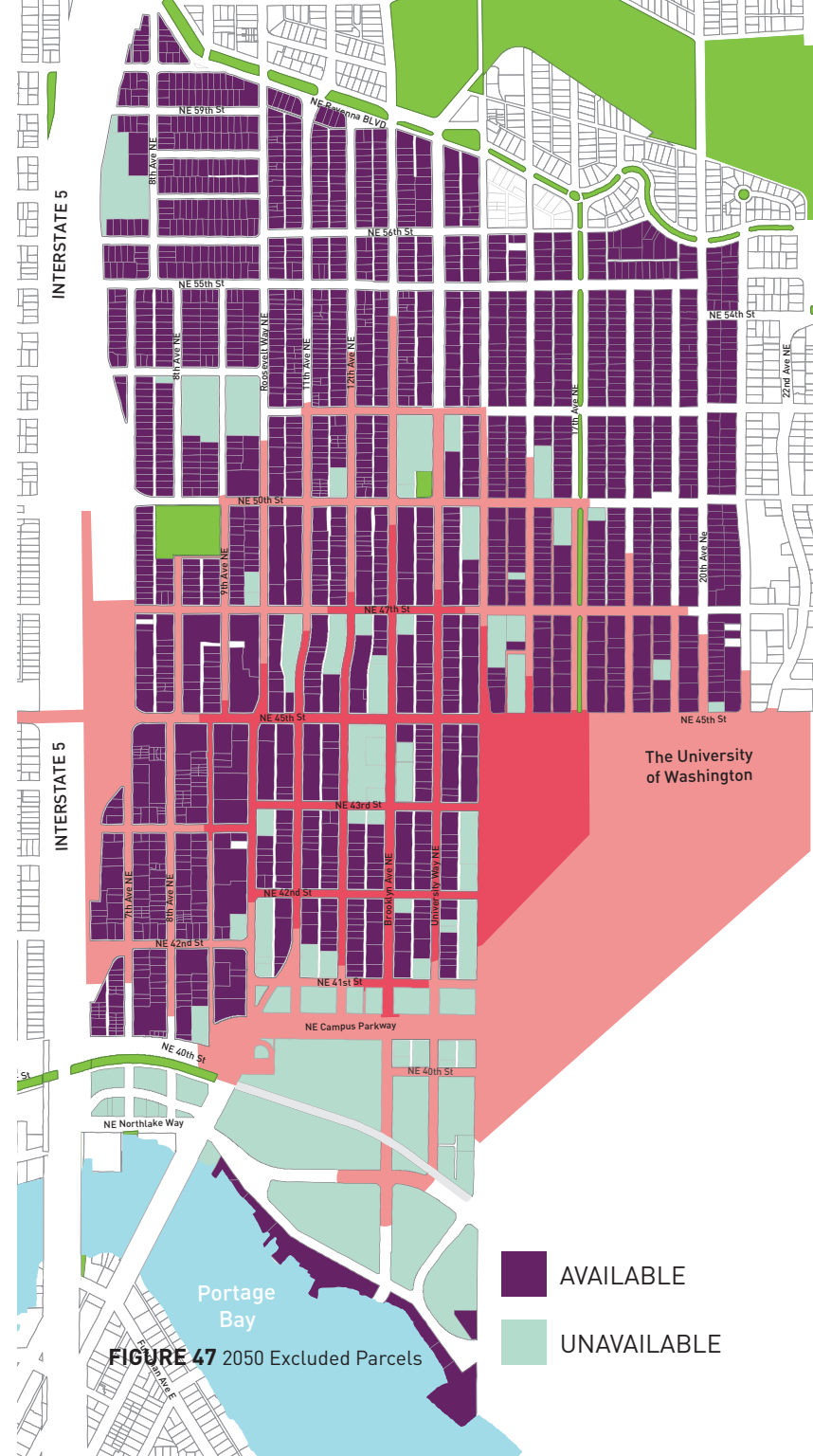


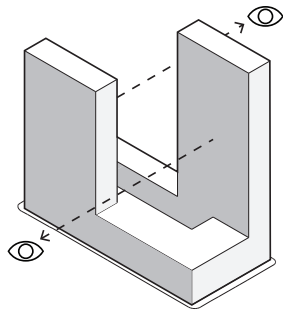
FIGURE 47 2050 Excluded Parcels

- AVAILABLE
- UNAVAILABLE

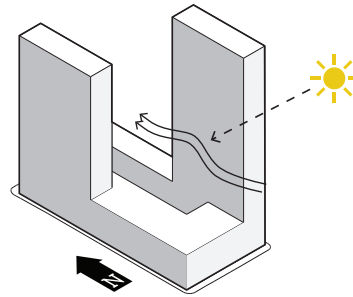
## 6 CREATE MASTERPLAN

## 7 CHECK TARGET AGAINST MASTERPLAN

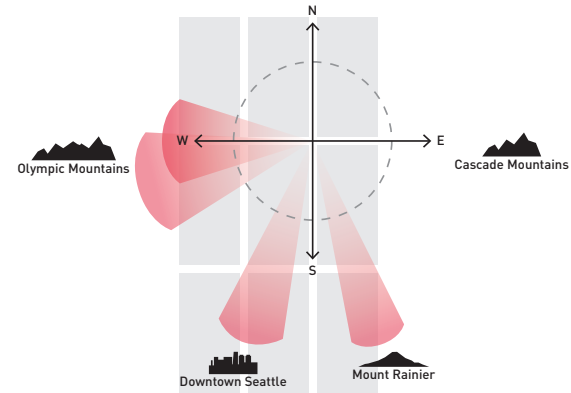
## 8 REPEAT STEPS 6 + 7



**FIGURE 48** Double Loaded Corridors



**FIGURE 49** Staggered Towers



**FIGURE 50** Maintain View Corridors

Double loaded apartment corridors ensure eyes on the street and courtyard space. Staggering towers in the north-south direction allows light and air between the towers. The residential towers will have great views given the building heights the masterplan proposes and the University District's relative height in relation to its surroundings.

Given potential market forces during the years before the 2050, the masterplan has a sequential 30% and 60% buildout.





FIGURE 53 2050 Masterplan - 100% Buildout

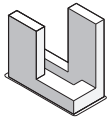
**2050 EXTRAPOLATED  
GROWTH TARGET**



**2050 MASTERPLAN**



The 2050 Masterplan integrates Hybrid Building Typology 2 and satisfies the extrapolated housing and office targets for 2050.

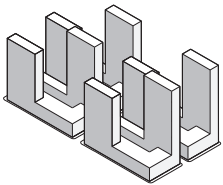


**ONE HYBRID BUILDING**

1058 HOUSING UNITS (850 SQ FT EACH)  
960 JOBS (350 SQ FT EACH)

900,000 SQ FT HOUSING  
84,000 SQ FT AMENITY SPACE (PODIUM TOP)  
336,000 SQ FT OFFICE  
29,483 SQ FT GROUND FLOOR RETAIL  
54,517 SQ FT GROUND FLOOR LOBBIES + CORE

**1,404,000 TOTAL SQ FT / HYBRID BUILDING**



**2050 MASTERPLAN**

NEED 19 HYBRID BUILDINGS TO MEET  
2050 EXTRAPOLATION

20,102 HOUSING UNITS (850 SQ FT EACH)  
18,240 JOBS (350 SQ FT EACH)

17,100,000 SQ FT HOUSING  
1,596,000 SQ FT AMENITY SPACE (PODIUM TOP)  
6,384,000 SQ FT OFFICE  
560,177 SQ FT GROUND FLOOR RETAIL  
1,035,823 SQ FT GROUND FLOOR LOBBIES + CORE

**26,676,000 TOTAL SQ FT**

**2050 Masterplan**

The highest building concentration is within the 1/4 mile walking diamond. Concentrating the highest density within the 1/4 mile walking diamond ensures that residents will be able to commute easily to and from other destinations in Seattle.

**FIGURE 54** 2050 Masterplan Housing and Job Targets

## 9 OVERLAY SITE DATA

Seattle's population skews towards people from their mid-twenties to the early 60s. In contrast, the University District is home to many young students.

### Demographics

More site-specific data is now integrated to generate a variety of residential unit types. The University District has a large student age population (18-29). In order to align the demographics of the University District more closely with Seattle's, this thesis proposes an annual 1% increase of people 18-29 and a 5% annual increase for all other age groups. Unit numbers are generated from this extrapolation.

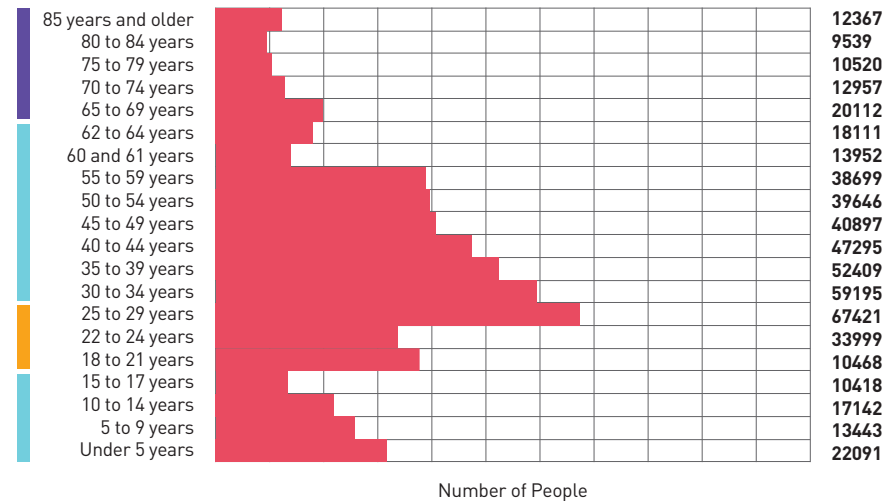


FIGURE 55 Seattle Age Demographics (2010)

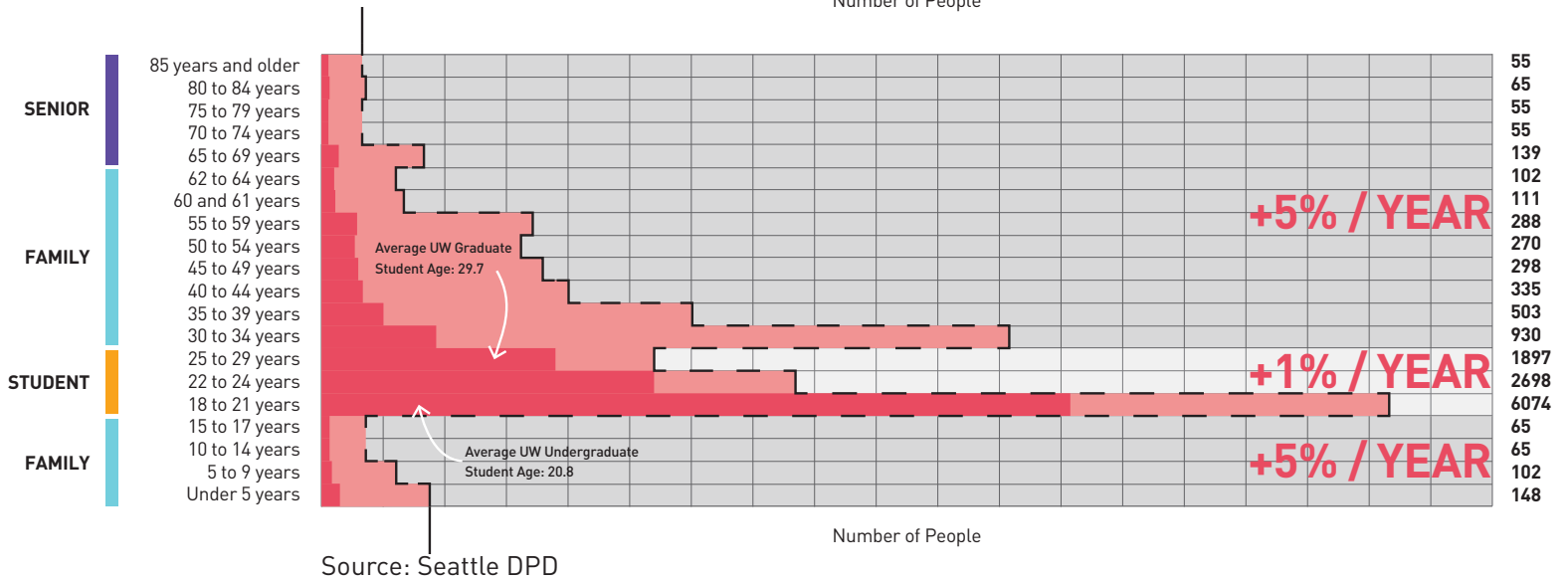
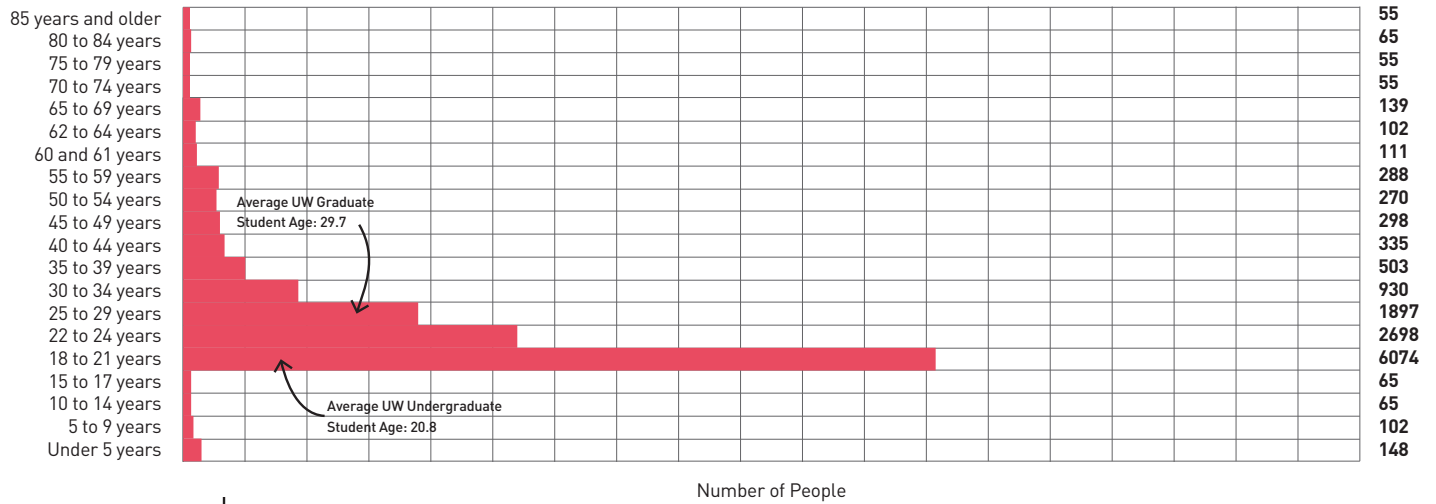


FIGURE 56 University District Age Demographics (2010)

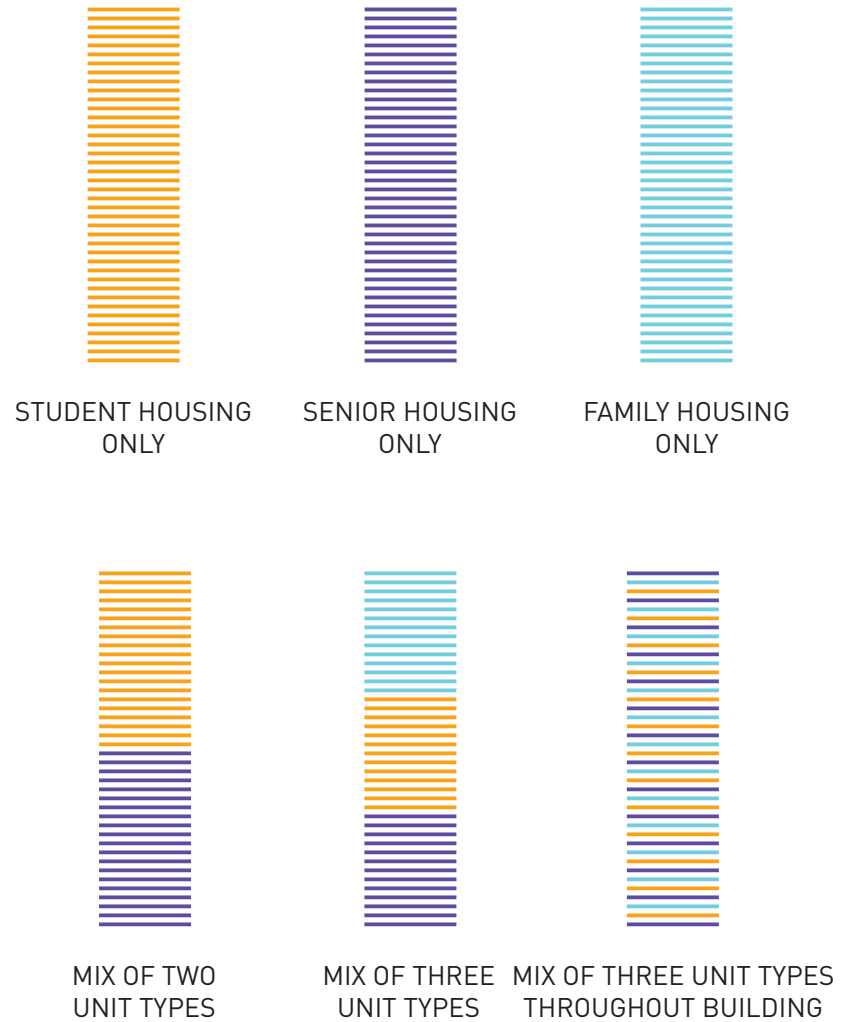
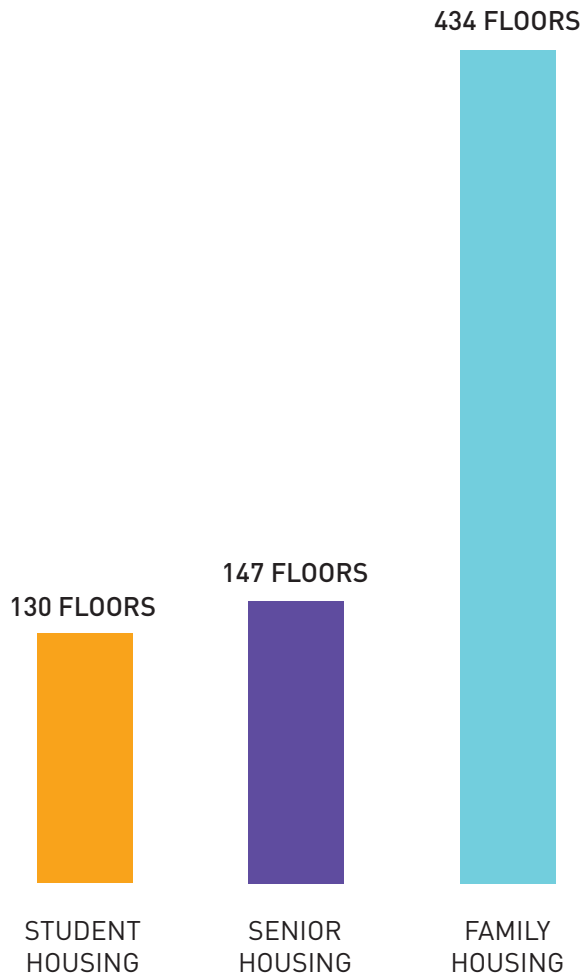
FIGURE 57 University District 2050 Extrapolated Age Demographics (Proposed)

The extrapolated demographic numbers provide the basis for the number of typical student, senior, and family housing floors necessary to meet the 2050 extrapolated growth target.

Three typical housing unit floors were developed for integration into the typical hybrid building: student, family, and senior. The typical housing unit floors can be stacked vertically as individual towers or as mixed-use floors (Figures 58 + 59). This suggests buildings that are single use housing types or mixed.

Program adjacencies were determined through

an analysis of green space types like sky gardens, traditional parks, vertical farms, or podium top green gardens (Figure 60). Amenity spaces like lounges, gyms, daycares, and playgrounds were also examined. Overlap in amenity spaces begins to inform the sectional organization of the building and suggests how program can be arranged vertically in the building.



**FIGURE 58** Number of Typical Floors Necessary to Meet 2050 Goal

**FIGURE 59** Possible Floor Configurations

HOUSING

RETAIL

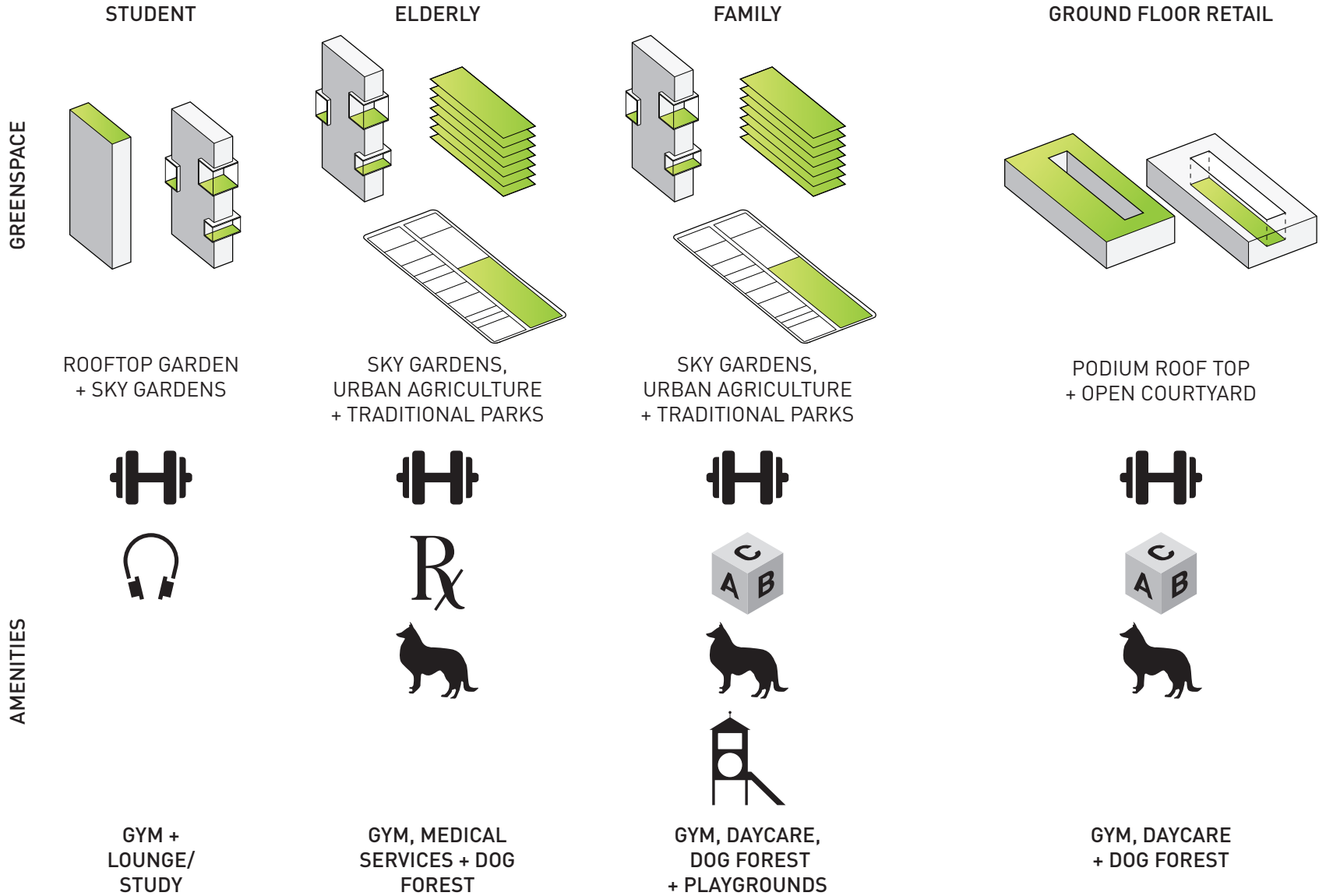
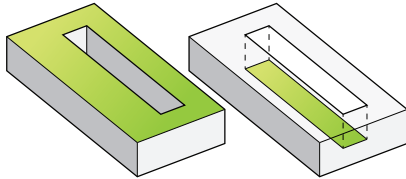


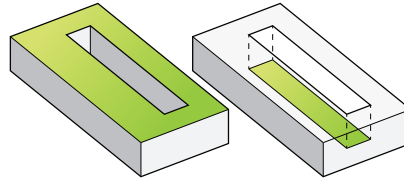
FIGURE 60 Greenspace + Program Adjacencies

OFFICE

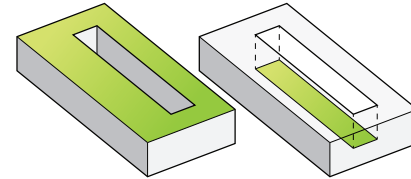
OFFICE  
(TRADITIONAL)



OFFICE  
(MODERN)



OFFICE  
(LABS)



PODIUM ROOF TOP  
+ OPEN COURTYARD



GYM + DAYCARE

PODIUM ROOF TOP  
+ OPEN COURTYARD



GYM, DAYCARE  
+ DOG FOREST

PODIUM ROOF TOP  
+ OPEN COURTYARD



GYM, DAYCARE  
+ DOG FOREST

## 10 SELECT SITE + DESIGN

The building is a product of the data. The site was chosen because of its potential for growth. The building types was determined by extrapolating population statistics. The variety of office types, residential units, and program adjacencies is driven by site demographics.

It is now possible to design a building.



**FIGURE 61** Section through the University District



The building site is located directly adjacent to the University District Light Rail Station and requires the most intense development to create a dense, walkable urban community.



FIGURE 62 Site Plan



**FIGURE 63** Ground Level Rendering

- GREENSPACE
- STUDENT
- SENIOR
- FAMILY
- OFFICE
- LAB
- AMENITY
- RETAIL



**FIGURE 64** Site Section

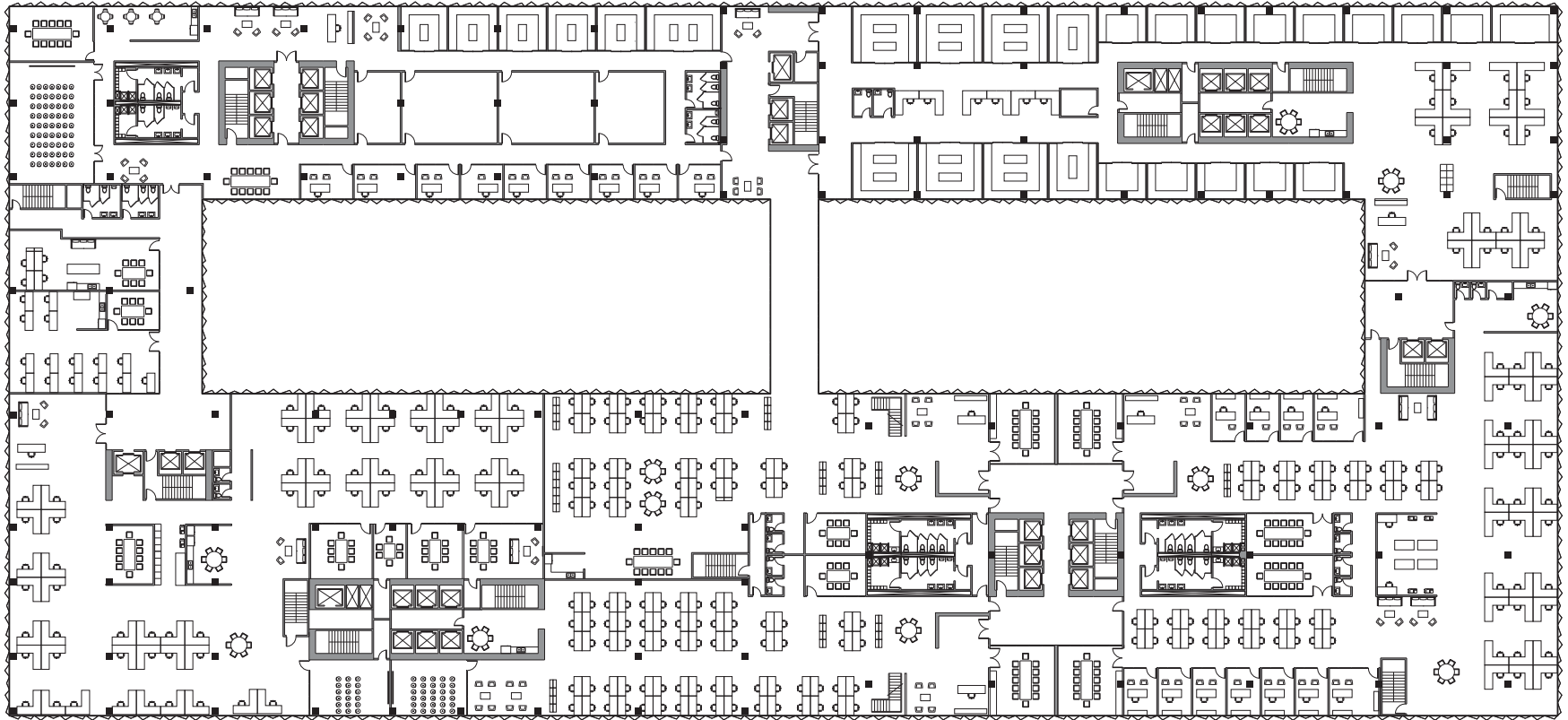
0 20'



**FIGURE 65** Ground Floor Plan

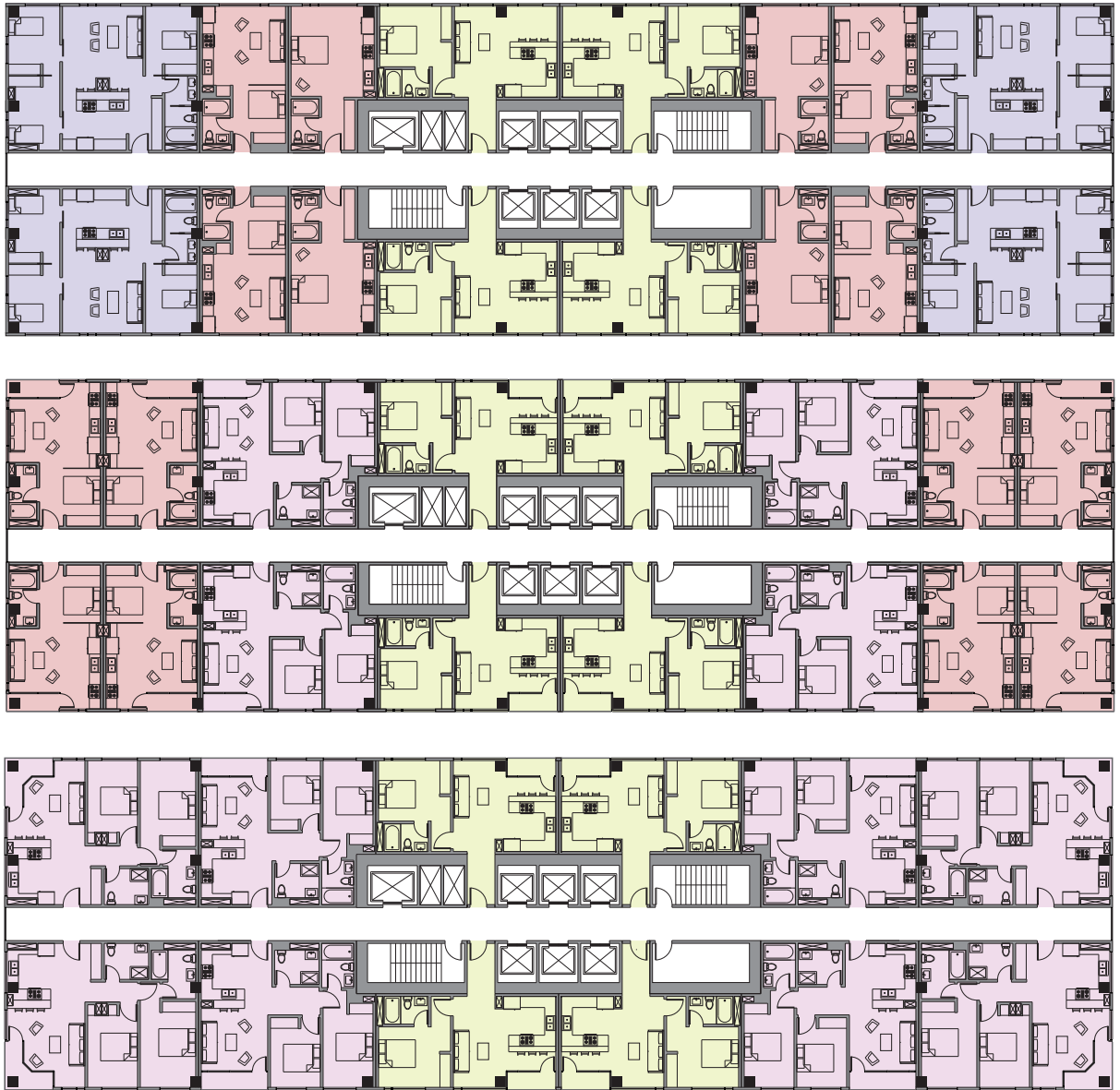
0 20' ← N





**FIGURE 66** Typical Office Floor

0 20'



**FIGURE 67** Typical Student Floor

**FIGURE 68** Typical Senior Floor

**FIGURE 69** Typical Family Floor

0 20'

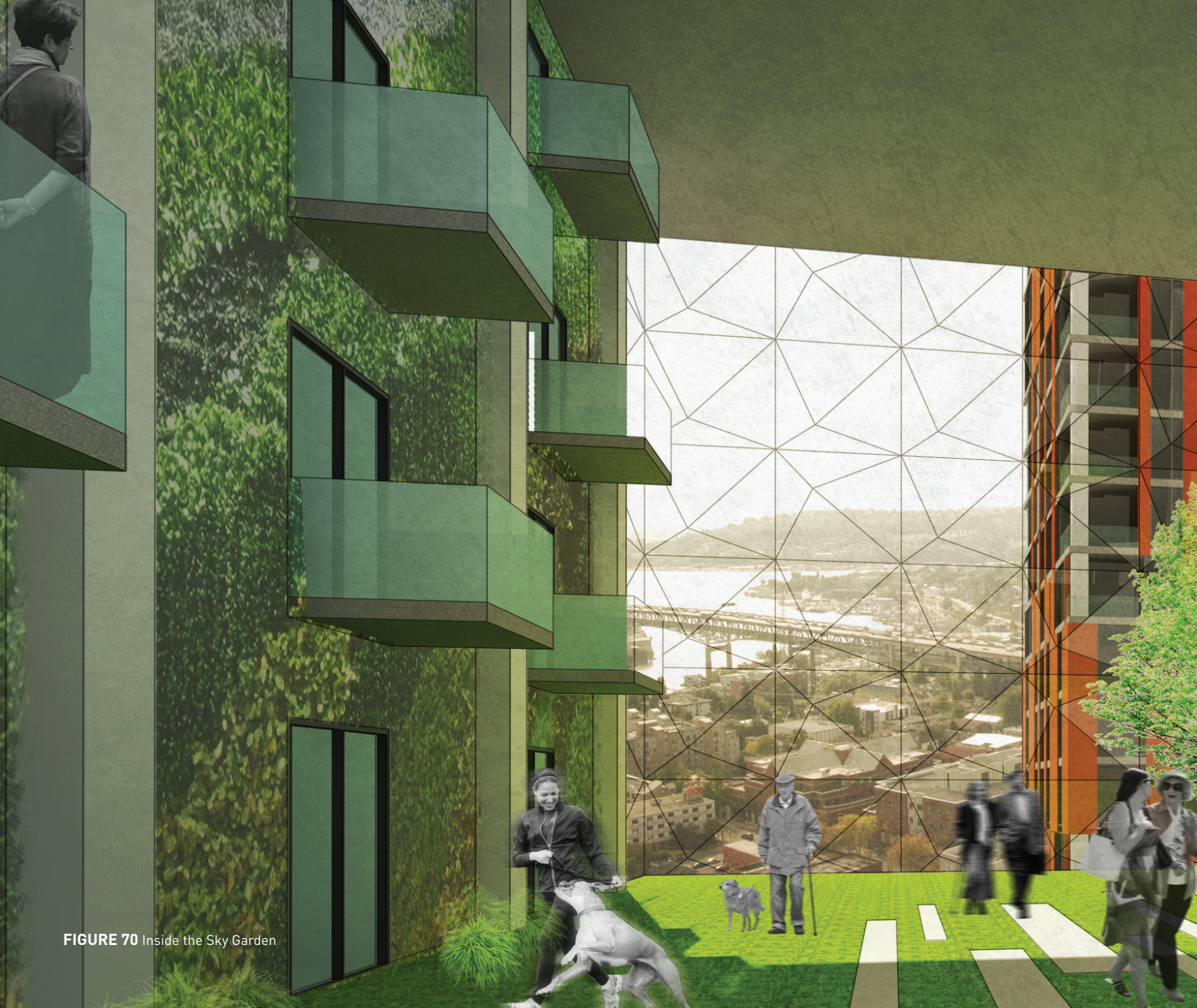


FIGURE 70 Inside the Sky Garden





**FIGURE 71** In the Interior Courtyard

## Conclusion: A Way Forward

### The Future of Data

Data is neither entirely anonymous nor entirely objective. It is a product of its time, changing from one minute to the next. We can capture and analyze more data than ever. As designers become increasingly aware of the immense potential of data, we can harness it to develop new approaches to solve future challenges.

However, our knowledge of useful data is also evolving. We must mine data from untraditional sources and use the data in unconventional ways. This will allow for flexibility of process, intent, and result.

One dataset invariably affects others. We must be aware of the character of data, its fallacies,

strengths and shortcomings.

The grand challenges of the twenty-first century may not find answers in data. However, this quest is a worthwhile one. With the ability to predict, data illuminates a future with faint construction lines already in place. Have we become prisoners to the actions of our past?

This thesis ends with the hope that architects and designers will begin to more effectively use data about our cities to transform them into livable environments despite their projected growth. The ability to do more, do new, and do better are now all possibilities with data.

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Somewhere, something  
incredible is waiting to be  
known.

- CARL SAGAN

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# Acknowledgements

Gundula Proksch

for devotion and support for this thesis and for always telling me to be radical.

Jeffrey Karl Ochsner

for pushing clarity in design, presentation, and especially writing.

Rick Mohler

for being an active listener and telling the truth.

Louisa Iarocci

for initial conversations about data and for always taking an interest in anything a student brings into your office.

My classmates

for being constant sources of inspiration.

My family

for love, support and always saying yes.

