



Destination: Tigard Transit-Oriented Development and Urban Design Strategies

Spring 2018

ARCH 584 • Sustainable Urbanism Design Studio

ARCH 407/507 • Sustainable Urbanism Seminar

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Acknowledgments

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We would also like to thank all of the design professionals and stakeholders who attended design reviews and critiqued student work. Their assessments and observations were extremely helpful in better understanding the project and its constraints. We appreciate their time and feedback.

The students of this course would like to acknowledge the instructors of the studio for all of their time and efforts toward the course. Nico Larco, Kate Brooks, and Shannon Simms were excellent resources, bringing different perspectives and areas of expertise to the urban design process.

About SCI

The Sustainable Cities Initiative (SCI) is a cross-disciplinary organization at the University of Oregon that promotes education, service, public outreach, and research on the design and development of sustainable cities. We are redefining higher education for the public good and catalyzing community change toward sustainability. Our work addresses sustainability at multiple scales and emerges from the conviction that creating the sustainable city cannot happen within any single discipline. SCI is grounded in cross-disciplinary engagement as the key strategy for improving community sustainability. Our work connects student energy, faculty experience, and community needs to produce innovative, tangible solutions for the creation of a sustainable society.

About SCYP

The Sustainable City Year Program (SCYP) is a year-long partnership between SCI and a partner in Oregon, in which students and faculty in courses from across the university collaborate with a public entity on sustainability and livability projects. SCYP faculty and students work in collaboration with staff from the partner agency through a variety of studio projects and service-learning courses to provide students with real world projects to investigate. Students bring energy, enthusiasm, and innovative approaches to difficult, persistent problems. SCYP's primary value derives from collaborations resulting in on-the-ground impact and expanded conversations for a community ready to transition to a more sustainable and livable future.

SCI Directors and Staff

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Nico Larco, SCI Co-Director, and Professor of Architecture, University of Oregon

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About TriMet

The Tri-County Metropolitan Transportation District of Oregon was created by the Oregon Legislature in 1969 to operate and oversee mass transit in the Portland Metropolitan region. This public entity was formed by the legislature as a municipal corporation to replace the multiple private interest mass transit companies that previously operated in Multnomah County, Clackamas County, and Washington County; the counties that make up TriMet.

In addition to operating bus lines, light rail, and paratransit in the defined Tri-Metropolitan district, TriMet also connects to external mass transit services to provide wider blanket coverage for the region. TriMet's nationally recognized transit system provides more than 100 million rides annually, and carries 45% of rush hour commuters going into the downtown Portland area. TriMet not only moves people, but helps build sustainable cities by improving public health creating vibrant, walkable communities; supporting economic growth; and working to enhance the region's livability.

Several civic leaders have been highlighted as key figures in the creation, establishment, and ultimate success of TriMet. Governor Tom McCall is credited with the initial call for the creation of the public corporation; other key contributors include Congressman Earl Blumenauer, Rick Gustafson, Dick Feeney, and Mayor Neil Goldschmidt. All were instrumental in shaping the organization itself, as well as the land use, civic development, and transformation policies that make TriMet the success that it is today.

The vision and efforts of these individuals and countless others have borne fruit. Recently, TriMet celebrated the second anniversary of the opening of its most recent light rail line. Since its inauguration the 7.3-mile MAX Orange Line has experienced continued growth, having a six percent year-to-year increase in ridership. Illustrating the holistic approach that has been a part of TriMet from its inception, there have been wider community benefits such as a positive impact on employment and a focus on sustainable practices such as bioswales, eco-roofs, a first-in-the-nation eco-track segment, solar paneling, and regenerative energy systems.

TriMet is a key partner in the region's Southwest Corridor Plan and Shared Investment Strategy. Eleven partner agencies are participating in planning for a new 12-mile light rail line in southwest Portland and southeast Washington County that will also include bicycle, pedestrian, and roadway projects to improve safety and access to light rail stations. Southwest Corridor stakeholders include Metro (the regional government), Washington County, Oregon Department of Transportation, and the cities of Beaverton, Durham, King City, Portland, Sherwood, Tigard, and Tualatin. This collaborative approach strives to align local, regional, and state policies and investments in the Corridor, and will implement and support adopted regional and local plans. These initiatives and outcomes from participation with the UO's Sustainable City Year Program will help develop ideas that are cost effective to build and operate, provide safe and convenient access, and achieve sustainability goals while supporting the corridor's projected growth in population and employment.

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This report represents original student work and recommendations prepared by students in the University of Oregon's Sustainable City Year Program for TriMet's Southwest Corridor project. Text and images contained in this report may not be used without permission from the University of Oregon.

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Executive Summary

Tigard, a suburb of Portland, Oregon, is interested in a new urban design vision as a new MAX light rail line is proposed to extend through the city. TriMet and the city of Tigard partnered with a University of Oregon graduate architecture seminar and design studio to envision a new plan and identity for the city. The city of Tigard sees this new transit line as an opportunity on many levels. Tigard aims to be the “most walkable city in the Pacific Northwest,” which could include a shift from its current identity as a transit line transfer point into a destination for visitors and commuters. With a new light rail line making travel to downtown Portland and surrounding suburbs easier, the city of Tigard sees opportunity for growth and development, and the potential to redefine some of its city goals.

Student teams of three to four members tackled these issues and presented proposals for a new town center in Tigard. Though each team proposed unique schemes, there are similar issues and goals. Some key focus areas include:

- Creating a public “place” and identity where the MAX light rail stops in Tigard
- Creating a connection to the existing town
- Celebrating Fanno Creek, a natural area and trail system located west of downtown
- Re-designing Hall Boulevard to become safer and more accessible for pedestrians
- Redefining the city grid and creating more manageable block sizes

The following proposals have various approaches to urban design and the future vision for the city of Tigard, but all make an effort toward sustainable urban design. Through effective street design, stormwater management, pedestrian-focused public spaces, mixed-use development strategies, and more, these proposals aim to develop Tigard into a place where people want to live, develop, and enjoy public spaces.

Introduction

This seminar and studio investigated contemporary trends and thinking about ‘Sustainable Urbanism’ and evaluated these trends in light of their applicability to current design and development projects. The class discussed the framework of sustainable urbanism, specific approaches and techniques of implementation, the barriers that limit implementation at a wider scale, and case studies and strategies for overcoming those barriers. TriMet and the city of Tigard provided a platform for students to apply these methods to urban design issues related to its new light rail line.

Background Information

The Site

The area of focus was not limited to hard boundaries, but rather a region surrounding the downtown district of Tigard. This area is roughly bound by the Fanno Creek trail to the west and Main Street to the northwest. Hunziker Street defines the northeast edge, and Wall Street and Red Rock Creek form a natural southeast barrier. Hall Boulevard splices the region as the major thoroughfare for vehicular traffic. The Westside Express Service line railroad tracks create an interesting challenge as the tracks form a barrier and limit access.

Methodology

This course was taught by Nico Larco, urban designer and professor of architecture at the University of Oregon; Kate Brooks, landscape architect at Walker Macy; and Shannon Simms, landscape architect at Mayer/Reed. The participants of the course are all first-year graduate architecture students at the University of Oregon. This project presented new challenges and learning opportunities for students of architecture working on urban design. Before tackling the project in Tigard, students were taken through preliminary design exercises in Portland's Gateway district and other public places in the city. Students learned techniques to analyze public space and understand what improves or inhibits good pedestrian-focused spaces. Having instructors with experience across multiple disciplines was crucial to gaining knowledge and exposure of urban design issues and developing well-rounded projects.

The process of rethinking Tigard began with a presentation of the background and current status of the project. The development plan for Tigard is part of a larger TriMet plan referred to as the Southwest Corridor project. Participants met at Tigard city hall to hear from Gary Pagenstecher, city planner for the city of Tigard, and Jeb Doran, project manager for TriMet. Students from Portland State University's planning and urban design workshop also attended, as they were working on the site from a planning perspective. Following the presentation, Jeb and Gary led a walking tour of downtown Tigard. Students left with a better understanding of the current feel and aesthetic of the area, photographs of existing conditions, and had their questions answered by project stakeholders (see Appendix A for the framework).

After learning the project parameters and seeing the site in person, students broke into teams of three to four and began initial design concepts. The beginning stages of design focused on ways to connect the existing city center with the new transit stop. Through iterations and constant feedback from instructors, teams settled on their overall scheme and dove into smaller-scale design decisions. Teams focused their design on streets and public spaces. Halfway through the course, teams presented their proposals to a group of professionals and Tigard stakeholders in a mid-term review. Students got feedback and suggestions from outside sources to improve the project moving forward.

Jeb and Gary actively participated in studio critiques and discussions throughout the term. They provided valuable project information and helped keep proposals within practical parameters. In turn, teams presented new ideas and brought new creative solutions to the table. The term culminated with a final presentation of proposals. Panels of design professionals and Tigard representatives reviewed teams; reviewers also attended the mid-term review. This report aims to compile all the student work and serve as a helpful tool and point of reference as the project moves forward.

Transportation and Accessibility

Currently, Tigard is a major public transit transfer point in the greater Portland area. The Tigard Transit Center is important to the area as it houses a park and ride and serves as a major hub for commuters by bus. The WES line, a heavy commuter rail, is also important to the area as it connects major Portland suburbs from Beaverton to Wilsonville. The following images show the network of transportation options in the Tigard area.

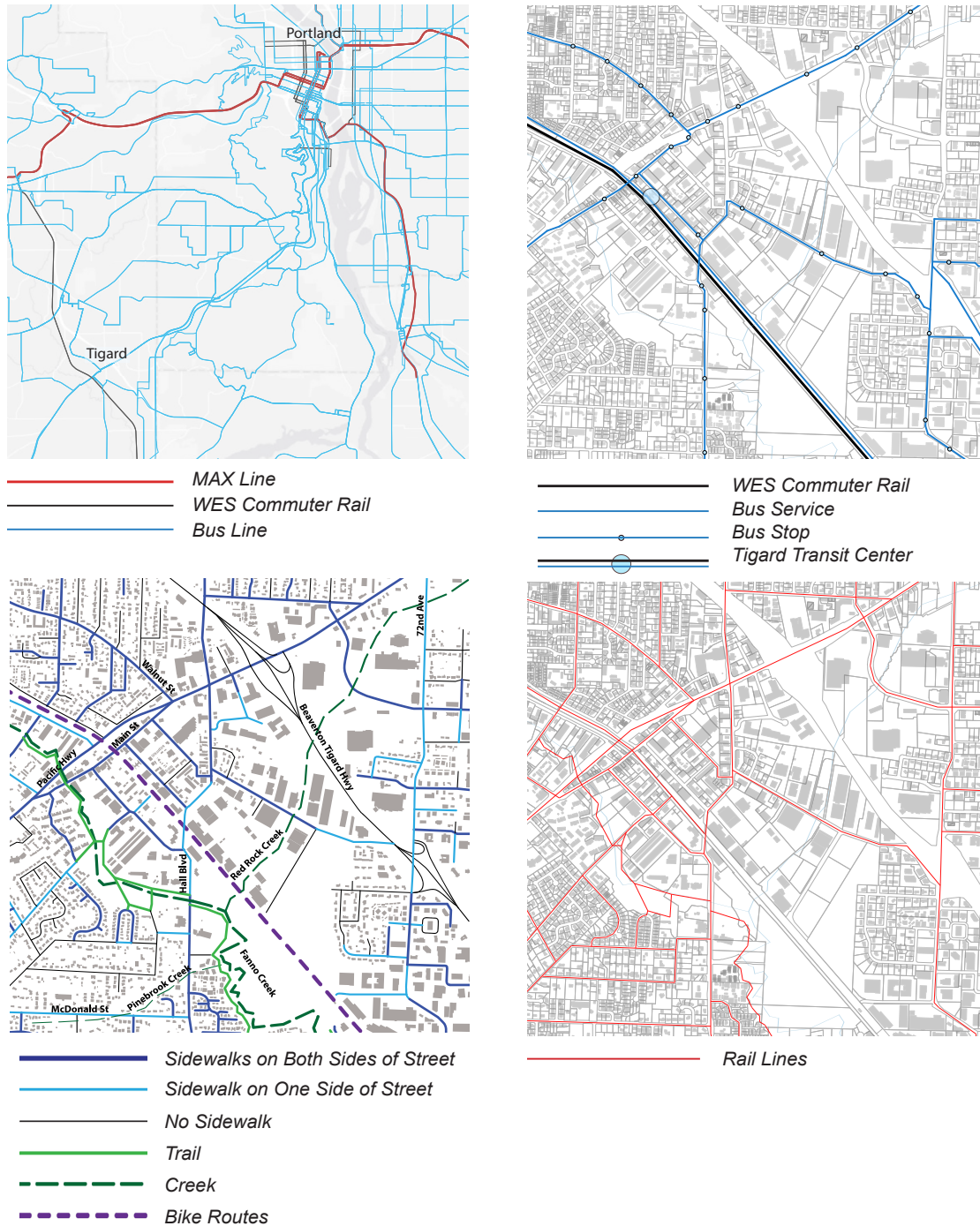


Figure 1: Mode context maps of Tigard

Existing Streetscapes

Main Street

Main Street is the hub of commercial activity in downtown Tigard. The city has invested in the streetscape along Main Street. The sidewalks are lined with trees and bioswales that provide shade and sustainably manage stormwater. Bulb-outs occur at crosswalks to facilitate a safe, comfortable pedestrian experience.

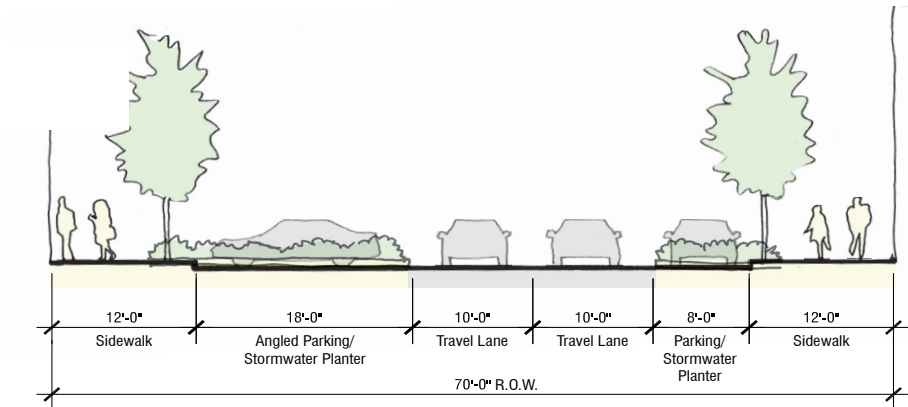


Figure 2: Section through Main Street



Figure 3: Plan of Main Street with buildings highlighted to understand the level of density



Figures 4, 5: Photos of Main Street as it exists today. Street trees, street parking, bulb-outs, and 1-2 story commercial buildings are all positive elements that are helping create a pedestrian-friendly streetscape

Burnham Street

Tigard has also recently made improvements to Burnham Street. Bulb-outs, various pavers, large bioswales, and new street lights have improved the walkability of the street. The city has made positive moves toward good street design, but the buildings along Burnham Street have extremely large setbacks, making the street-width-to-building-height ratio less than desirable. This leaves plenty of opportunity for development. Increasing density along Burnham Street could greatly improve the activity along the street.

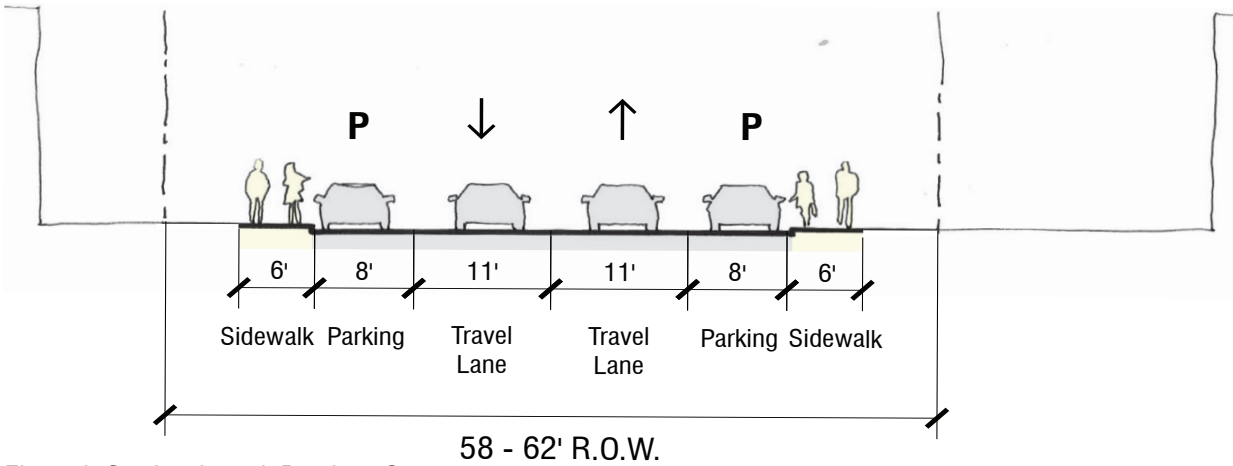


Figure 6: Section through Burnham Street

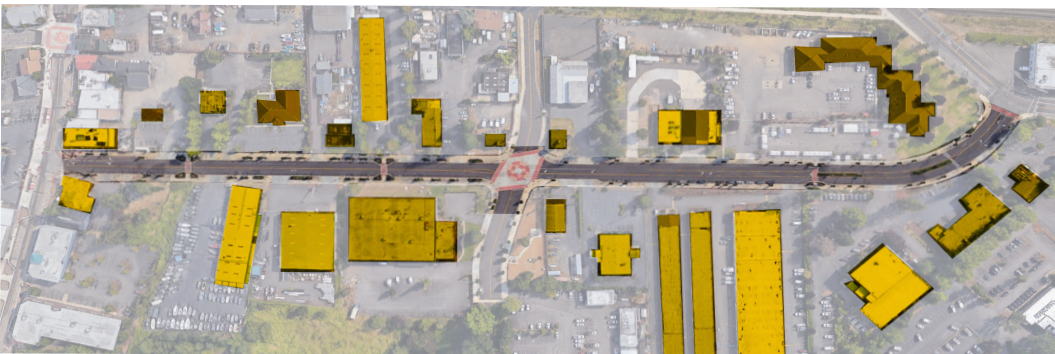


Figure 7: Site plan of Burnham Street with buildings highlighted to show lack of density and large setbacks



Figures 8, 9: Photos of the existing Burnham Street. With wide drive lanes and narrow sidewalks, this street prioritizes vehicular traffic over walking pedestrians

Commercial Street

Commercial Street runs parallel to Burnham Street but lacks its walkability and aesthetics. The sidewalks are narrow and there are few street elements that encourage motorists to drive slower. Buildings along Commercial Street have large setbacks and lack density. This street has great potential for development as it could become a major connector between Main Street and the new MAX light rail station.

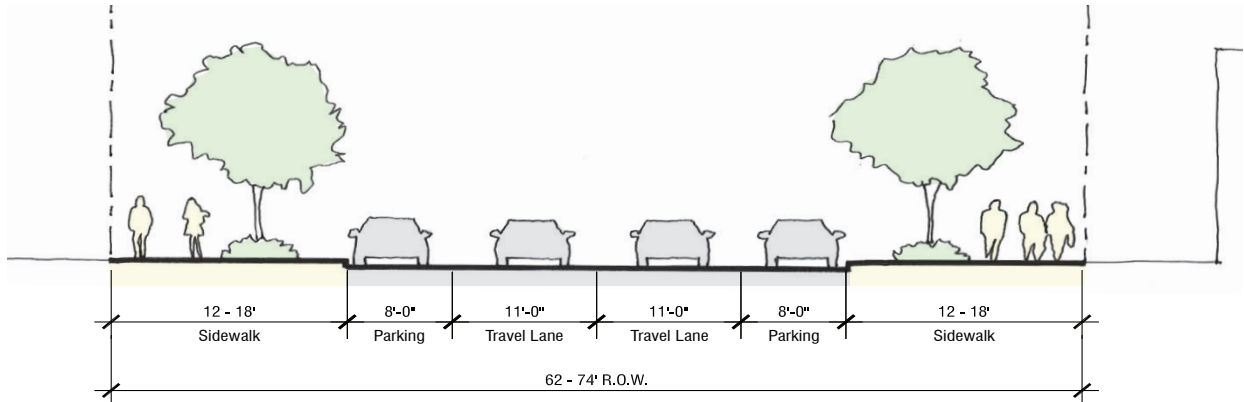


Figure 10: Section through Commercial Street



Figure 11: Plan of Commercial Street with buildings highlighted



Figures 12, 13: Photos of the current Commercial Street showing positive, sustainable street elements such as bulb-outs, well-marked pedestrian crossings, street parking, and plenty of vegetation

Hall Boulevard

Hall Boulevard is a major arterial for the city of Tigard. It runs generally north and south but jogs as it reaches the downtown district. As it exists today, Hall Boulevard is not a comfortable experience for pedestrians. The street could benefit from buffers between vehicular lanes and sidewalks. The buildings along Hall Boulevard are mostly industrial and have very large setbacks from the street edge. The right-of-way is large, which provides a great opportunity for sustainable street design and a public plaza when the new MAX station is implemented.

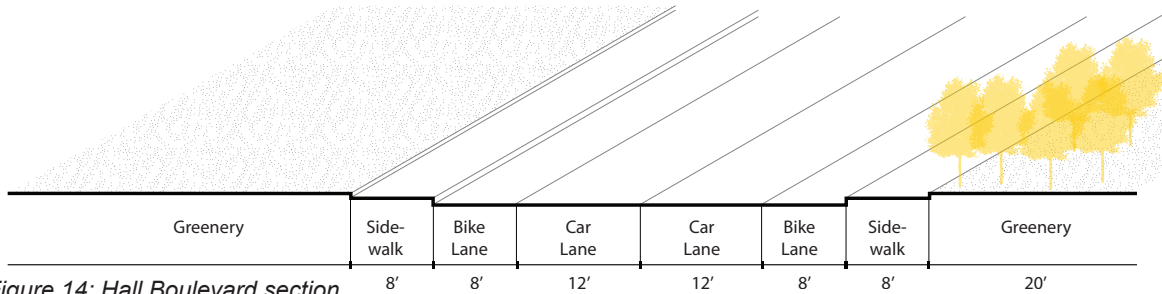


Figure 14: Hall Boulevard section



Figure 15: Site plan of Hall Boulevard



Figures 16, 17: Photos of the current Hall Boulevard

Design Proposals

The following pages explain each of the seven teams' urban design proposals. Though teams chose different drivers of design and development, all worked with the underlying goal of sustainability. Implementation of sustainable strategies happened at many scales. Initially, teams worked at "big-picture" master planning scale to understand how downtown Tigard fits within its regional context. After understanding what large-scale moves were to be made, students worked at a smaller scale, doing detailed design for selected public spaces.

Of the seven teams, four were given the MAX station location along Hall Boulevard and three were to assume the MAX station was located along Hunziker Street. TriMet and the city of Tigard have been exploring both options. Teams were assigned these different sites with the intent of identifying the pros and cons of each arrangement. Within the Hall Boulevard option, teams could decide whether to arrange the operations and maintenance facility (OMF) parallel or perpendicular to the MAX station. The orientation of the OMF is one of the challenges for TriMet and Tigard. Students also had the option to realign Hall Boulevard. As it exists today, Hall Boulevard jogs from SW Scoffins Street to SW Burnham Street. This causes Hall Boulevard to cross the Westside Express Service (WES) line tracks at an approximately 45 degree angle. According to TriMet, angled railroad crossings are much more dangerous and require more crossing infrastructure. Some teams propose to realign Hall Boulevard so that it becomes part of a city grid and reaches the railroad tracks perpendicularly.

Though there are many options and routes for teams to pursue, commonalities exist between schemes. Not all teams decided to realign Hall Boulevard, but all agreed that moves should be made to slow down traffic and increase pedestrian safety along the street. Teams chose to invest in different streets or blocks, but similar small-scale sustainable design elements appear among the proposals.

Ultimately, teams were encouraged to think big for the future of Tigard while keeping proposals within the realm of possibility. These proposals aim to show the many stakeholders of this project that sustainable urban design decisions across many scales could benefit the city of Tigard.

Proposal 1: Catalytic Parallel

Skyla Leavitt • Rachel Lozeau • Luke Ralston

To encourage the integration and success of the future Hall Boulevard MAX Station in the city of Tigard, this proposal implements a series of trails that will facilitate local and regional connections and act as catalysts for development. Tigard is currently a major transfer point for bus and WES riders, but the city seeks to become a destination with the introduction of a new MAX line. This scheme builds upon the identity of Tigard with the goals of walkability, green identity, amenity access, and a focus on two demographic groups: families and workers. Three trail types—regional, community, and neighborhood—and three oriented development zones—live, work, and play—are the bones of this scheme. The proposed hierarchical trail system is in response to the regional context of Tigard and the need for new connections in the existing trail framework. To demonstrate these goals, sustainable initiatives, and the results of critical analysis, we identified a major node from each zone in our scheme that integrates moments of the trail system and various programmatic elements. In conclusion, we propose green infrastructure as a means to drive development and further evolve the identity and character of Tigard and make the city a destination and economic contender in the Pacific Northwest.



Figures 18, 19: Photos from the current Tigard community and built environment are arranged in the form of an abstract map of the city. These activities come together in the parti diagram where significant districts are denoted by their zoning colors and connected by a trail system and transit line.

Areas of Focus:

Green Identity



Worker Ratio



Youth



Walkability



Amenity Access



Trail Guide

Walkability and active transportation methods have the power to affect development and create a sense of community. Active transport methods, such as trail systems, can stitch together metropolitan centers and create larger systems of connectivity. This proposal breaks down walkable, bikeable paths into three scales of space: regional, community, and neighborhood.

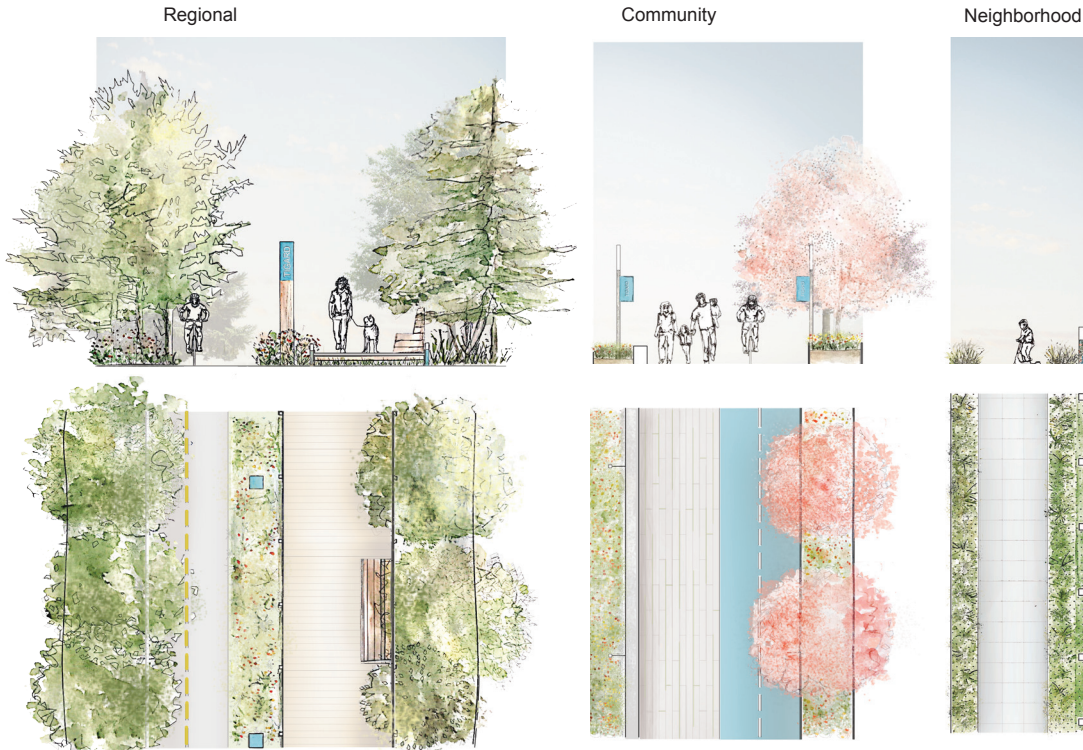


Figure 20: Sections and plans of each trail type



Figure 21: Tectonic characteristics of each trail type

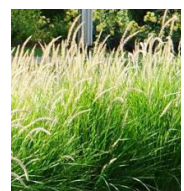
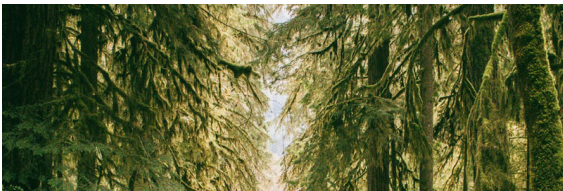


Figure 22: Differences in vegetation between trails

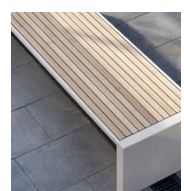


Figure 23: Furniture typologies for each trail type

Hall Boulevard MAX Station

Approaching the MAX station as more than just a point of transfer is key to this scheme. By incorporating layers of pedestrian trails and vegetation, the station becomes an activated part of town. This scheme aims to show that transit centers can be integrated directly with their surroundings and do not have to be seen as segregated islands. Light industrial uses can be a positive addition to urban spaces, as the industrial architecture can be used in creative ways to define public space.



Figure 24: Proposed master plan of downtown Tigard

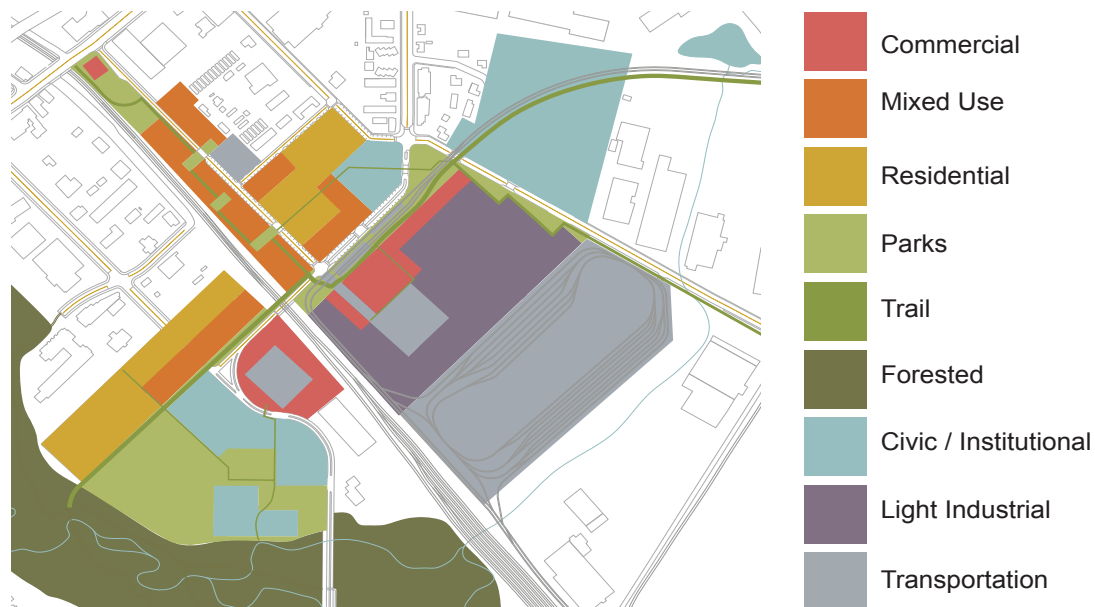


Figure 25: Proposed land use map of downtown Tigard

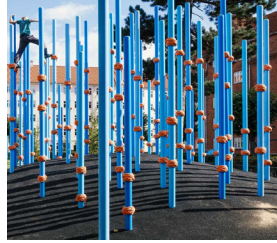


Figure 26-28: Walkable and bikable connections

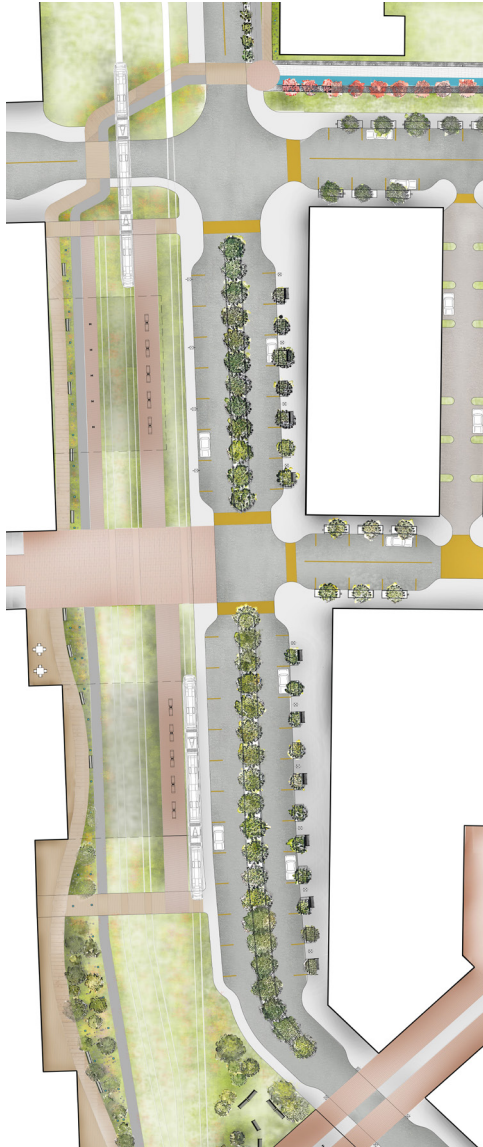
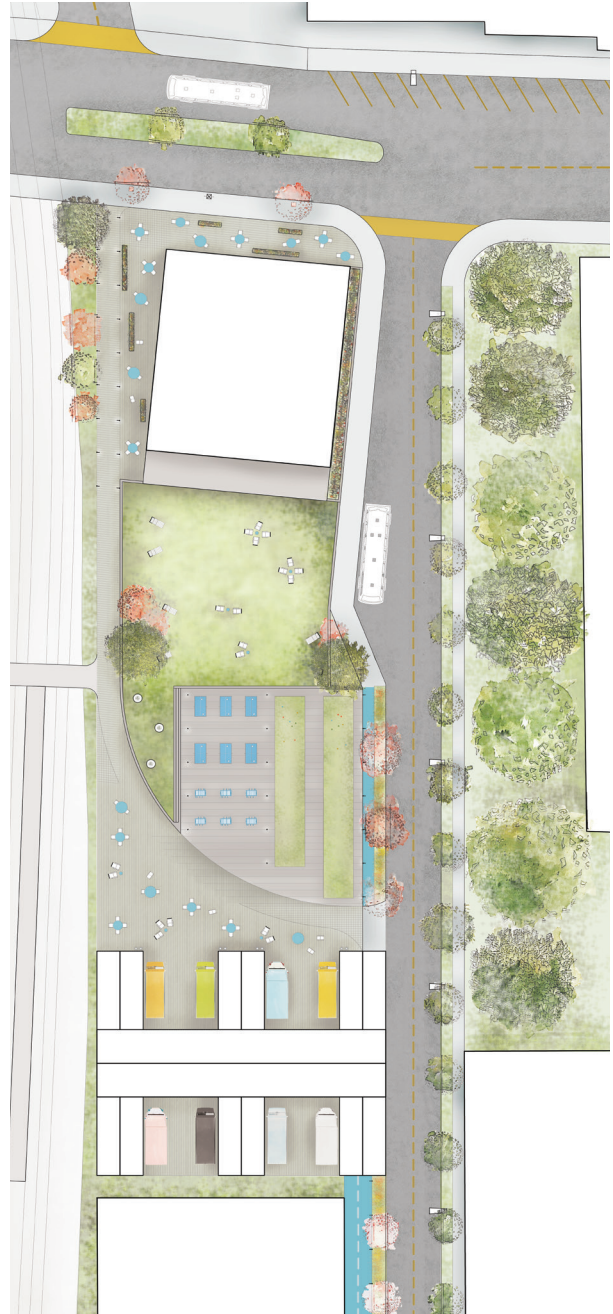


Figure 29: Safe and walkable nodes



Figures 30: A pedestrian-centered live / work / play atmosphere

Proposal 2: Fanno Fingers

Hannah Hirzel • Michael Moran • Matt Rolston

While downtown Tigard is a center of regional transit, its large block structure, low density, and rail and highway barriers may impede pedestrian movement. This urban design proposal responds to Tigard’s goal of being “the most walkable city in the Pacific Northwest” by providing increased density and a system of interwoven pedestrian-oriented corridors. The future construction of a light rail station south of Hall Boulevard is positioned to shift activity away from the town commercial center on Main Street and towards the light industrial park to the south. Functioning as a new front porch for the city, the MAX station plaza is located at the confluence of a new commercial spine and an extension of the regional trail network at Fanno Creek. The plaza blocks function as an orienting device by using a common design language and wayfinding pigment along shared pedestrian and automotive streets. It connects the MAX station to Main Street to the north and emerging industrial and residential development to the south. A series of green fingers extend out from Fanno Creek, increasing the visibility of the unseen natural resources and permeability to downtown Tigard for the neighborhood to the west. The interwoven plaza blocks and green fingers function as gathering points for respective commercial and natural activities. The thresholds created at their crossings create natural centers of public life.



Figure 31: Images of Tigard today



Figure 32: Proposed site plan showing how new MAX station and Operations & Maintenance Facility (OMF) fit into the context of the city. Also shown are natural elements along residential streets bringing Fanno Creek to downtown, and the commercial corridor as a spine of activity and connection

Existing Conditions

The current block structure of Tigard could be perceived as unorganized and oversized. One of the first phases of this scheme is to introduce new streets in order to break up these mega blocks. Creating a more coherent street grid allows for development opportunities at a manageable scale. Increasing street corners can also boost commercial activity and promote economic growth.

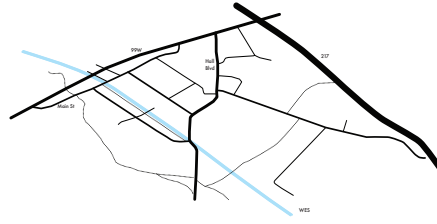


Figure 33: Existing Blocks and Streets

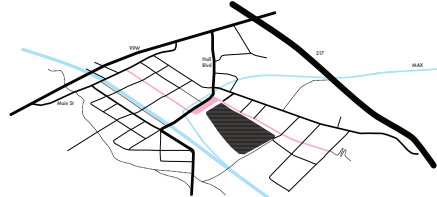


Figure 34: Proposed Blocks and Streets

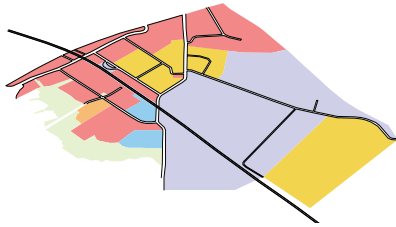


Figure 35: Existing Land Use

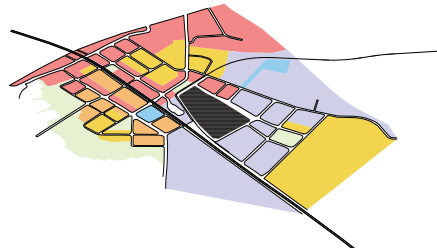


Figure 36: Proposed Land Use

The Plaza Blocks connect Main Street to the development south of Hall Boulevard and create double-sided access centered on the MAX station “Front Porch” node. These axial blocks share a common design language, creating a central identity and aiding orientation.

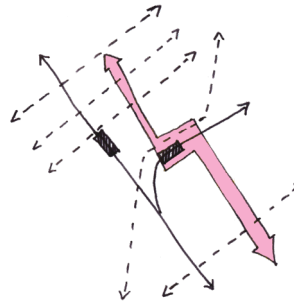


Figure 37: Plaza Blocks illustration.

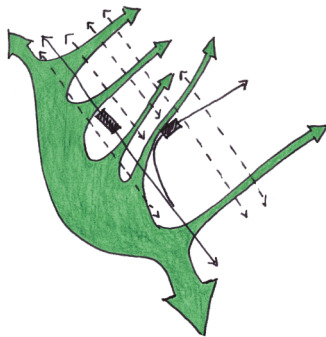


Figure 38: Fanno Fingers illustration

Fanno Fingers are green corridors that increase visibility to local and regional natural resources. Neighbors to the west of Fanno Creek are encouraged to enter town through these nature-filled streets. Extended fingers create stormwater management and environmental teaching opportunities in town.

These two elements together create **Woven Corridors**. The slope of the landscape creates a natural gathering point in the Fanno Creek wetland. The plaza blocks form a parallel confluence of commercial gathering. Thresholds between the plaza and fingers create natural centers of public life.

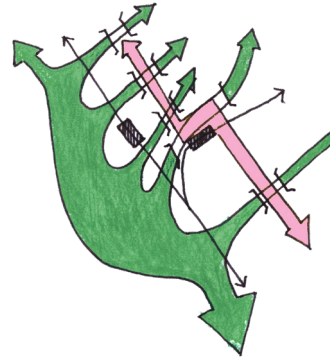


Figure 39: Woven Corridors illustration

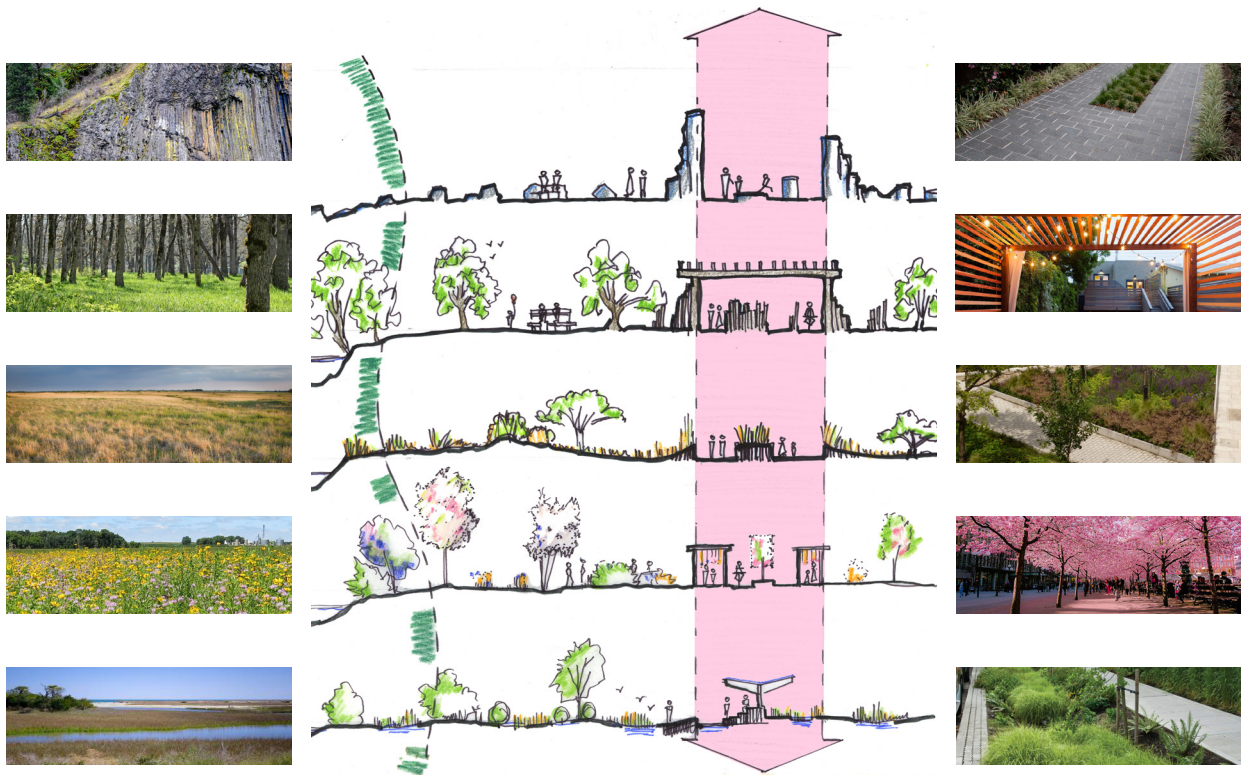
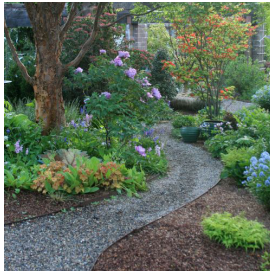
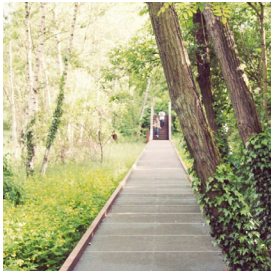


Figure 40: Diagram showing existing natural elements and urban implementation of these elements as pieces of Fanno Creek intersect with the Plaza Blocks

Plaza Blocks



Green Corridors



Station Plaza

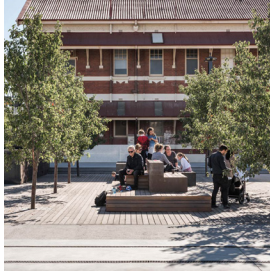


Figure 41: Inspiration images of colors, textures, materials, and human experience in public spaces for the three areas of focus in this scheme

The Plaza Blocks

The Tigard MAX station is presumed to be located along Hall Boulevard, which is more than a quarter mile from the current commercial downtown district along Main Street. This proposal aims to create a clear, deliberate connection between the existing commercial zone along Main Street and the buzz of activity that comes with the new transit stop. Rather than create a new center of town with the station, this urban design scheme respects the current conditions in a way that enhances the area. Commercial Street becomes the corridor of connection. This scheme uses strategies such as infill development, which increases density and tightens up the street edge. The street is also curb-less with bollards designating lanes for pedestrians and vehicles to coexist safely. Color is an important part of the Plaza Blocks as it creates identity and aids wayfinding. The pigment appears on the street in the form of pavers, umbrellas, light poles, and bike racks.

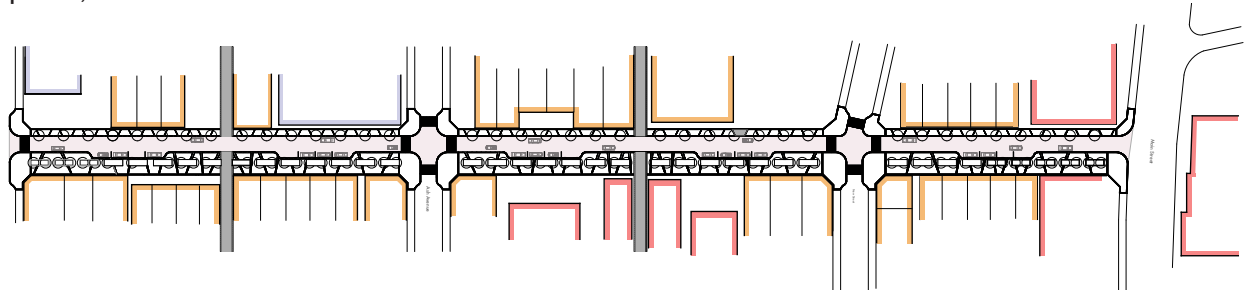


Figure 42: Proposed Commercial Street Plan (Plaza Blocks) with colored permeable pavers, a module of street plantings, and denser development plan



Figure 43: Pedestrian experience and activity along the Plaza Blocks



Figure 44: Section through Commercial Street, showing a more pedestrian-focused space and a denser street edge

Green Fingers

Through a more natural arrangement of street trees, meandering paths, and larger building setbacks, residential streets take on a much different characteristic than commercially-focused streets. This proposal increases visibility of Fanno Creek by extending the creek environment toward the city center. These corridors contain sustainable stormwater systems and paths that plug into the existing trail network of Fanno Creek, making it easier for people to walk and bike into town.



Figure 45: Site plan along Ash Avenue, a “green finger” that brings natural elements of Fanno Creek into the city center



Figure 46: Trail-like pedestrian walkways along Ash Avenue



Figure 47: Section through Ash Avenue showing layered vegetation and residential typologies spilling into the street

MAX Station Plaza

The Tigard MAX station becomes the front porch of the city. As a place where people first experience the city, this public space needs to be welcoming and dynamic. As visitors, commuters, and residents exit the train, they pour onto a plaza of activity. The plaza is located at the confluence of the Plaza Blocks and the Green Finger of Hall Boulevard. This woven connection is visually clear in the colored scheme and vegetation planting patterns. The plaza provides a variety of types and scales of spaces, including both hard and softscapes and a water feature. This scheme realigns Hall Boulevard to fit with the downtown grid and meet the tracks of the WES line perpendicularly. Introducing bulb-outs, street parking, a bike lane, and street trees help Hall Boulevard become a safer, more desirable place for pedestrians.



Figure 48: Plaza view from Hall Boulevard



Figure 49: Plaza view from MAX platform



Figure 50: Section through MAX station plaza

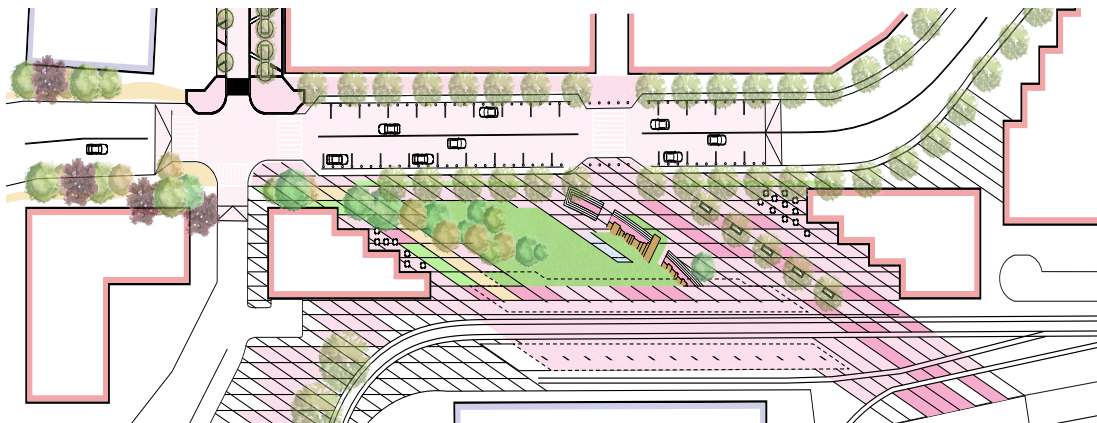


Figure 51: Plan of plaza, showing how the plaza blocks and green fingers intersect and weave together

Proposal 3: ECH₂O

Fatemeh Eskandari • Ellen Kume
Gloria Morazan Salgado • Sabrina Ortiz Luna

*The water understands
Civilization well;
It wets my foot, but prettily,
It chills my life, but wittily,
It is not disconcerted,
It is not broken-hearted:
Well used, it decketh joy,
Adorneth, doubleth joy:
Ill used, it will destroy,
In perfect time and measure,
With a face of golden pleasure,
Elegantly destroy.*

-“Water,” Ralph Waldo Emerson

Exploring the future of Tigard's urban fabric with the pending arrival of the MAX station, this urban design proposal analyzes how the city can be developed while reinforcing its identity. Seeking to strengthen the city's vision of being the most walkable community in the Pacific Northwest, the scheme focuses on creating a spine of activity and movement along Commercial Street, which connects Tigard's existing downtown to the new MAX station. The proposal also considers the city's connection to Fanno Creek, a major asset in the community. Through the use

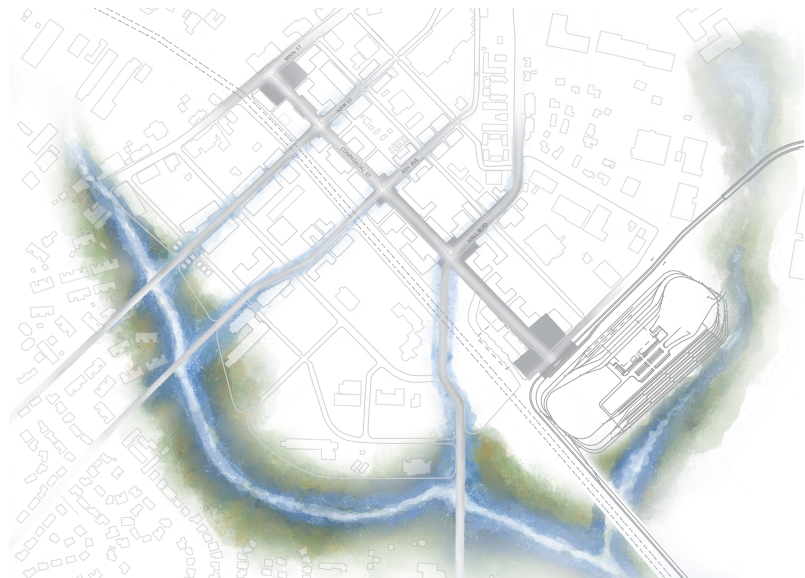


Figure 52: Context map highlighting Fanno Creek

of water, this urban design plan creates echoes of nature throughout the city. Nature and the urban environment are woven together through water features that transform from natural to sculptural as they reach the core of the city. These sculptural features also transform as they follow the city's topography along Commercial Street, drawing inspiration from the journey of water in Oregon's natural environment, starting as snowpack in the mountains and moving through waterfalls and rivers until it reaches the ocean. The urban design proposal is based on these concepts and is developed in three phases. The zoning is modified, new streets and improvements are proposed, and several sustainability strategies are applied to achieve the main goals of promoting walkability and reinforcing Tigard's identity to encourage a healthy and sustainable lifestyle.

THE TIGARD VISION

"[To Be] The Most Walkable Community In The Pacific Northwest, Where People Of All Ages And Abilities Enjoy Healthy And Interconnected Lives."



GOALS + ASPIRATIONS

- Honor Fanno Creek by weaving together nature and the city
- Promote walkability by creating destinations and improving pedestrian connections
- Reinforce the identity and spirit of downtown by creating spaces that uphold Tigard's values
- Create a robust multi-modal network around Tigard
- Encourage a health and sustainable lifestyle within Tigard's natural and built environment



TIGARD ON THE MOVE

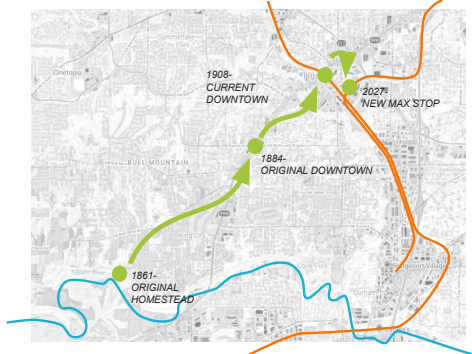
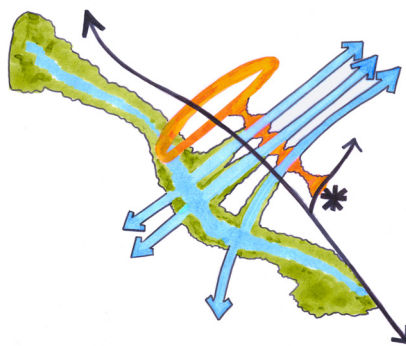


Figure 53: ECH₂O inspiration

PARTI DIAGRAM



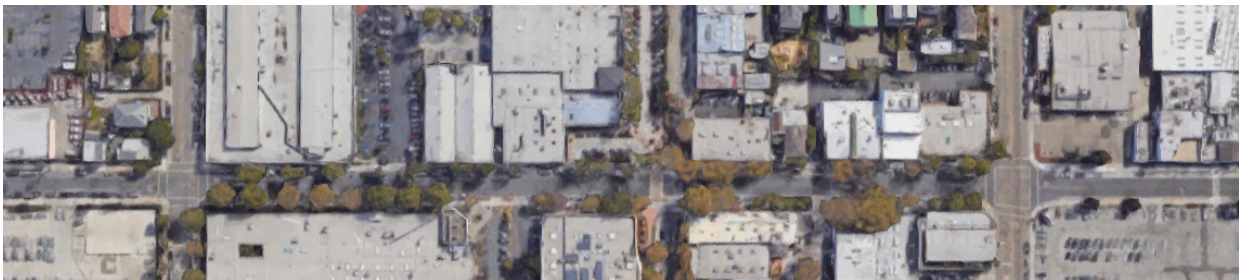


Figure 54: Fourth Street



Figure 55: Orenco Station



Figure 56: Beaverton City Center

Street and Site Sections

An important goal of this scheme is to honor Fanno Creek by weaving together nature and the city. These sections show the relationship between the natural path of water and the water features implemented on the urban streetscapes. As the water follows its course through the city, these water features and stormwater management techniques change from urban and structured to natural and organic.

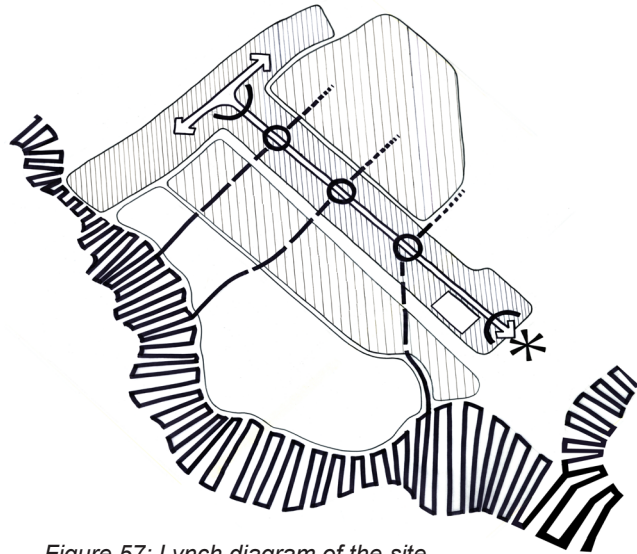


Figure 57: Lynch diagram of the site

Urban Design Strategy



Figure 58: Urban design strategy, uses

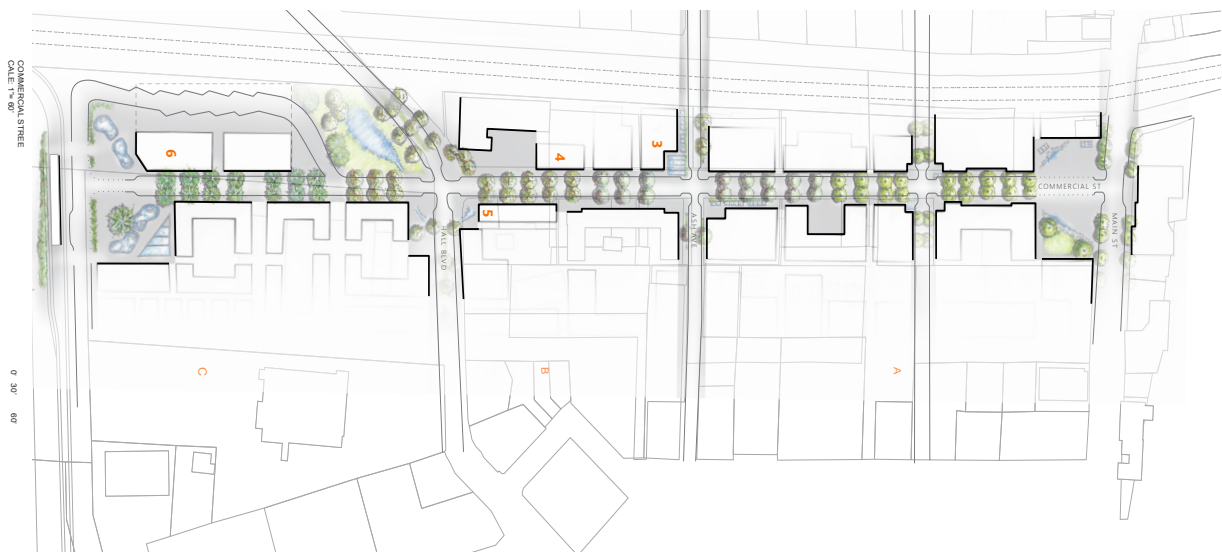


Figure 59: Urban design strategy, uses

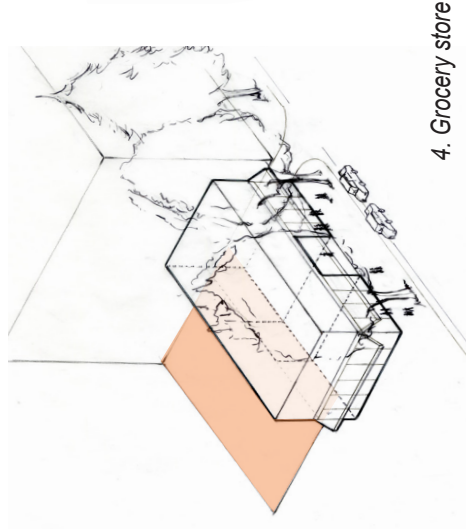
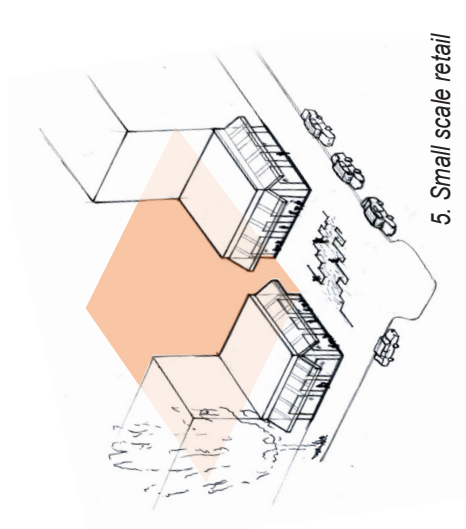
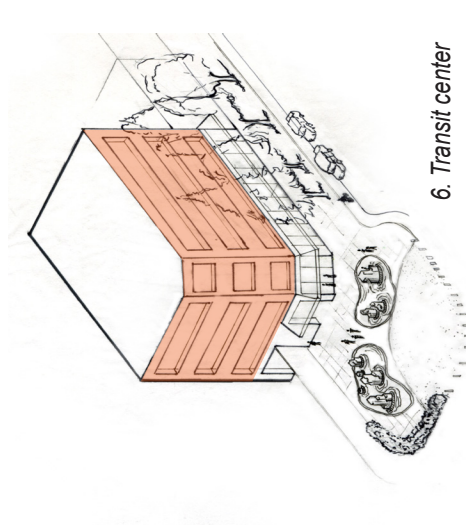
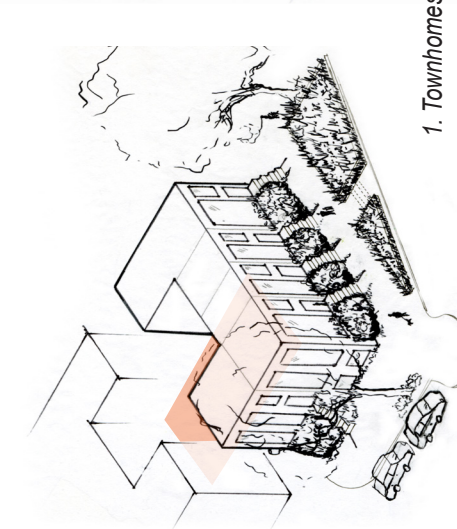
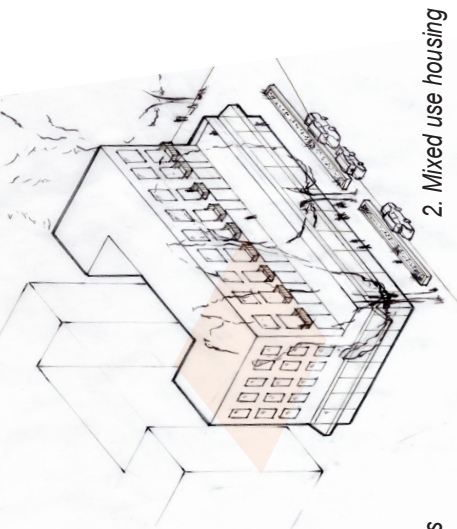
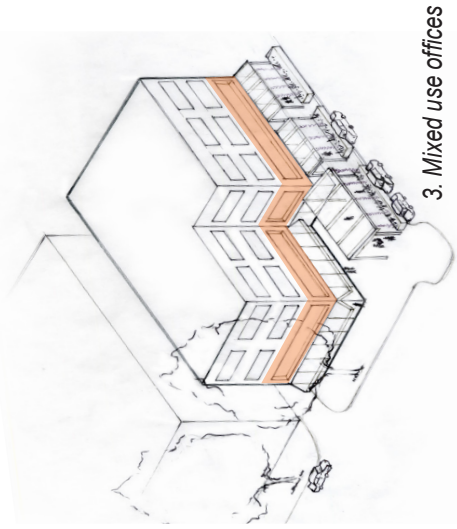
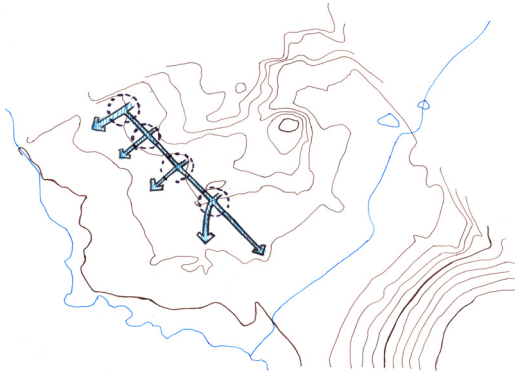


Figure 60: Building types and uses

Topo and watershed



Existing parcels



Proposed parcels



Existing zoning



Proposed zoning



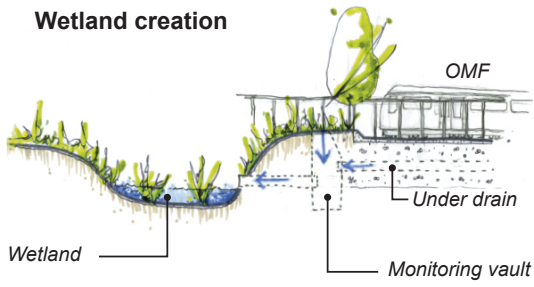
Parking distribution



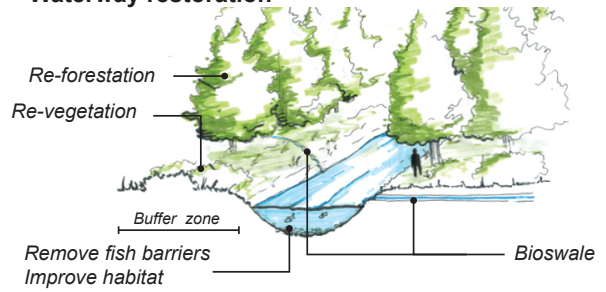
Figure 61: Land use

Sustainability Strategies

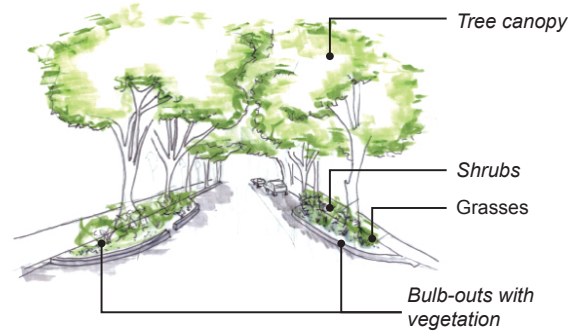
Wetland creation



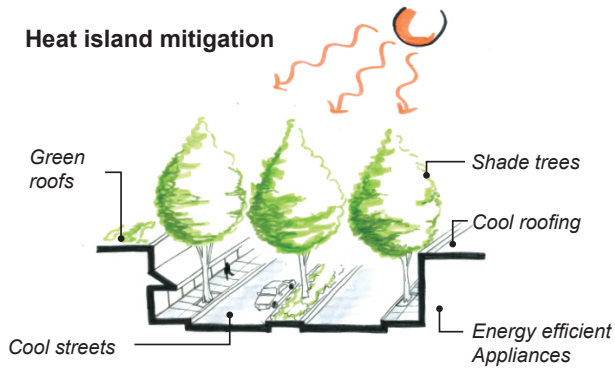
Waterway restoration



Micro habitats and vertical complexity



Heat island mitigation



Permeability

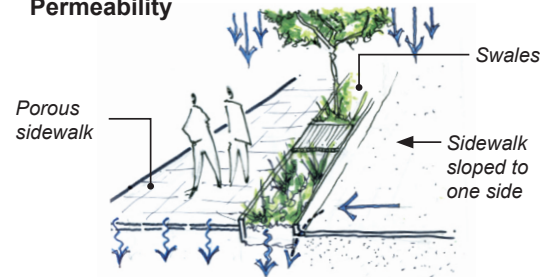


Figure 62: Sustainable strategy, use of water



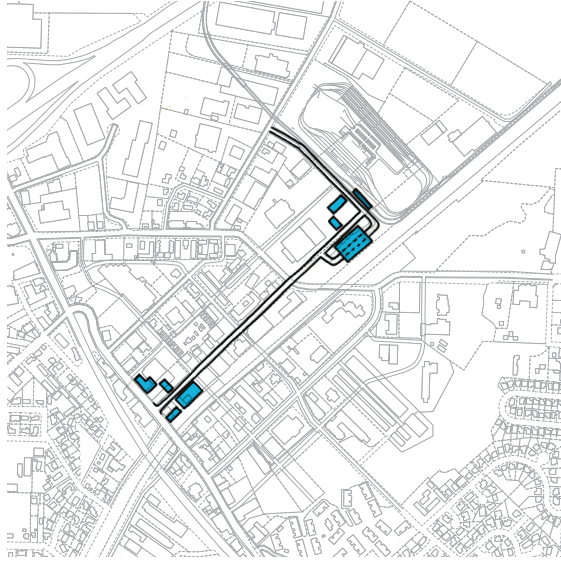
Figure 63: Sustainable strategy, use of water

Phasing



Phase 2

- Public Space
- Hall Boulevard plaza
- Ash Avenue plaza
- Development
- Retail
- Office
- Housing-apartments
- Housing-townhomes
- Street Improvements
- Ash Avenue improvements
- Hall Boulevard improvements
- Connect Ash Avenue and Hall Boulevard
- Begin new street connection between Main Street and MAX station



Phase 1

- Public Space
- MAX station plaza
- Main Street plaza
- Development
- Housing
- Office
- Street Improvements
- Commercial Street extension
- Commercial Street improvements
- New street connecting Commercial Street to Hunziker Street
- TriMet
- Tigard MAX station
- Tigard transit center and park and ride



Phase 3

- Public Space
- New street plaza
- Development
- Retail
- Office
- Housing-apartments
- Housing-townhomes
- Street Improvements
- New street connecting Fanno to Hall Boulevard
- Completion of new street between MAX and Main Street

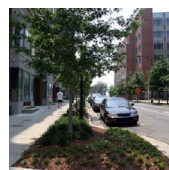
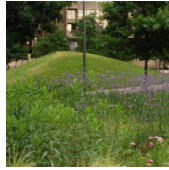
Figure 64: Phases of implementation



Commercial and Main Street intersection



Ash Avenue streetscape



Commercial Street and Hall Boulevard intersection

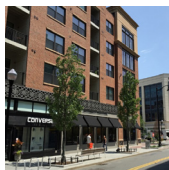
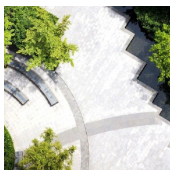
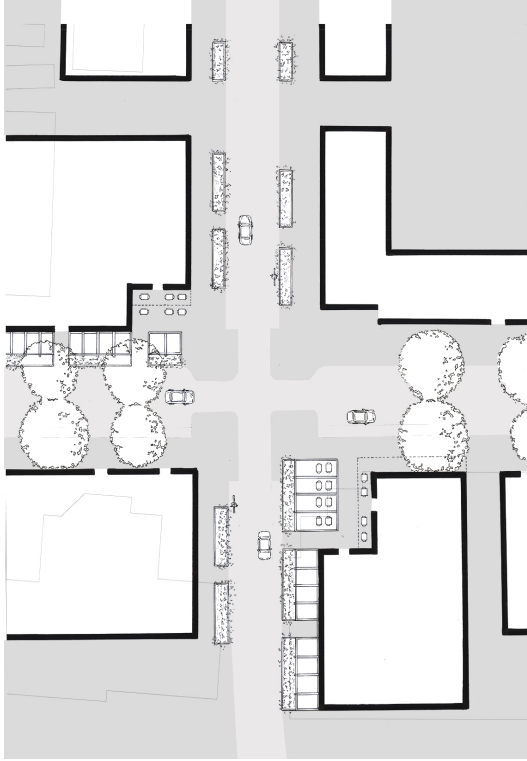


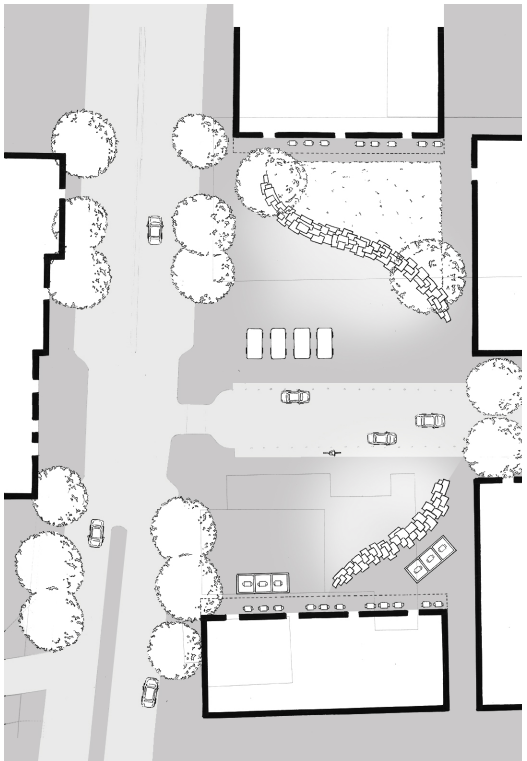
Figure 65: Street concept renderings



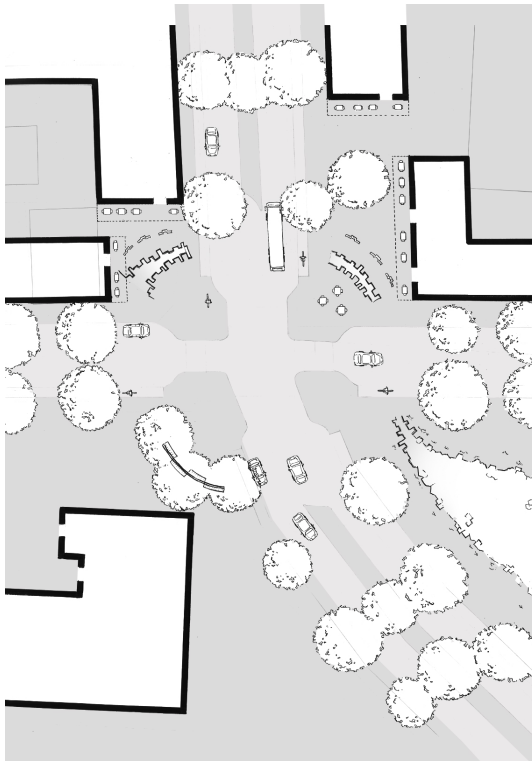
Commercial Street and Ash Avenue plaza



MAX station plaza



Commercial Street and Main Street plaza



Commercial Street and Hall Boulevard plaza

Figure 66: Plaza site plans

Proposal 4: Belt Blocks

Nate Carden • Douglas Greene • Cole Knight

The city of Tigard, in partnership with TriMet, is slated to receive a new high frequency light rail station (LRT) in 2027. The station's planned location is south of Hall Boulevard on an ODOT-owned arterial that divides the city. The Belt Blocks are intended to utilize the new rail line as an opportunity to catalyze development of a walkable district, provide a variety of public amenities, integrate the new station into downtown, and limit impacts to existing parcels. The programmatic vision includes a civic plaza, ecological park, transit station, and pedestrian-oriented street. These elements are linked by a major pedestrian pathway. Secondary paths and axes connect the Belt Blocks district with the cityscape and surrounding ecologies. Market-driven redevelopment is anticipated between the new district and the old downtown.

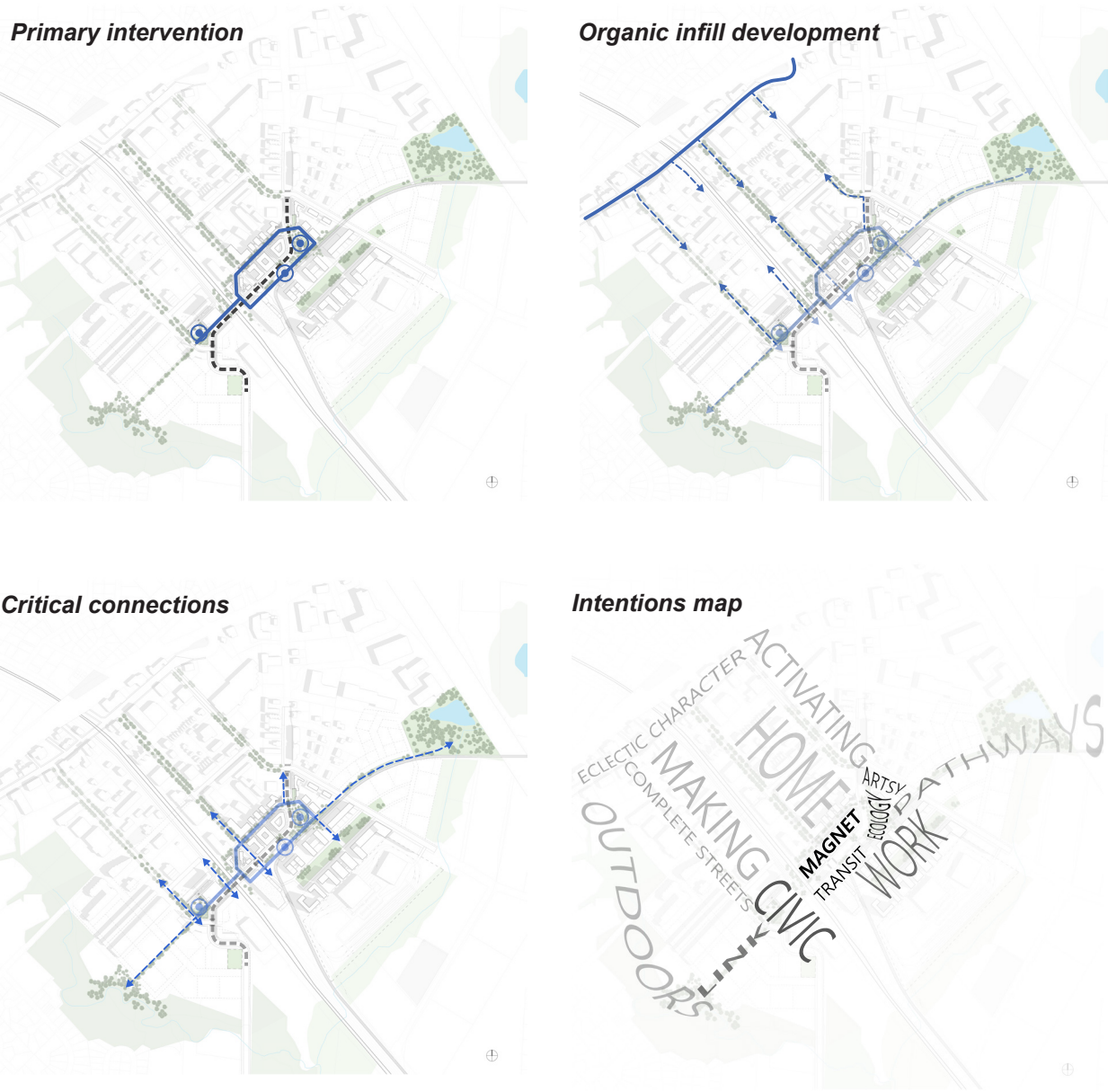


Figure 67: Site programming maps

Driving Forces & Goals

Through analysis of the site, four major conditions came to light. The surrounding ecology and residential communities are areas of focus for the design scheme. A new transit stop along Hall Boulevard should spark activity in a previously underutilized area, providing an opportunity to shift development while still respecting the existing downtown. This scheme recognizes the physical barriers of state highway 217 and the WES line railroad tracks. These barriers bring a challenge to the project, as they limit pedestrian movement.



Figure 68: Belt Blocks context maps

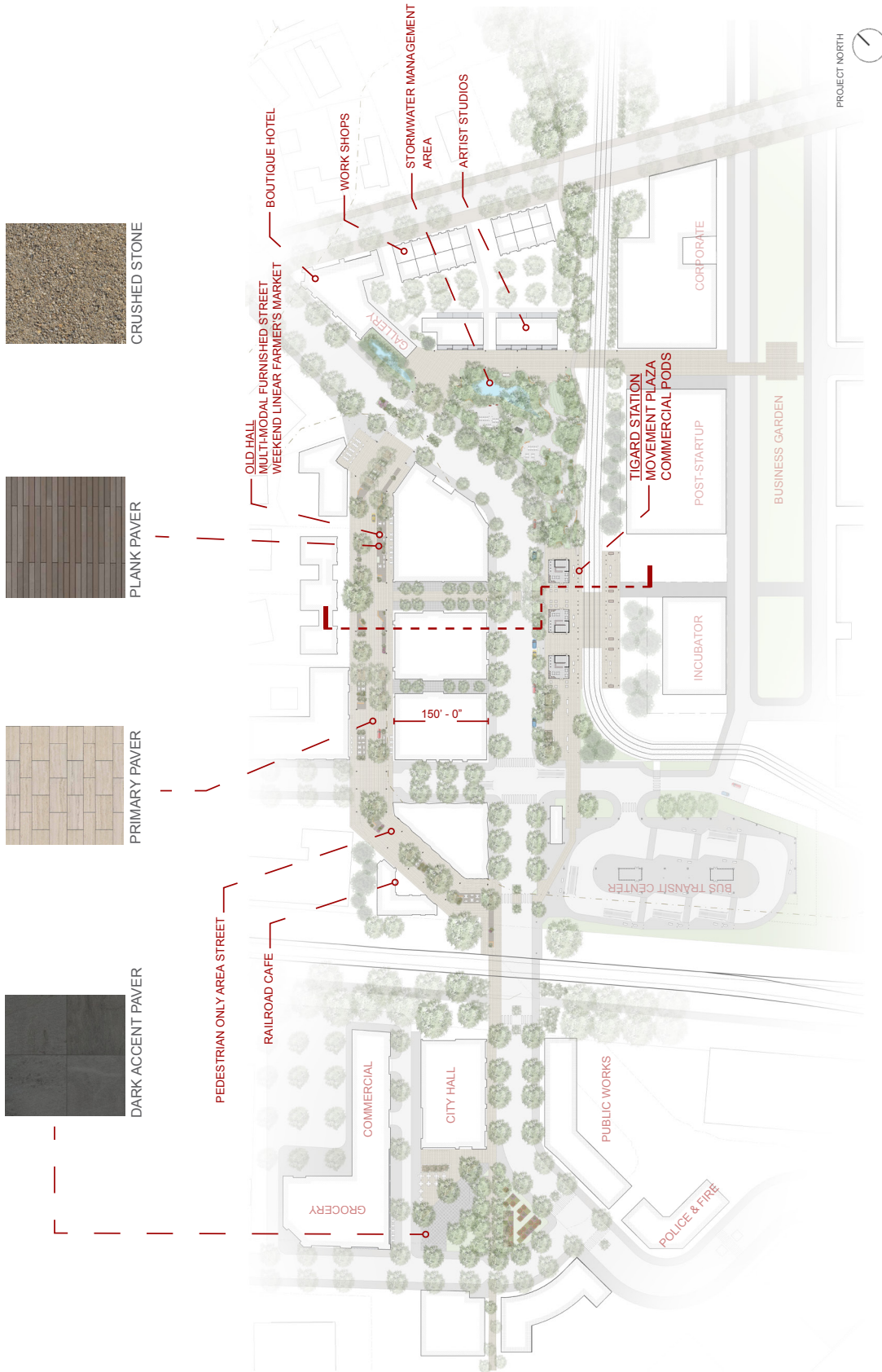


Figure 69: Belt Blocks plan

Magnet for Activity

Creating a functional and safe experience for both pedestrians and vehicular traffic is key to this scheme. Hall Boulevard is redesigned using sustainable complete street design. The existing Hall Boulevard becomes a slower, multi-modal street meant for meandering, shopping, eating, and enjoying the outdoor urban space. It serves as a site for festivals and markets. The new Hall Boulevard, which is located south of the existing street, becomes the through-route for vehicles passing through. Vehicles are allowed on a portion of the new Hall Boulevard, but the experience is much different. Bike lanes, permeable pavers, street furnishings, and the lack of curbs prioritize pedestrians over cars. By separating activity between two streets, pedestrians have a more pleasant experience and traffic can still move efficiently.

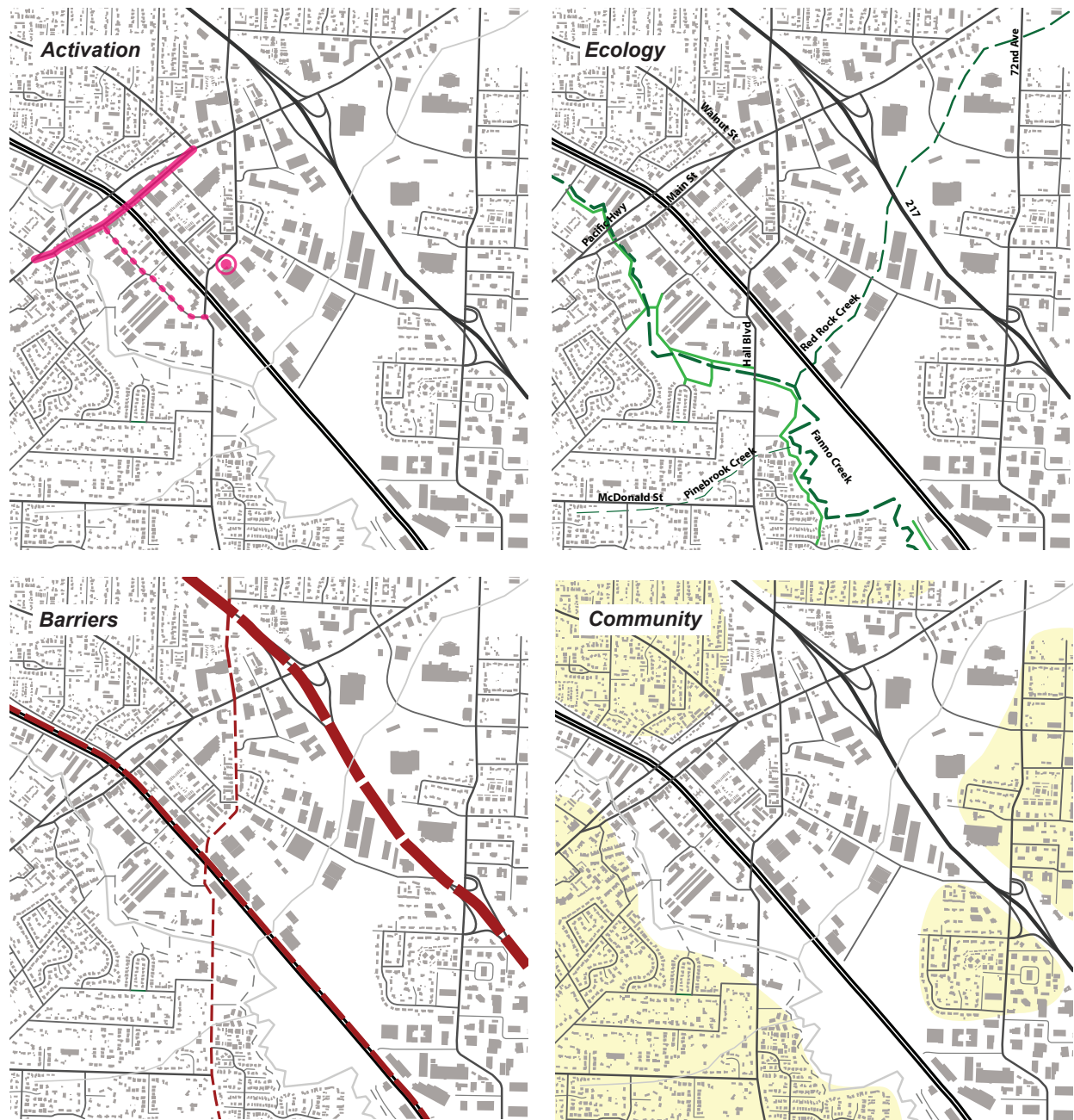


Figure 70: Belt Blocks site plan

The Old and New Hall Boulevard

Though Hall Boulevard could be split into two paths of circulation, the street design does not favor one street over the other. The proportions of the street width to building height differ between the two streets, as shown in the sections. Old Hall Boulevard has a narrow street width, providing a more intimate pedestrian setting. New Hall Boulevard is bordered by a four-story building edge to the north, then spills into Tigard Station. A plaza is situated directly to the north of the station, welcoming visitors and creating a gathering point. The MAX line enters the station beneath a steel structure, that responds to the industrial history of the site.

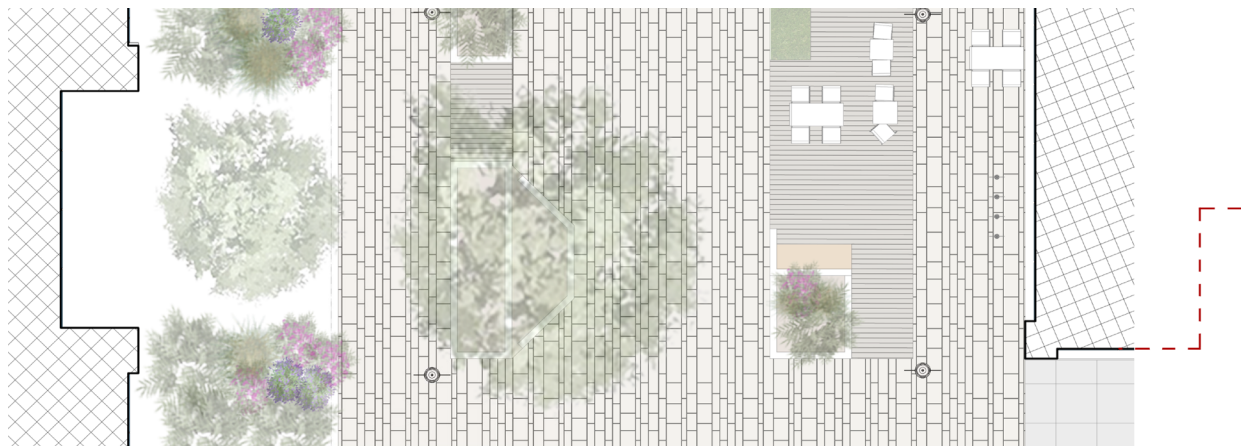
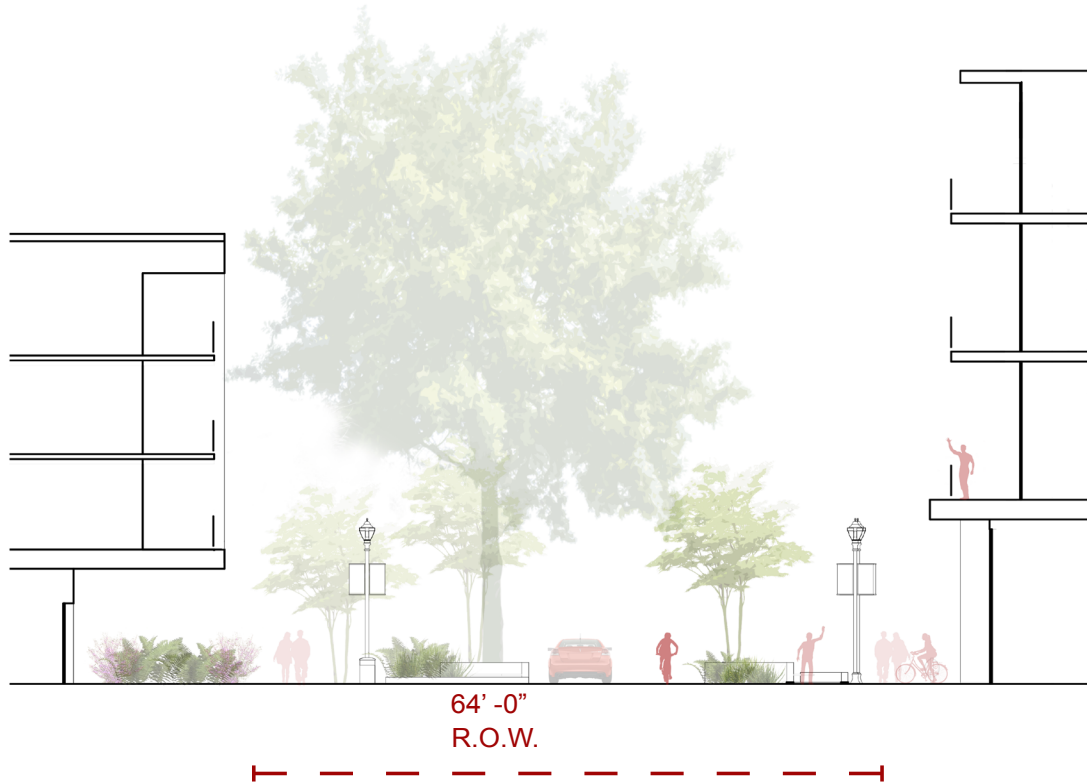


Figure 71: Section and street plan at old Hall Boulevard

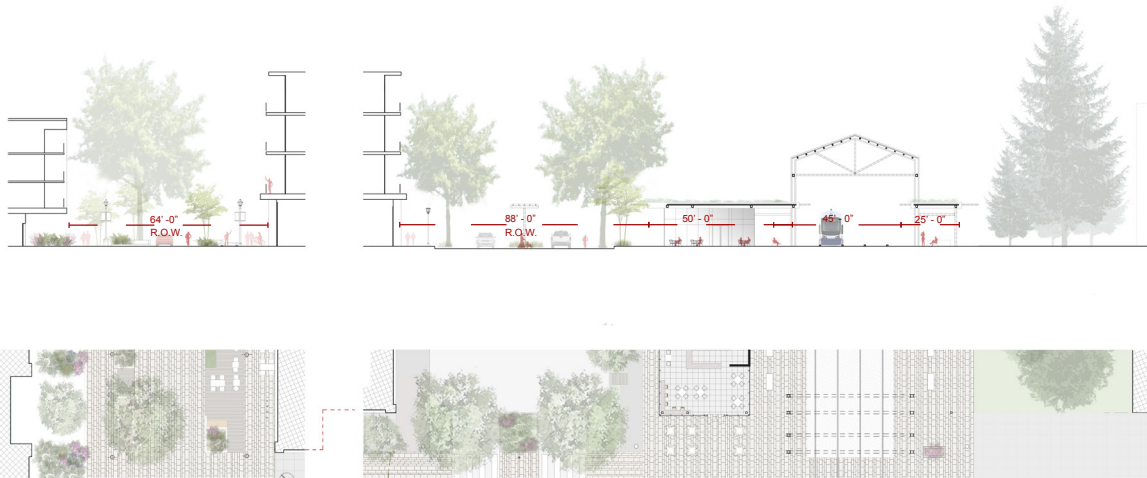


Figure 72: Old Hall Boulevard versus new Hall Boulevard



Figure 73: Old Hall Boulevard looking northwest



Figure 74: Tigard Station from Commercial Street and new Hall Boulevard

Eco Park and Civic Plaza

Eco Park and Civic Plaza are equal opposites in terms of public space. Eco Park, as the name suggests, is an ecological core of natural vegetation, natural ponds, and bioswales for stormwater management. The meandering path of crushed gravel supports the natural character of the park. The plaza takes an urban quality, as the majority of the area is hardscaped. Fountains, outdoor furniture, and shade trees populate the plaza.

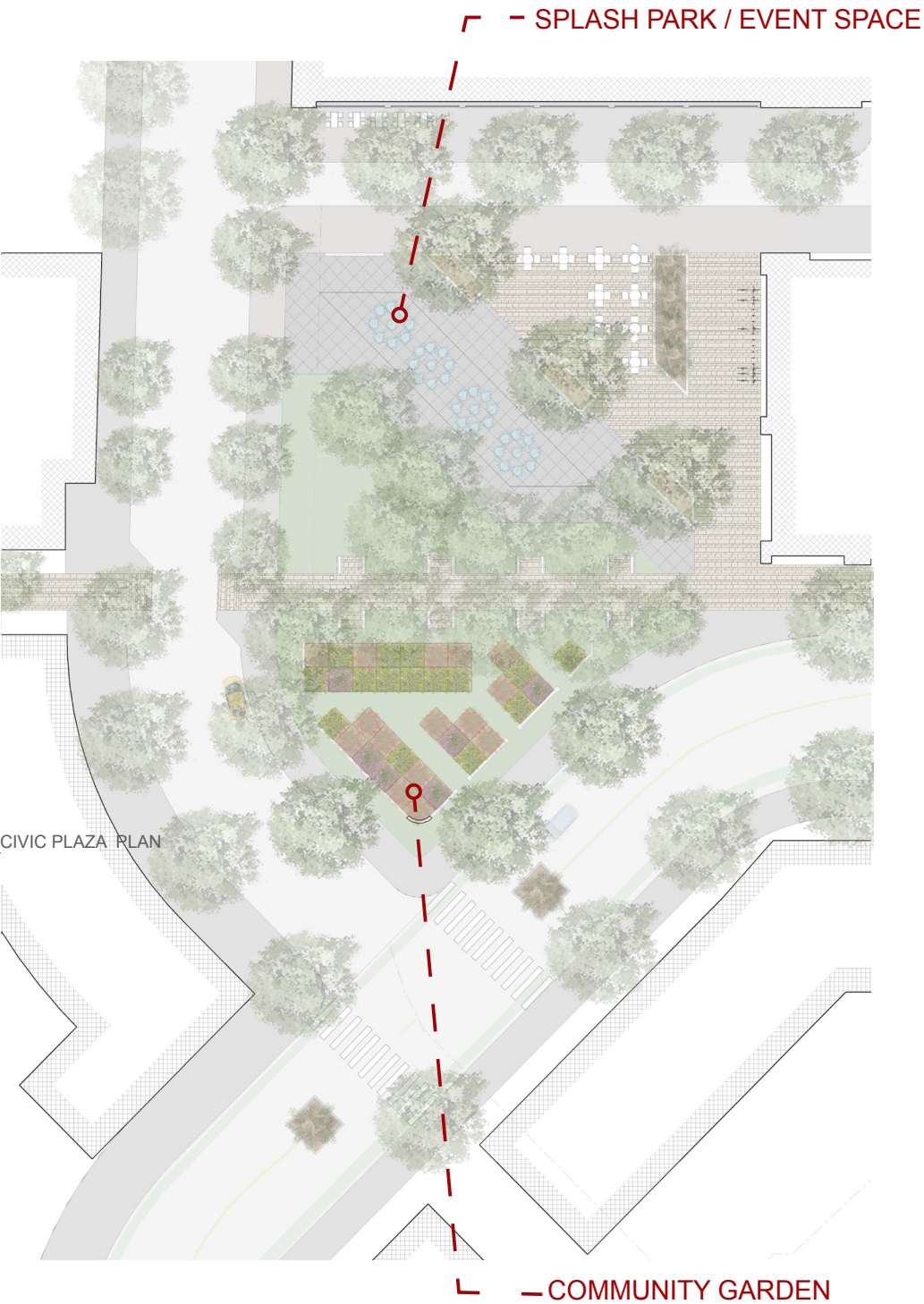


Figure 75: Civic Plaza and Eco Park site plan



Figure 76: Civic Plaza and Eco Park site plan



Figure 77: Civic Plaza at Burnham Street and Hall Boulevard

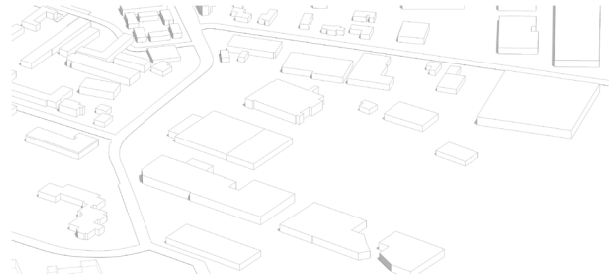


Figure 78: Eco Park looking southeast

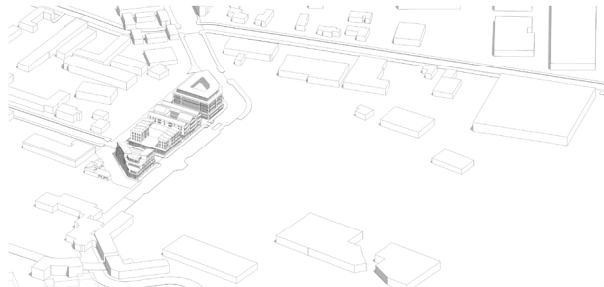
Phasing Process

This proposal for development is broken into four primary phases.

Phase one entails the realignment of Hall Boulevard, a civic plaza, and conversion of the old Hall Boulevard into a “living street”.



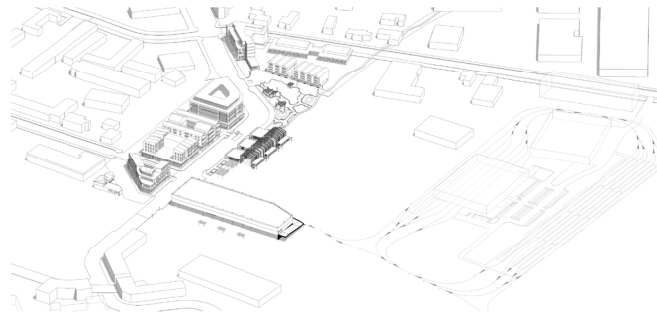
PHASE 0 - EXISTING



PHASE I - BELT BLOCKS

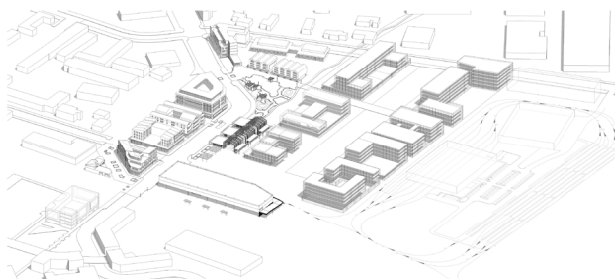
Phase one also includes catalytic mixed-use development on the parcels between old and new Hall Boulevard, relocation of Public Works, and a new City Hall.

Phase two consists of a sheltered MAX station, bus transit center, structured park-and-ride, retail spaces, and the construction of an ecological park. A business incubator, mixed-use development, and boutique hotel are programmed for the area adjacent the ecological park



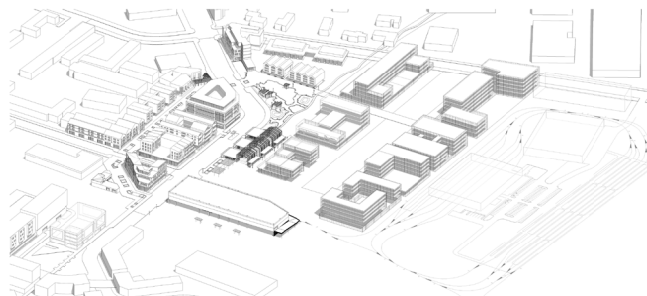
PHASE II - TRANSIT

In phase three, the development of a business garden is planned for the impacted parcels south of the station.



PHASE III - BUSINESS GARDEN

Phase four focuses on mixed-use affordable housing on the north side of old Hall Boulevard to complete the urban intervention.



PHASE IV - MIXED-USE AFFORDABLE HOUSING

Figure 79: Phases 1-4 of urban intervention



Figure 80: Land use

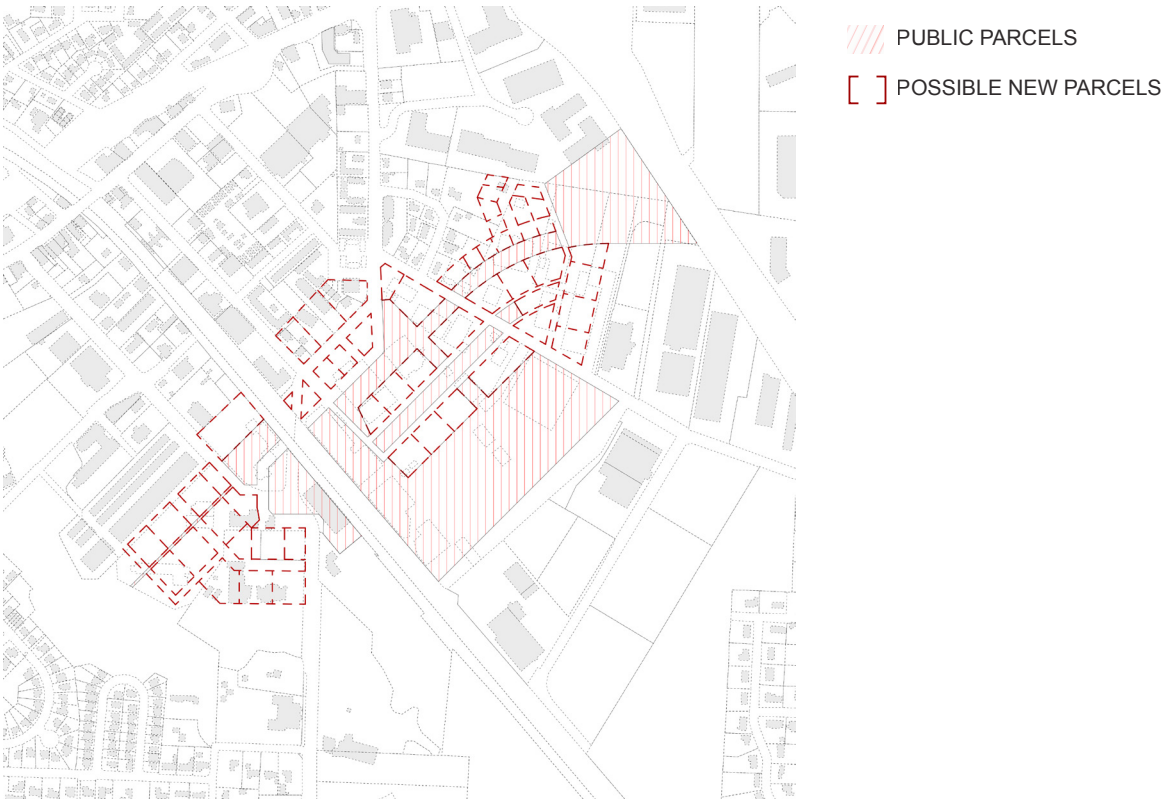


Figure 81: Parcels

Proposal 5: Urban Forest

Chelsea Clark • Matt Loudermilk • Kevin Neuman

The intent of this redevelopment project is to create a new Tigard that fits over the existing culture and strives to produce a more unified community that can foster growth as the new TriMet MAX stop is positioned within the city. This redevelopment will connect corridors and new nodes or plazas to the existing improved infrastructure of Main Street and SW Burnham Street. With the repositioning of city hall and room for growth around the new MAX stop, Tigard will have the opportunity to grow substantially and reinforce the sense of community that is already ingrained within the streets by allowing nearby residents walking access to downtown Tigard. With the addition of more connecting streets and paths, the city of Tigard will be able to confidently say that they are the most walkable city in the Northwest. They will also have expanded their network of walking trails and sustainable ecological zones. With the redevelopment of Hall Boulevard and a new city plaza for community events and gatherings, we hope to produce a more functional, walkable, and sustainable Tigard and its city center, and set a precedent that can radiate beyond the city limits.



Figure 82: Aerial rendering of site

Objectives

Pedestrian walkability, ecological restoration, and community identity are three major areas of focus in this scheme. Walkability is achieved through the connectivity of sidewalks, which includes breaking down the existing large block structure. Designing well defined street edges with building heights that create an appropriate ratio to the street width makes for a comfortable pedestrian experience on the street. Ecological restoration is done by connecting to the existing natural features on the outskirts of town, as well as incorporating native vegetation into the urban fabric. This scheme proposes the restoration and protection of existing habitats and sustainable stormwater solutions in the city center. Community identity is accomplished as the two previous goals are set in motion. When Tigard becomes more walkable place with a more defined street grid and an established ecological plan, it creates an identity of its own.



Figure 83: Aerial rendering of the Tigard area



Existing Tigard



Proposed Tax lots



Proposed Street Grid



After Building Footprints



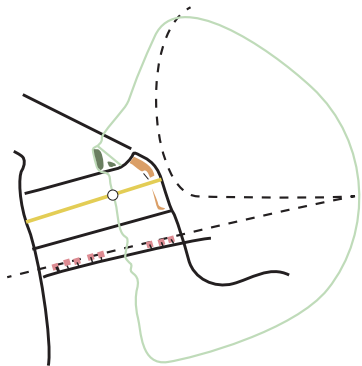
Before Building Footprints



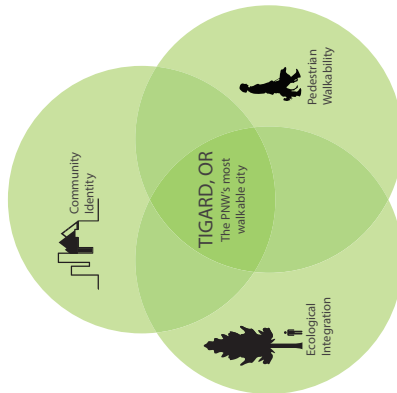
After Block Size



Before Block Size



Project Parti



Project Goals

Figure 84: Walkability in Tigard

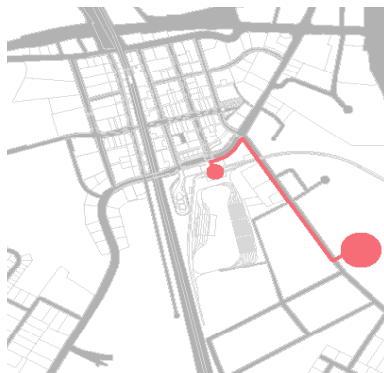
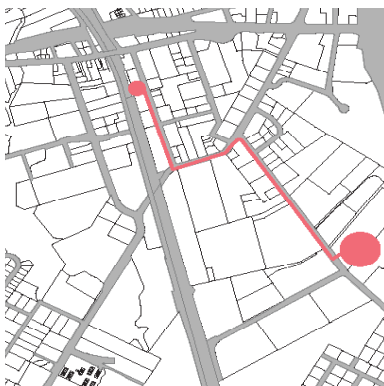
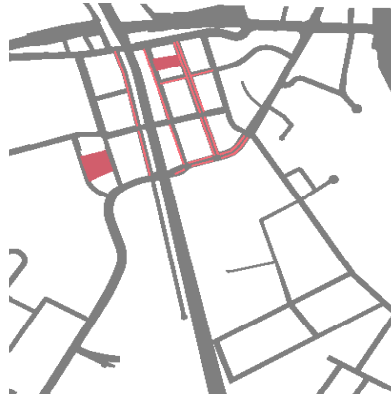
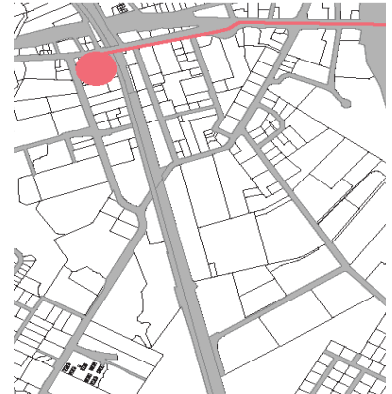
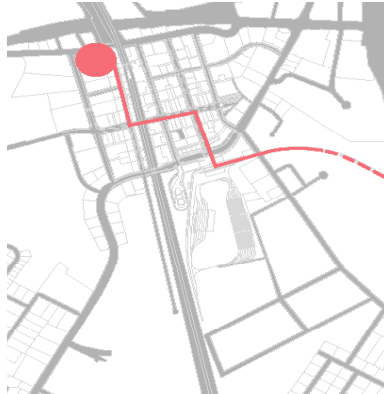
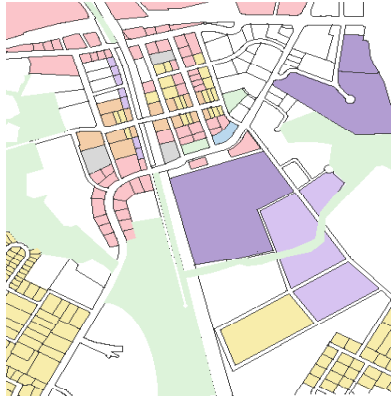


Figure 85: Mobility maps

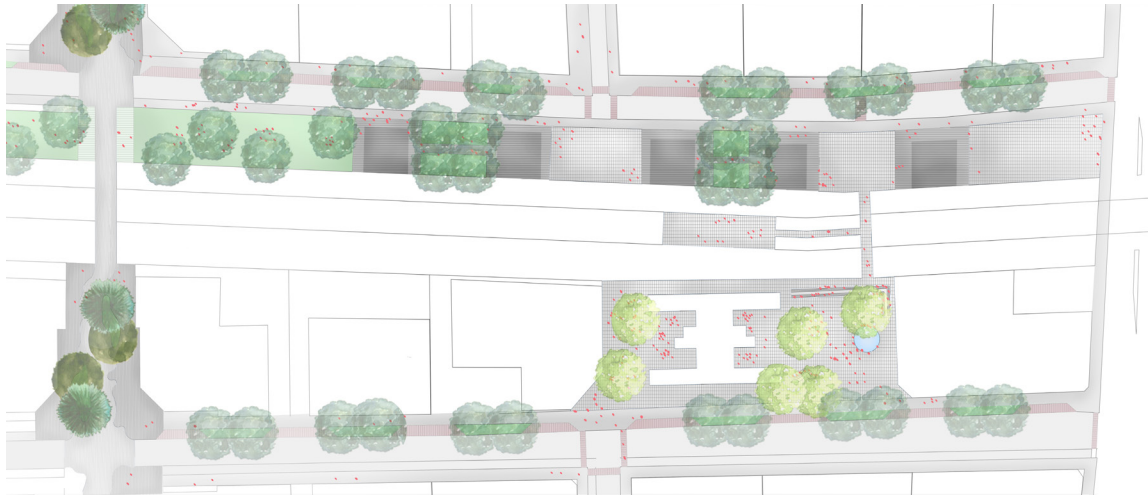


Figure 86: Section and site plan of Makers Alley

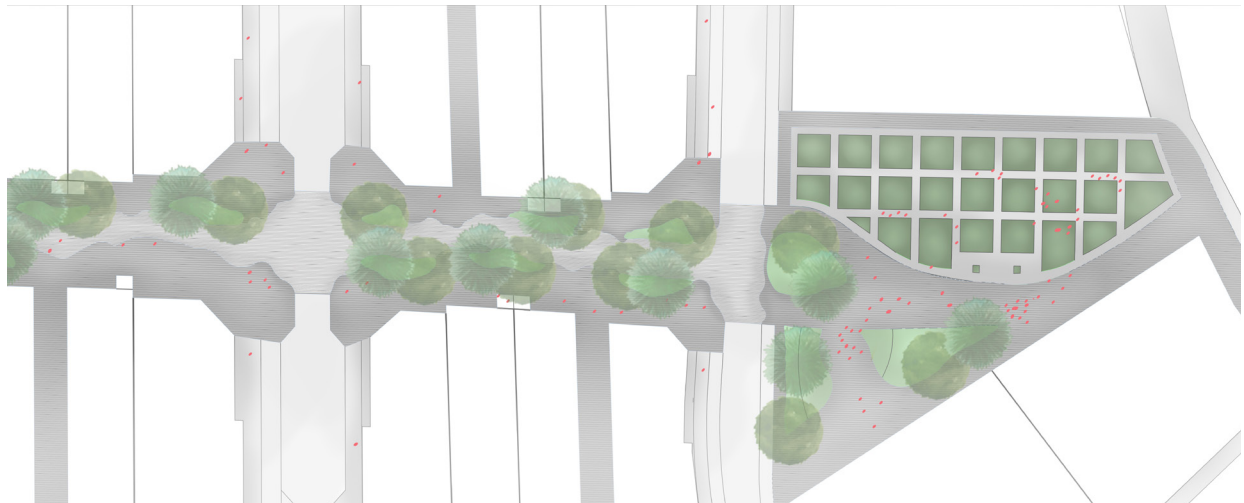
Makers Alley Plan



Figure 87: Rendering of SW Ash Avenue and Community Garden



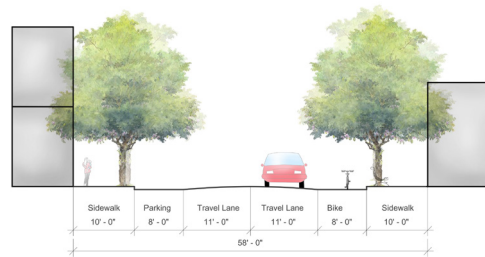
Figure 88: Key and precedents of SW Ash Avenue and Community Garden



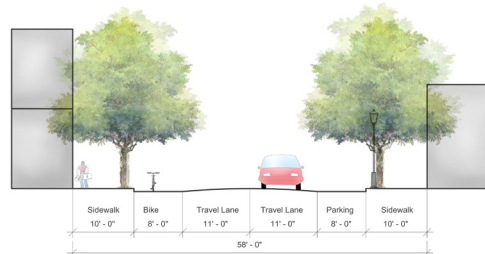
SW Ash St & Community Garden Plan



SW Ash Street Section



Commercial Street Section



Scoffins Street Section

Figure 89: Site plan and sections of SW Ash Avenue and Commercial and Scoffins Streets



Makers Alley Elevation

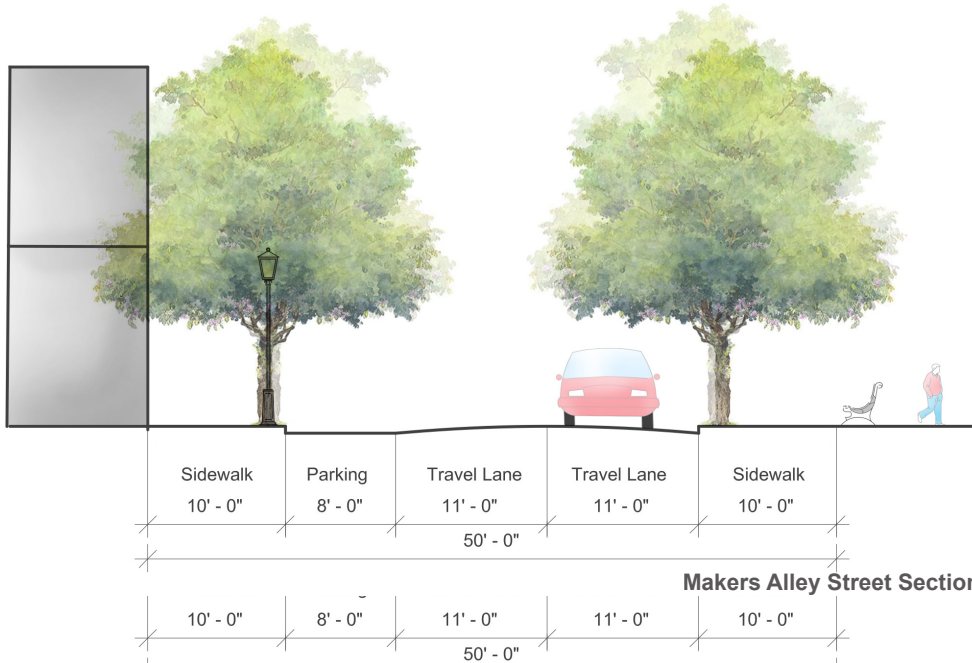


Figure 90: Makers Alley section and elevation

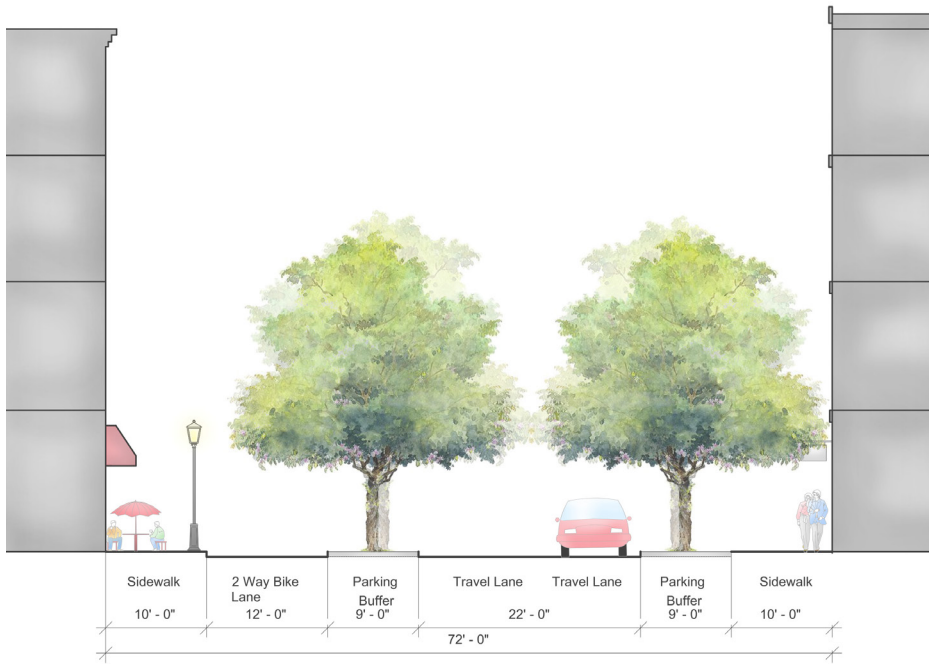


SW Ash & Community Garden Elevation

Figure 91: SW Ash Avenue and Community Garden elevations

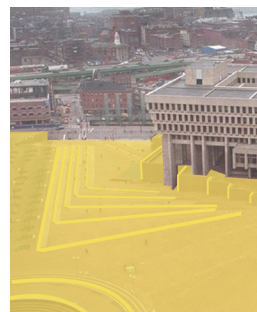
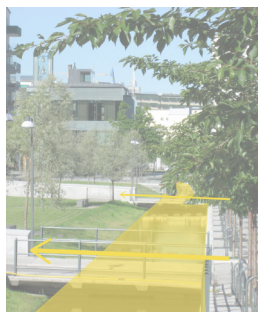
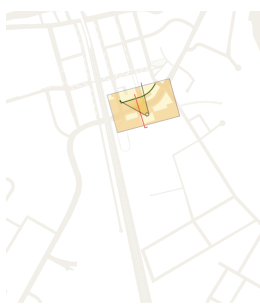


Station Plaza Perspective



Wilson Ave Street Section

Station Plaza Key



Station Plaza Precedents

Figure 92: Station Plaza rendering and precedents and Wilson Avenue street section

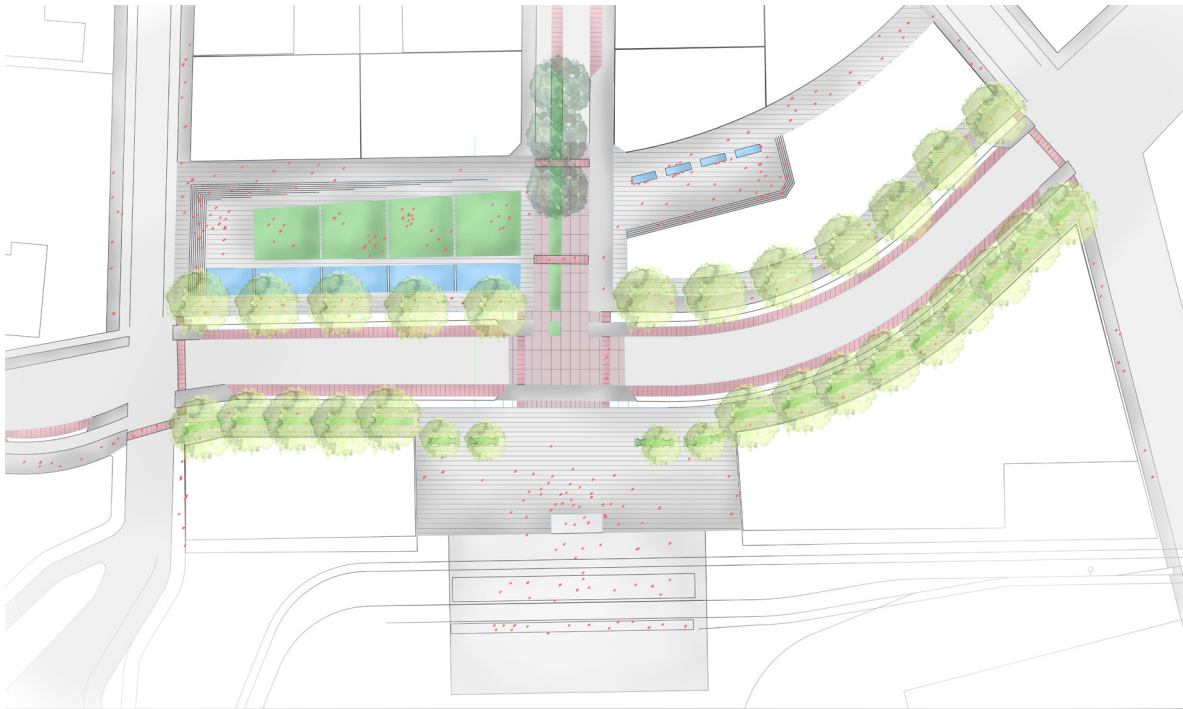


Figure 93: Station Plaza site plan



Figure 94: Hall Plaza section



Figure 95: Hall Boulevard section

Proposal 6: Industrial (RE)vitalization

Emily Buckberg • Angelo DeBlase • Ethan Zagorec-Marks

The (re)industrialization of Tigard focuses on the acknowledgment and celebration of the character and trades that were instrumental in the town’s original founding. Rooted in the logging industry and having formed around the railroad, Tigard is the ideal location for an urban strategy that infills around existing industrial programs with new spaces for makers, creators, and fabricators. Our scheme is organized around a central bicycle-pedestrian spine, an area for development of open space, and visible maker programming along the existing WES tracks that currently run north-south through the middle of Tigard. Connecting the new MAX station to existing historic Main Street, this spine will serve as a vibrant, living timeline that celebrates Tigard’s past while providing the connection and walkability that will allow new development in the city to thrive. Through the conversion of existing structures such as the current transit center into open air places for the making and selling of artisan goods, the spine celebrates the history and vibrancy of existing Tigard while looking to its future as a center of manufacturing and collaborative office spaces. The winding paths through the open areas of the spine also allow for meandering exploration around a series of industrial artifacts and spaces for gathering, allowing each user a unique experience through the park. Overall, this project focuses on carefully selecting the materials and programs that populate the new built environment in Tigard as a means by which to create an exciting identity that celebrates the industrial roots and history of the city and facilitates its growth by promoting future development.



Figure 96: Industrial (RE)vitalization site map



Figure 97: Existing blocks

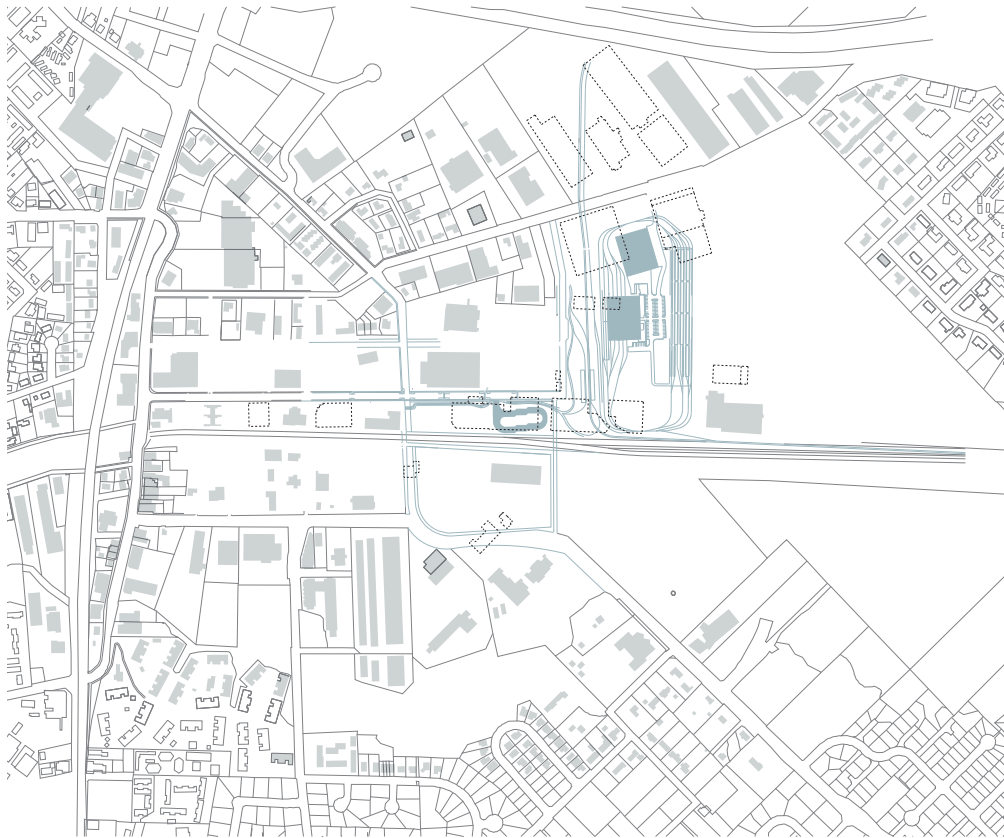


Figure 98: Phase 1

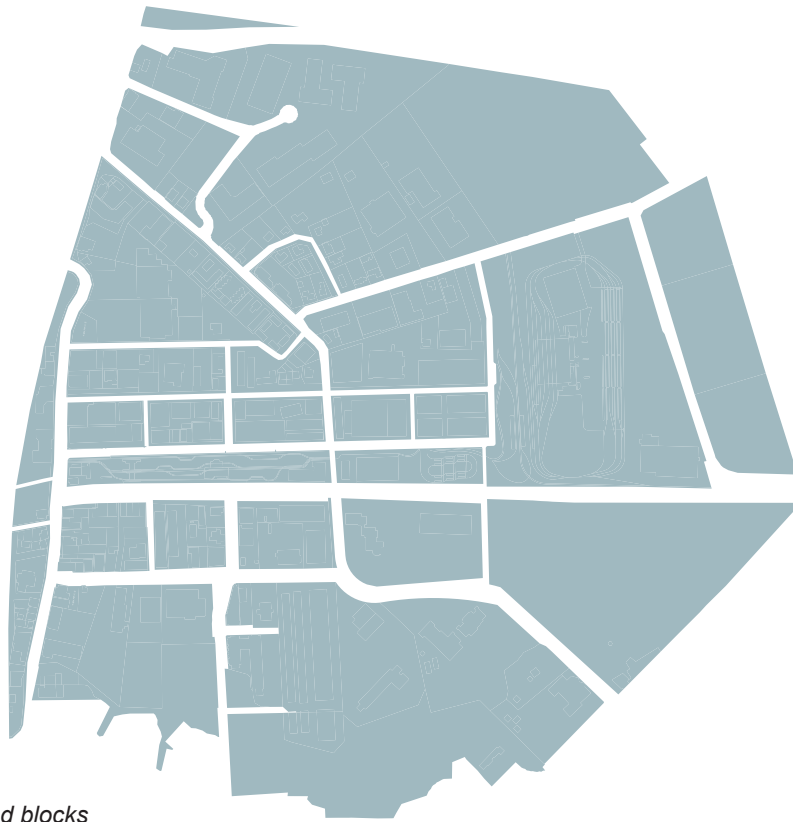


Figure 99: Proposed blocks

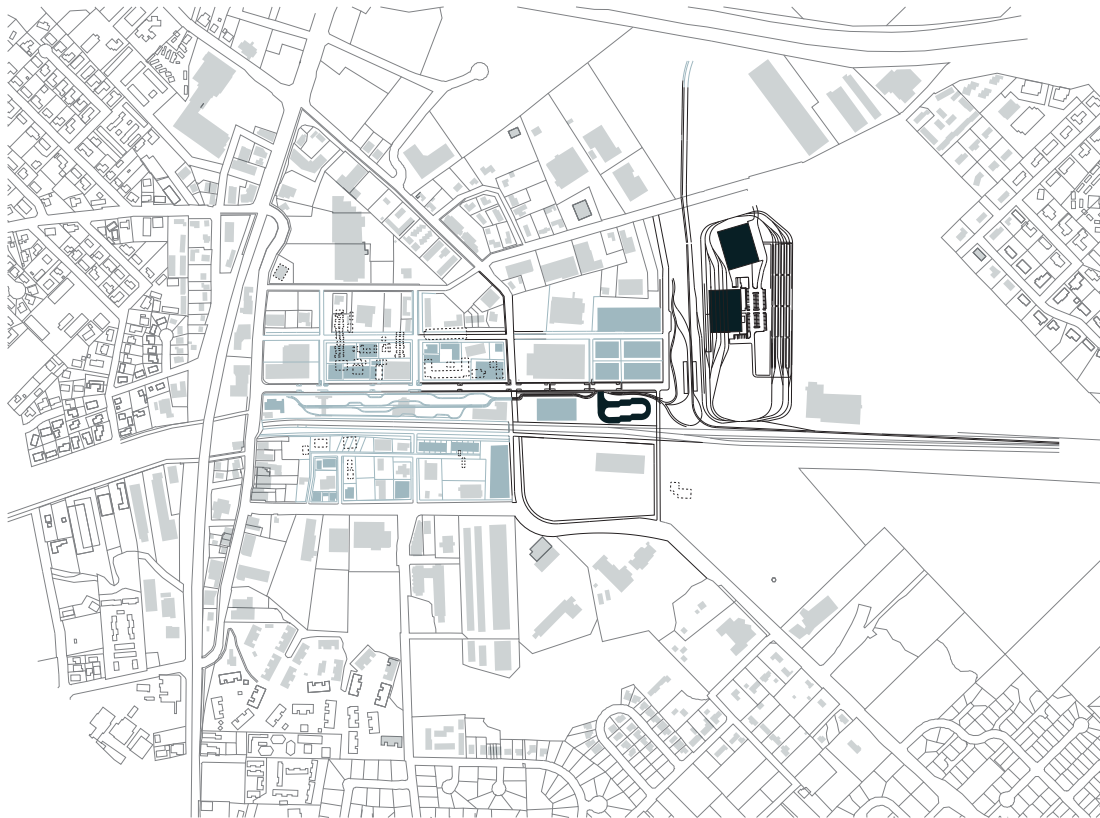


Figure 100: Phase 2

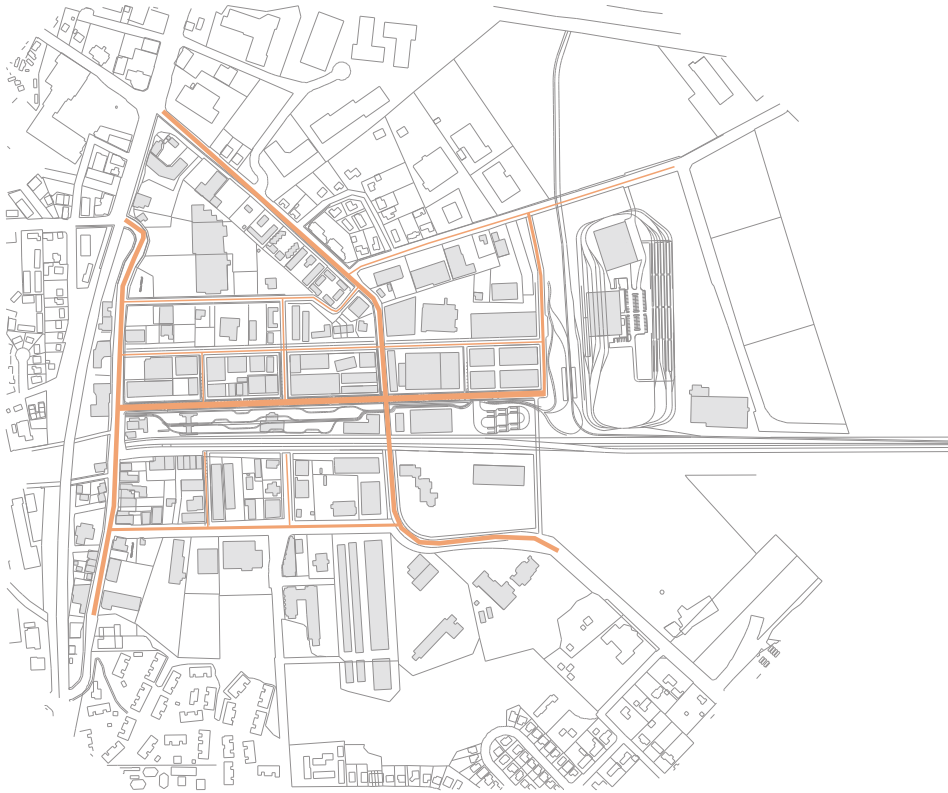


Figure 101: Street hierarchy

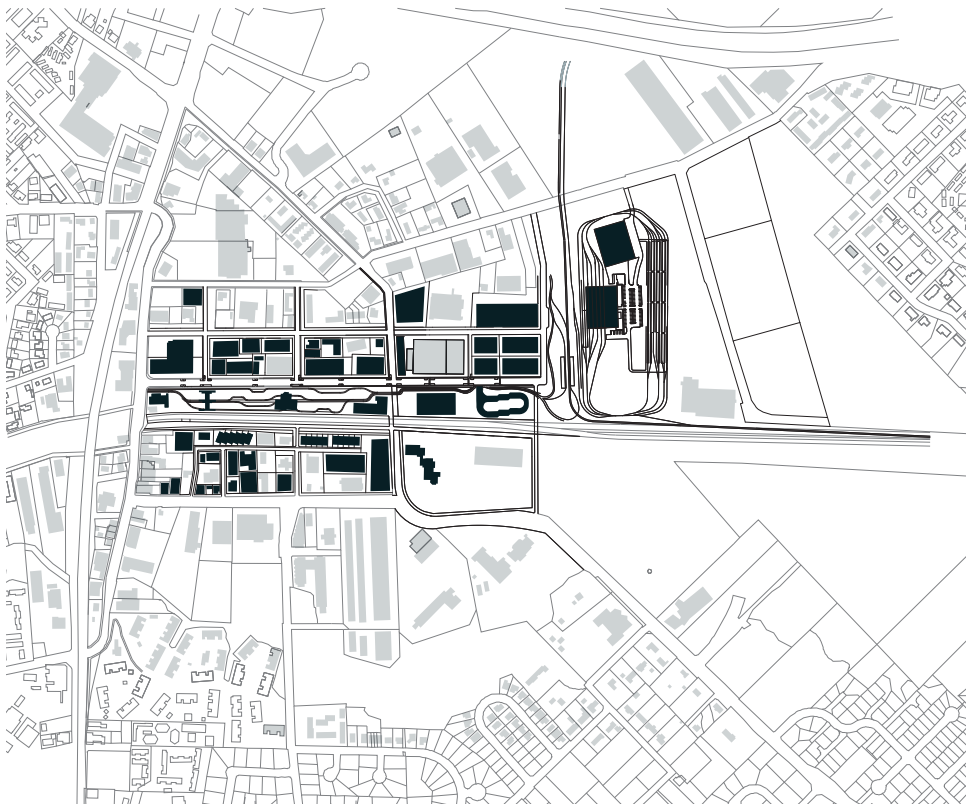


Figure 102: Phase 3



Figure 103: Pedestrian network

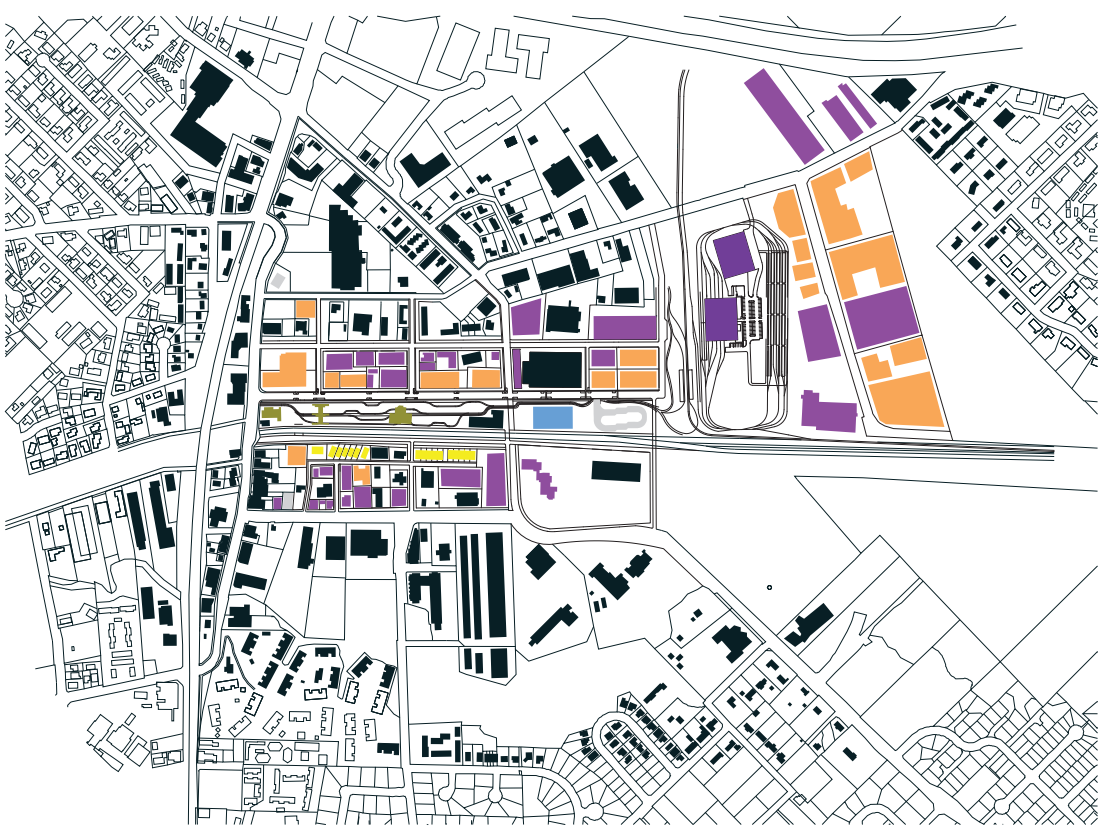


Figure 104: Land use

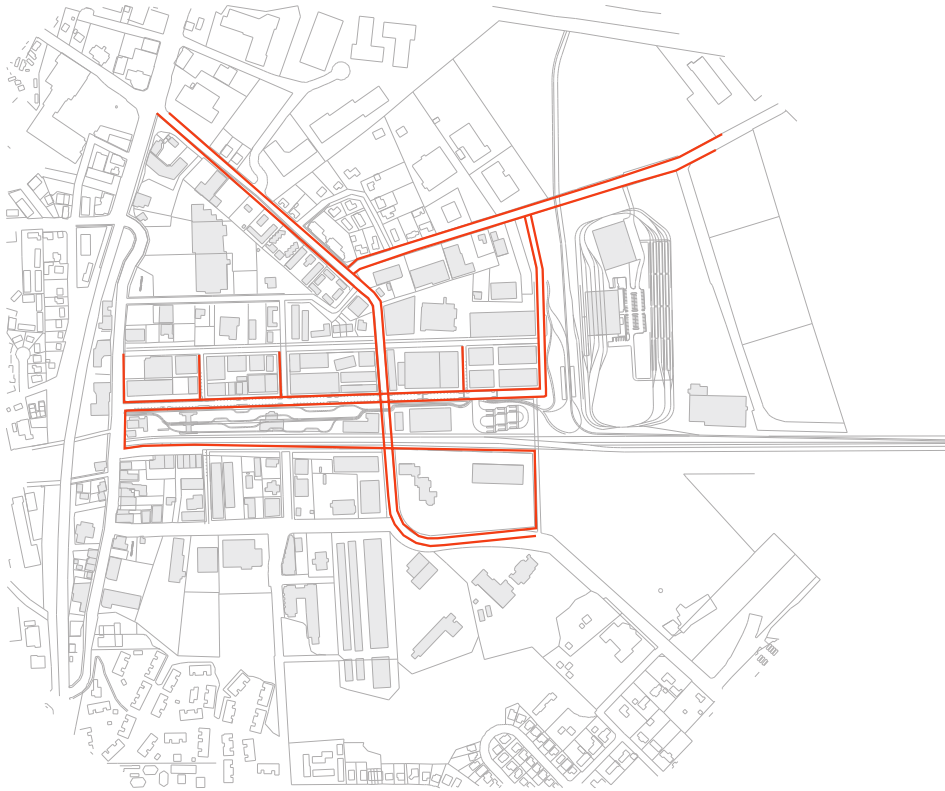


Figure 105: Bike network

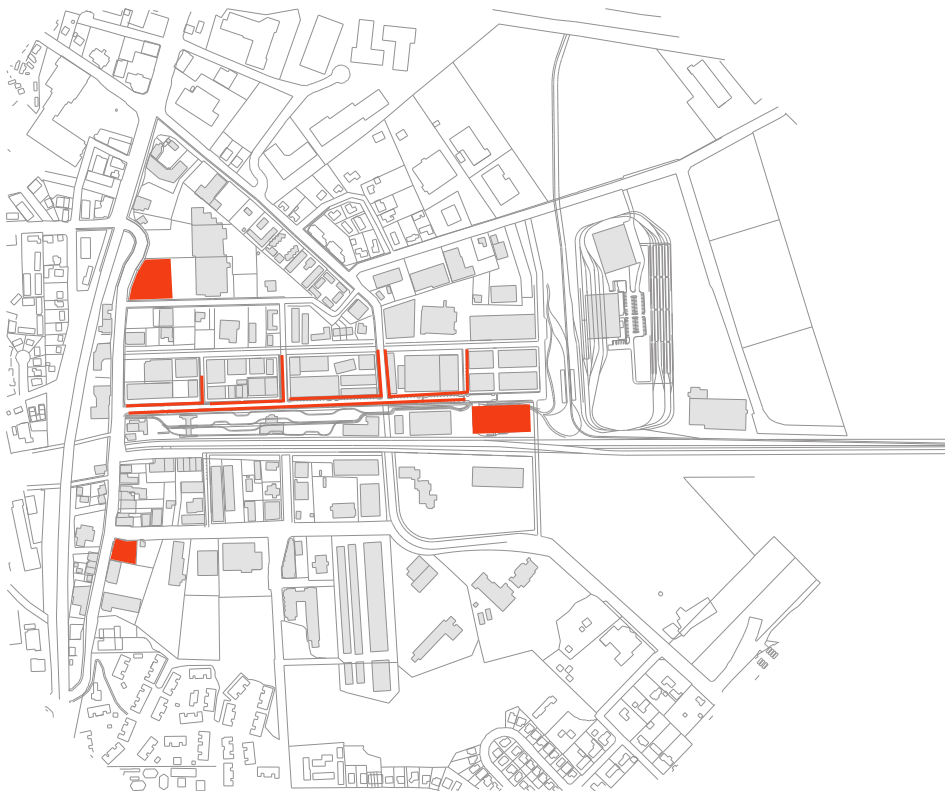


Figure 106: Parking



Figure 107: Texture



Figure 108: Repetition and order

Operations and Maintenance Facility Plaza

The Operations and Maintenance Facility (OMF) is a necessary programmatic piece in TriMet's Southwest Corridor light rail project. The facility will be used for maintaining and cleaning rail cars. The building is located directly adjacent to the MAX stop on top of tracks that peel away from the main line. This proposal works to incorporate the OMF into the overall design scheme. The act of maintenance on the rail cars becomes a performance for the people of Tigard. In an effort to celebrate the rail industry, the train cars are put on display in a transparent building.

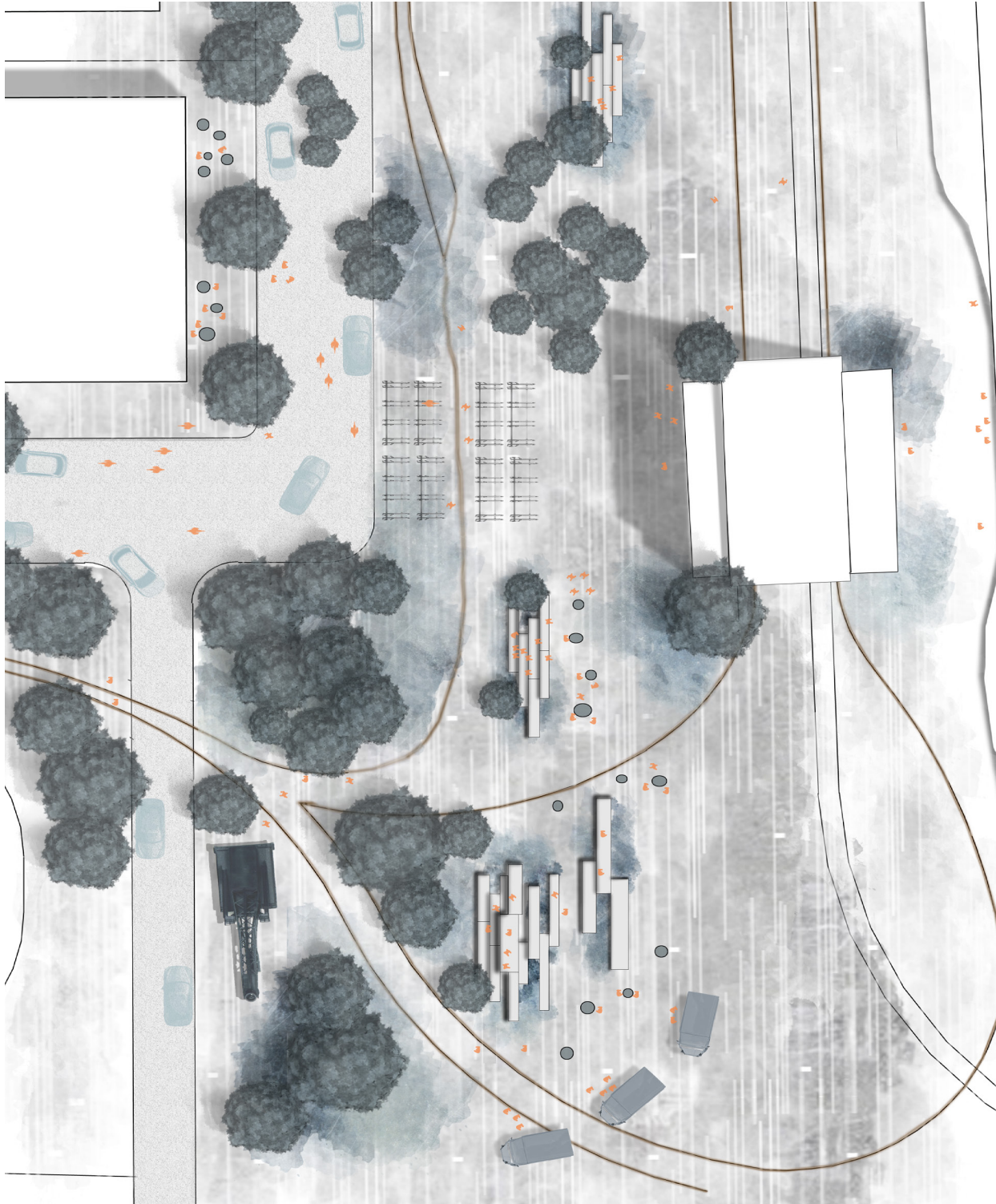


Figure 109: OMF Plaza

Hall Plaza

Hall Plaza sits directly south of Hall Boulevard and caps off the blocks of linear park along Commercial Street. The plaza becomes a gateway for the transportation hub located to the south. This design move is materialized in a steel gateway towering above the street. The gateway becomes a landmark for the downtown district and begins a common industrial design language throughout the park. The goal is to renew the industrial identity through careful use of material selection and program in areas of new development. A clean laboratory is located directly across from the plaza. Because this building cannot be moved or redeveloped, this scheme proposes creating a mural along the facade and turning it into a point of attraction.



Figure 110: Hall Boulevard Plaza

The Spine

A linear park runs from Main Street to Hall Boulevard and becomes the driver of this urban plan. This green space makes it much easier for pedestrians to move through the downtown district. A boardwalk runs parallel to the WES tracks starting at Main Street and continuing past the MAX station. With the boardwalk and park on each side, the railroad tracks become incorporated into the public space. Rather than serving as an unappealing barrier, the tracks are a point of attraction. The location of the park along the tracks brings visibility to the trains and industrial history of the city. Within the park, old industrial objects and decommissioned train cars are scattered and used as public art. Because adaptive reuse is important to this scheme, the shell of the existing bus transit center is to remain and become an open-air market.

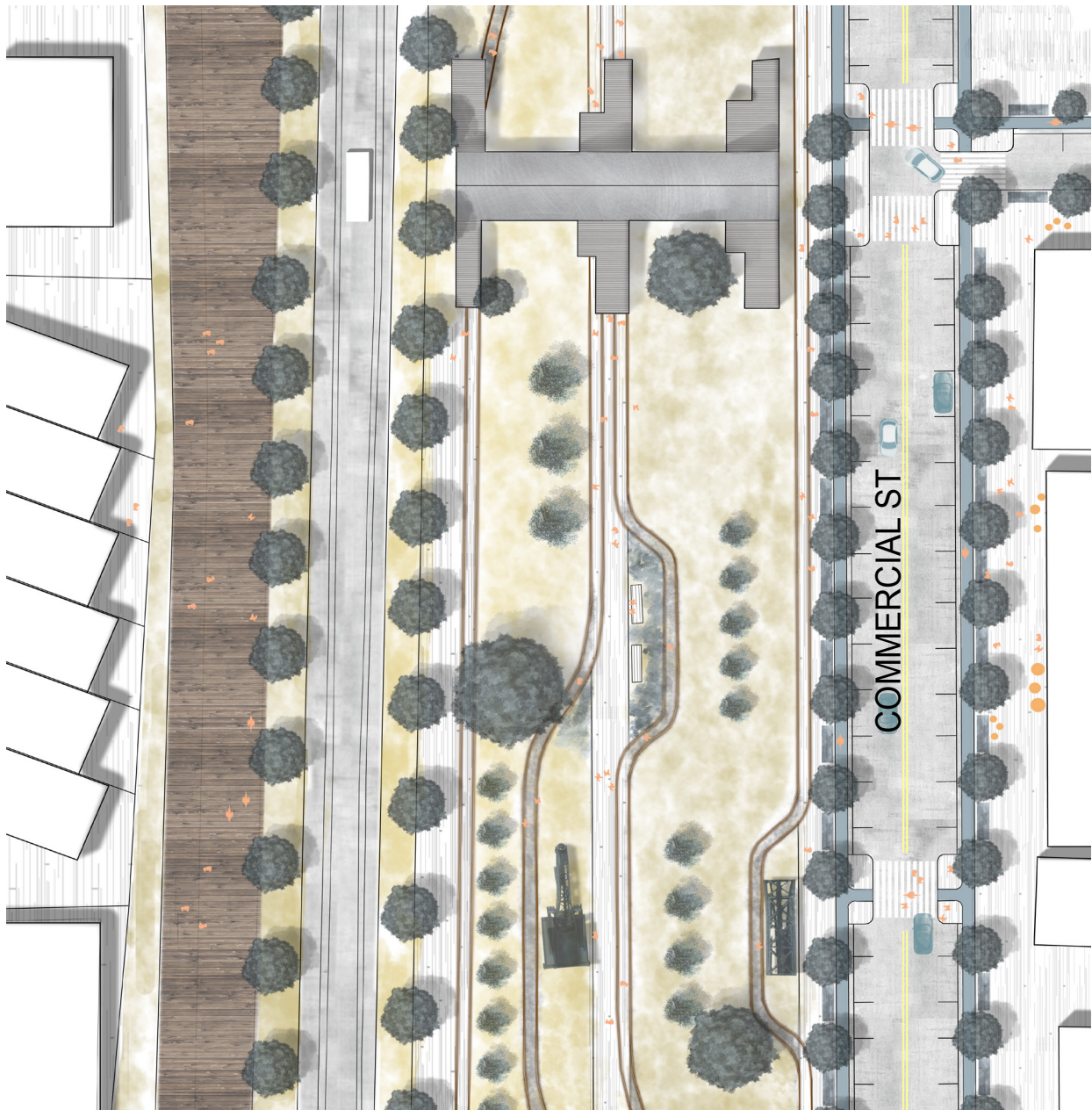
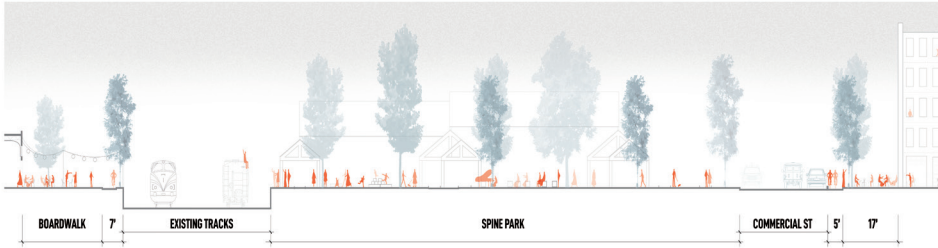
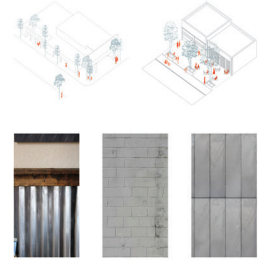


Figure 111: Spine transit shell



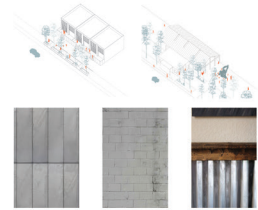
TRANSIT SHELTER SPINE SECTION @ 1/8" = 1' 0"



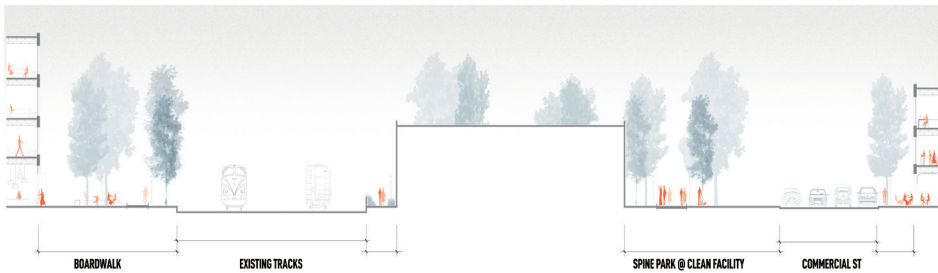
TYPLOGIES & SWATCHES



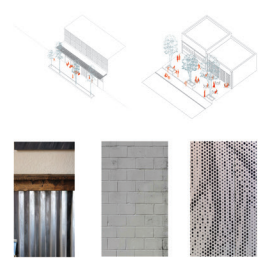
SPINE SECTION TYP. @ 1/8" = 1' 0"



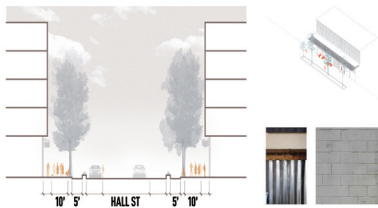
TYPLOGIES & SWATCHES



CLEAN FACILITY SECTION @ 1/8" = 1' 0"



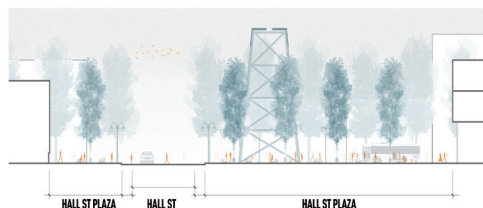
TYPLOGIES & SWATCHES



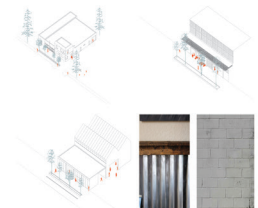
HALL STREET SECTION @ 1/8" = 1' 0"



TYPLOGIES & SWATCHES



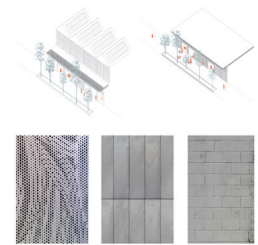
HALL STREET PLAZA SECTION @ 1/8" = 1' 0"



TYPLOGIES & SWATCHES



PROPOSED MAX STOP AND OMF FACILITY @ 1/8" = 1' 0"



TYPLOGIES & SWATCHES

Figure 112: Sections, typologies, and swatches



Figure 113: The crane and the train, and the friendly foamers

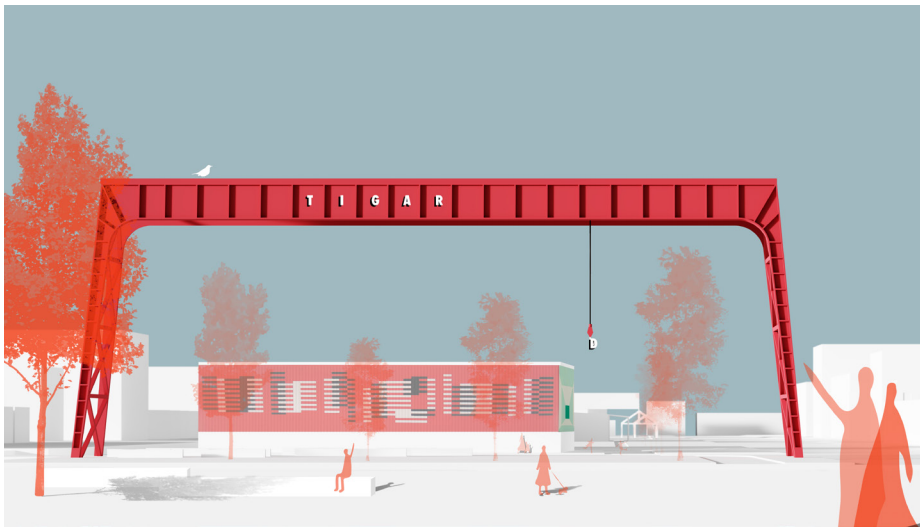


Figure 114: The clean facility and the 70-foot gantry

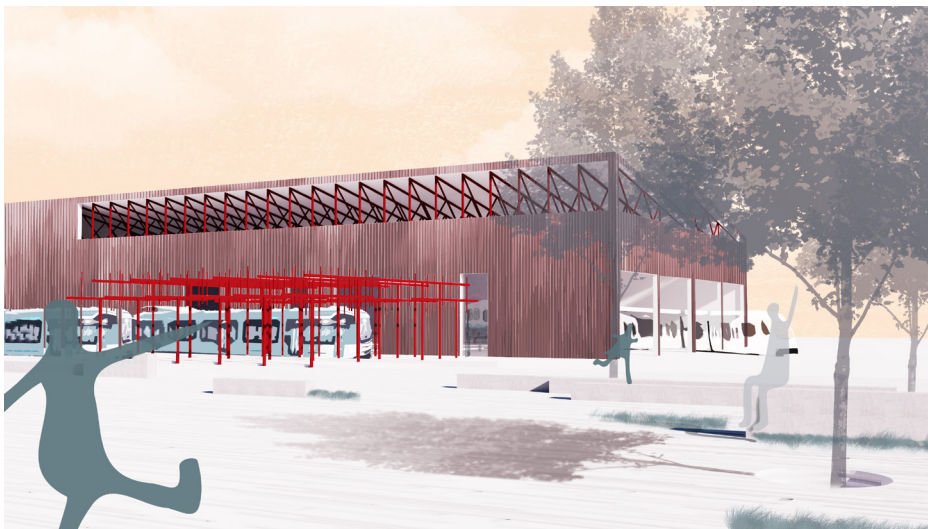


Figure 115: Maintenance theatre on a spring afternoon

Proposal 7: Connecting Corridors

Colton Groves • Shannon Hines • Aidan Pera

As Tigard anticipates the arrival of a new MAX line as part of the Southwest Corridor, it is important to connect existing amenities and build upon recent infrastructure improvements the city has already made. Connecting Corridors embraces the city’s vision for the most walkable city in the Pacific Northwest by linking the core Main Street downtown area with the new transit center at the Hunziker Street alignment south of Hall Boulevard. As part of this link, a pedestrian boardwalk runs along Commercial Street, bringing people to two parks along the ten-minute walk between the station and Main Street. Many of the movement patterns and design features are inspired by Tigard’s deep relationship to its railways, especially its history as a commuter stop along the Oregon Electric Railway Main Line (now owned by the Portland & Western railway, the tracks that carry the WES commuter line). To create a safer crossing over the Portland & Western railroad—and to bring people to city hall’s front door—Hall Boulevard is realigned, creating an opportunity for a new civic center with recreation amenities and a community center. The MAX station park bridges Hall Boulevard by creating a gateway at the intersection of Commercial Street and Hall Boulevard with street improvements, increasing pedestrian and cyclist safety. With the new development around the station, the Hall-Station park allows downtown Tigard to expand economically without removing the existing character of Main Street. The transit center is reimagined as a vibrant place with active unloading and loading zones on the street and a zone for bus layover behind retail space. At the intersection of Commercial and Ash Streets, there is a new park with food carts, seating areas, and a community garden. Here, there is an opportunity to display historic rail cars to celebrate the adjacent railway. The core idea of our scheme is to maintain existing amenities and focus resources on Connecting Corridors that improve connectivity between these amenities and the MAX station, and use that improved infrastructure as an opportunity for economic expansion.

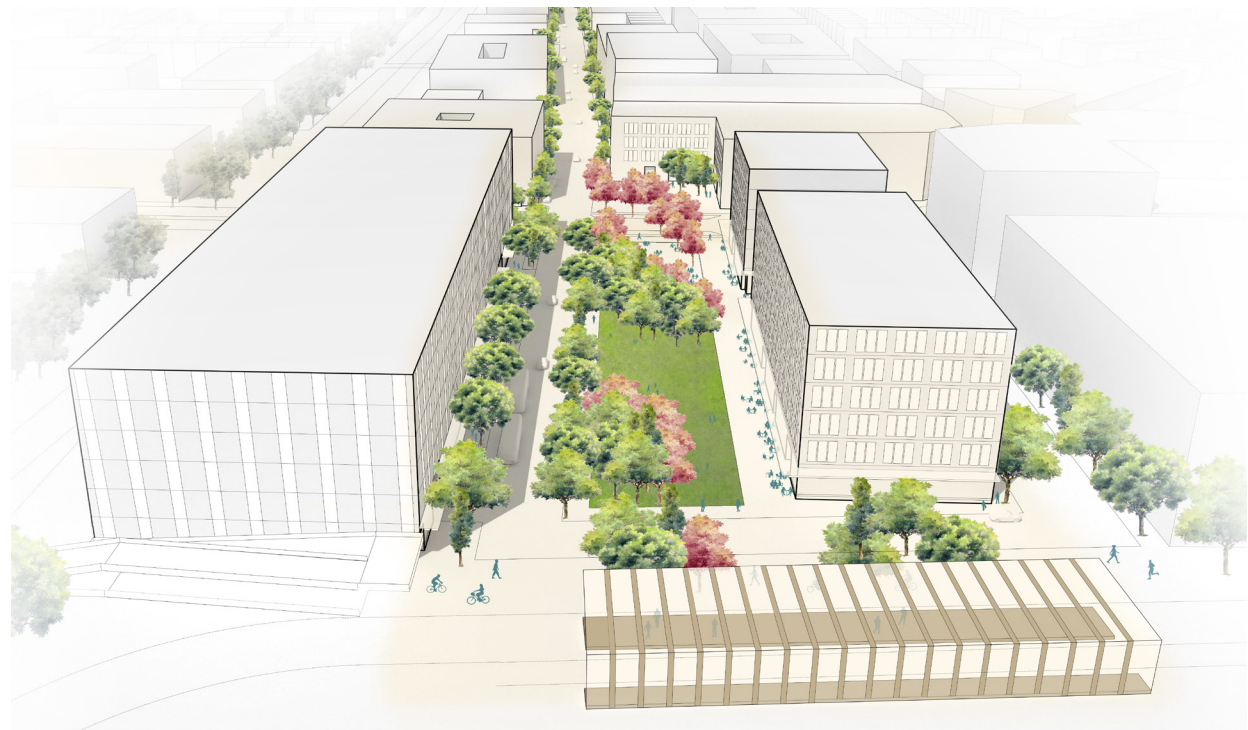


Figure 116: Connecting Corridors perspective

Goals and Precedents

The objectives of this scheme are to provide multi-modal connectivity between existing amenities and the new MAX station, fill the major connecting corridors with mixed-use development to increase economic growth, and celebrate railways as an essential part of Tigard's history, present, and future.

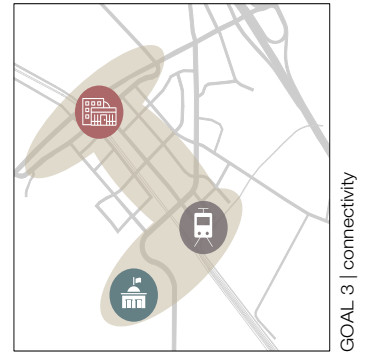
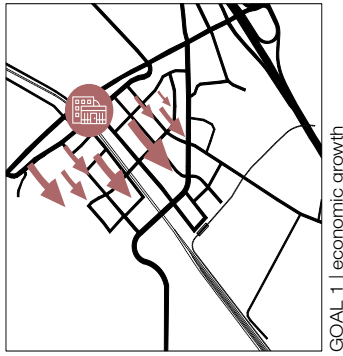
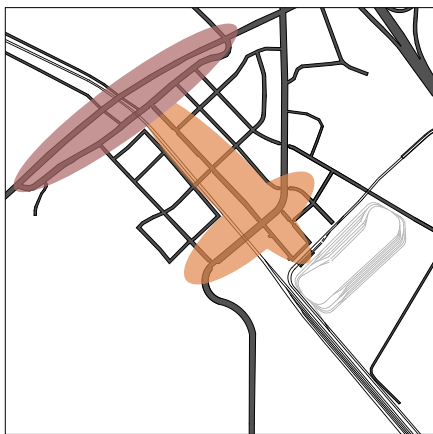


Figure 117: Project goals.











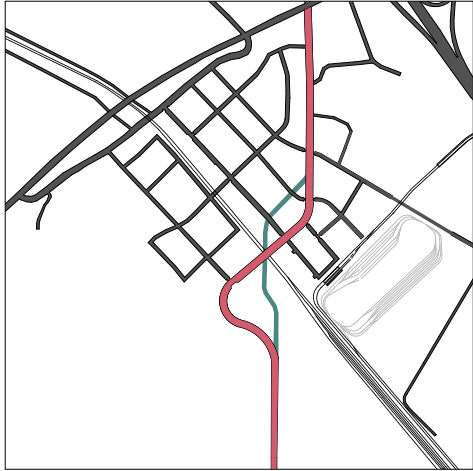
	COMMERCIAL		GREEN SPACE
	MIXED USE OFFICE		CIVIC
	MIXED USE RESIDENTIAL		INDUSTRIAL
	RESIDENTIAL		TRANSIT

Figure 118: Street and land use diagrams



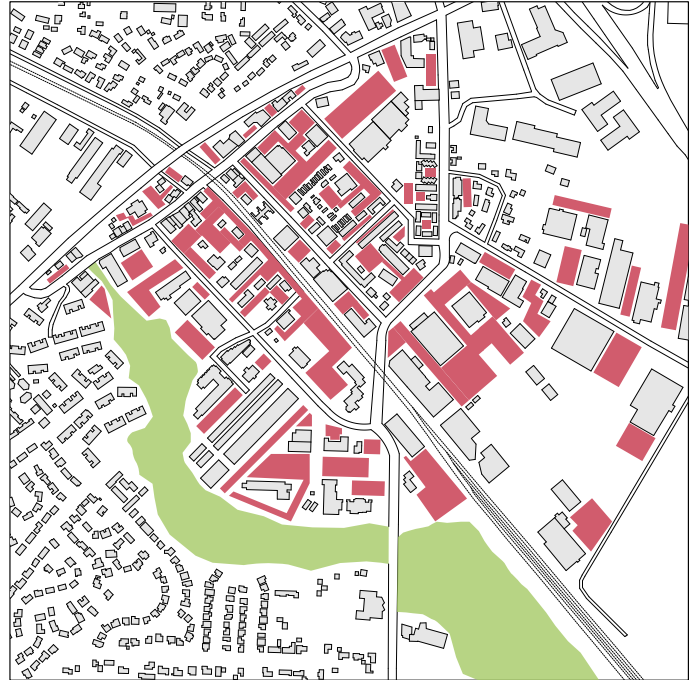
HALL REALIGNMENT



PROPOSED STREETS



BIKE PATHS



EXISTING SURFACE PARKING



■ SURFACE PARKING ■ DISTRICT PARKING

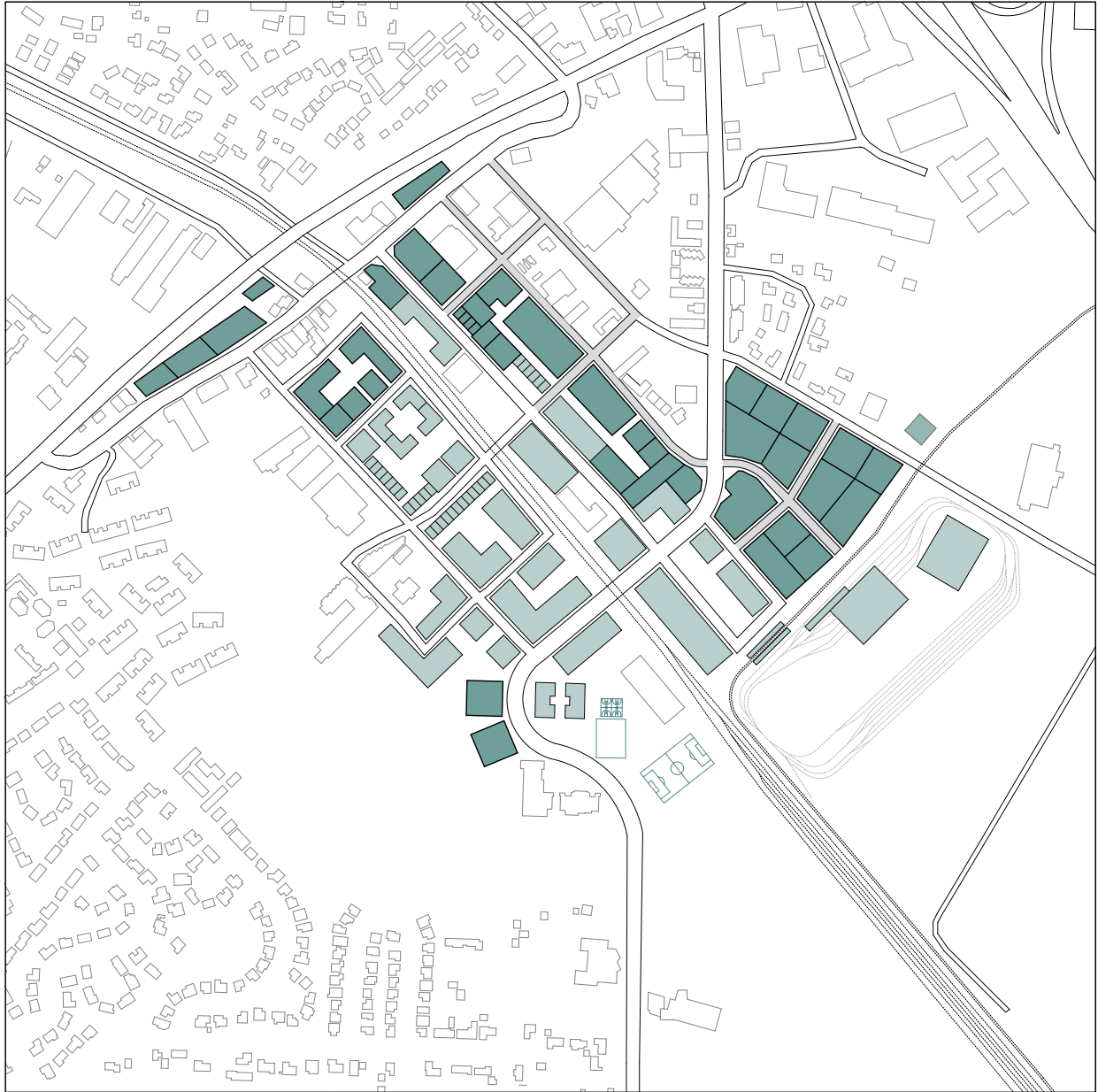
Figure 120: Existing and proposed parking maps

Figure 119: Connectivity maps



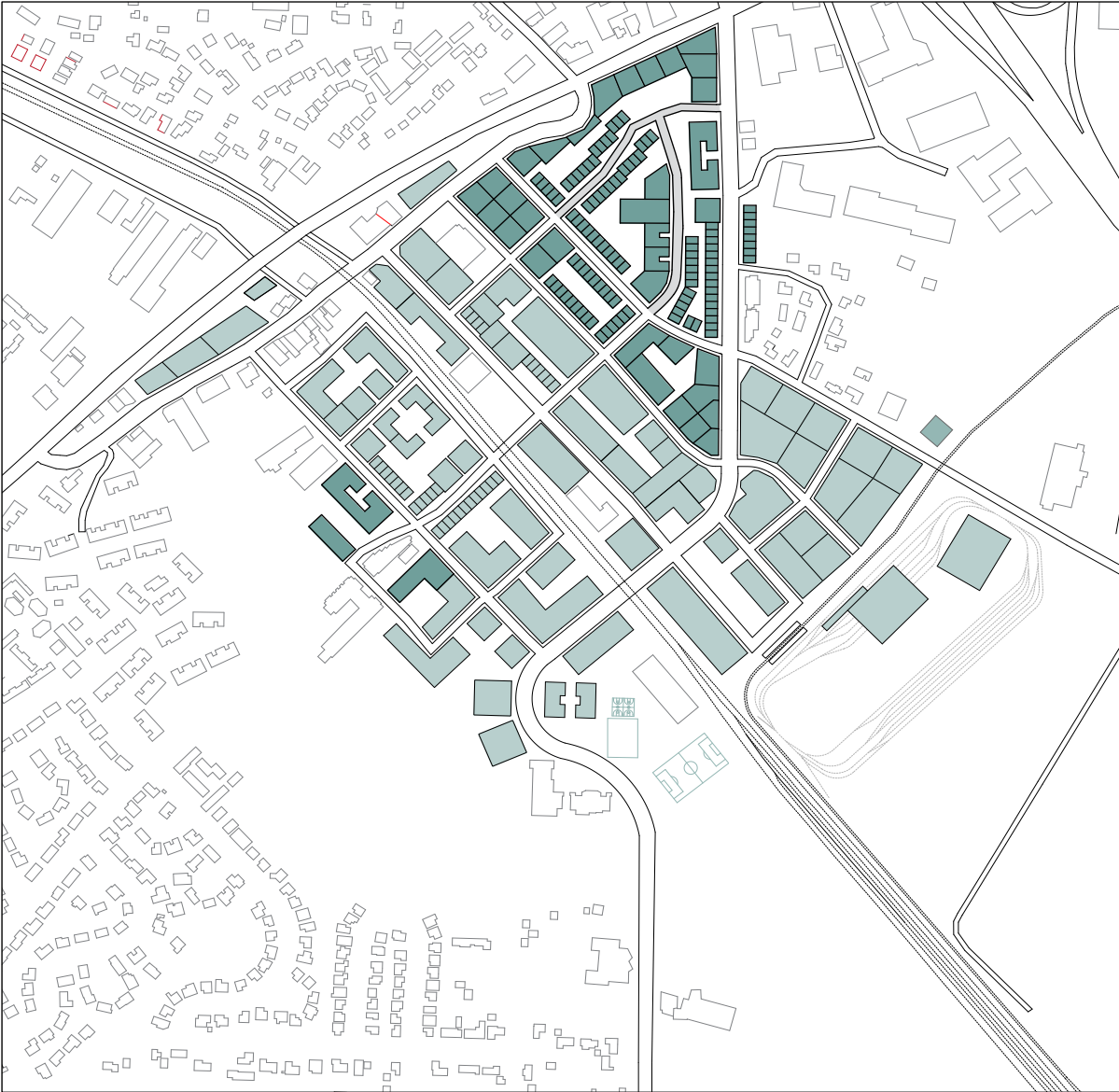
PHASE 1 | infrastructure improvement, realign Hall Blvd, develop affordable housing complexes, infill along Commercial St

Figure 121: Phase 1



PHASE 2 | infill mixed-use along Commercial St,
add streets throughout downtown, redevelop with light industrial

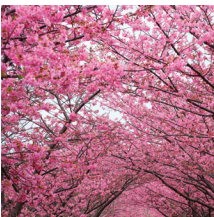
Figure 122: Phase 2



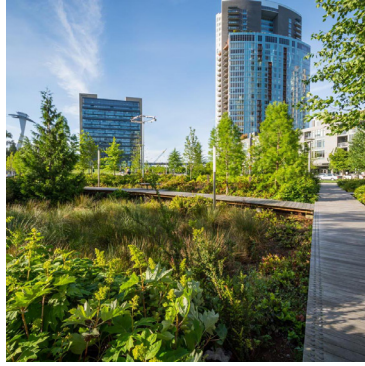
PHASE 3 | infill residential

Figure 123: Phase 3

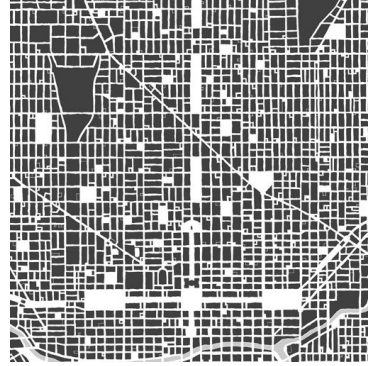
MATERIALS



SUSTAINABILITY STRATEGIES



Vertical complexity



Walkable block structure



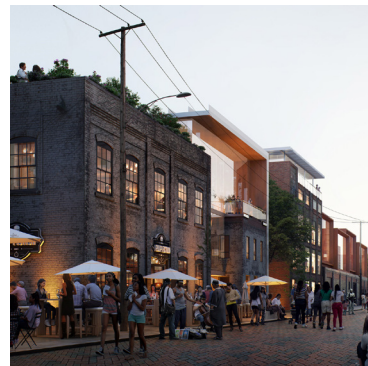
Multi-modal streets



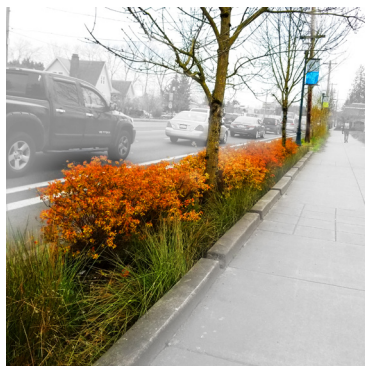
Mixed-use development



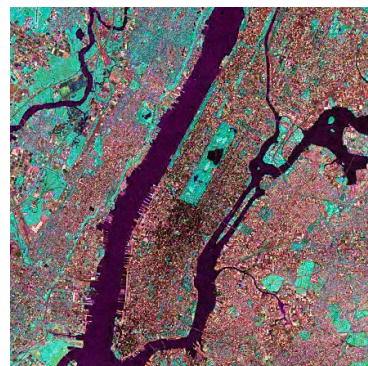
Affordable housing



Street activating building types



Stormwater management



Urban heat island

Figure 124: Materials and sustainability strategies



Connectivity



Residential



Public paths



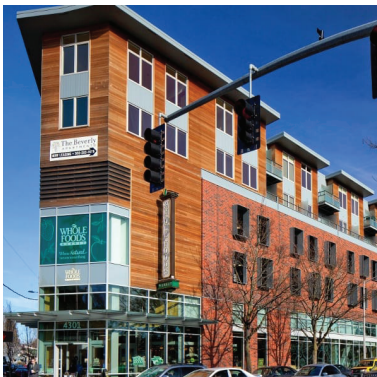
Industrial



Parks



Manufacturing



Retail

Figure 125: Precedent studies

Street Design

Rethinking the streets in Tigard is important to the success of this scheme. The corridors connecting the MAX station to the existing amenities need to be welcoming, safe, and full of activity. To accomplish these ideals, this scheme proposes major changes to Hall Boulevard and Commercial Street. Planting trees along the street edge immediately makes the space more desirable by creating shaded spaces and filtered light. Not only do trees help the streets aesthetically, they also reduce flooding and unwanted runoff. The street trees capture rain and reduce the amount of water reaching the ground, creating less runoff. Bioswales and natural buffers break up the travel lanes in the street and help with managing stormwater as well. Smaller-scaled lighting is implemented to keep the streets safe and comfortable for pedestrians.



Figure 126: Street design connectivity map



Figure 127: Commercial Street plan

Parks and Plazas

Ash Park is designed to be semi-public, as residential townhomes spill out onto the lawn. The gridded lawn creates separation and a sense of ownership of the space, though it is still accessible to the public. Hall Park creates a different atmosphere with its large lawn lined with commercial spaces located across from the station. The two parks are connected by a linear boardwalk, subtly encouraging pedestrians to make their way up the corridor.

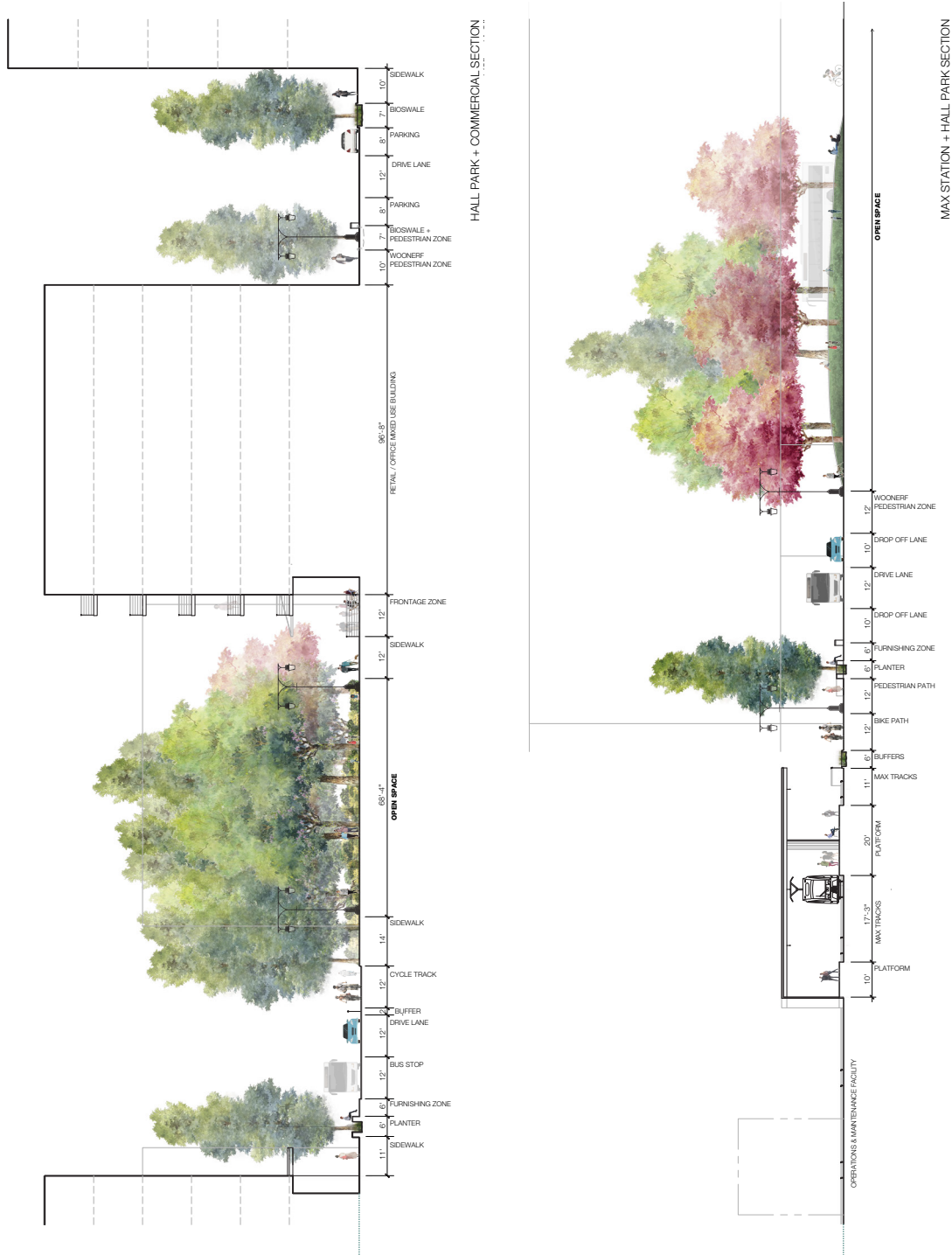


Figure 128: Hall Park sections



ASH PARK

Figure 129: Ash Park site plan

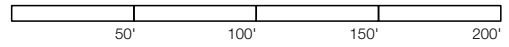
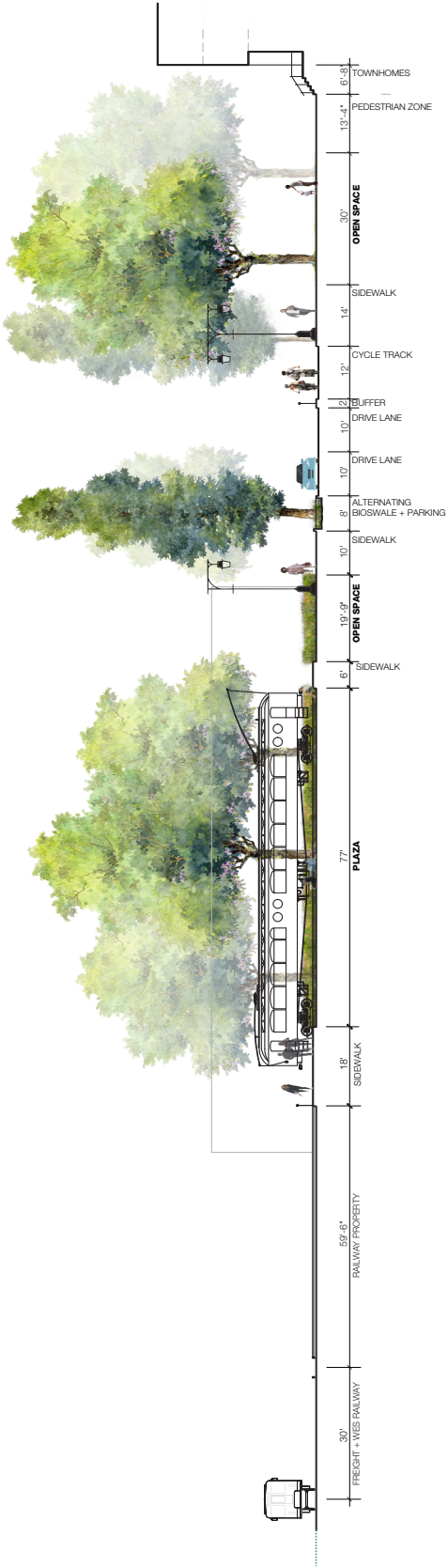




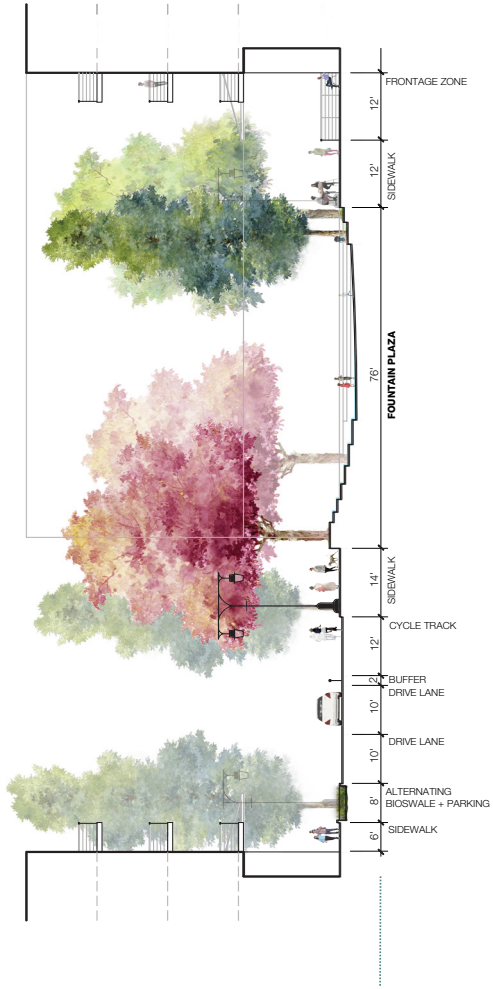
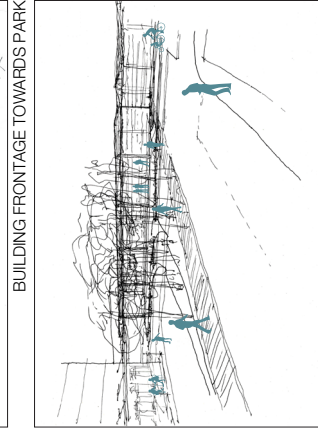
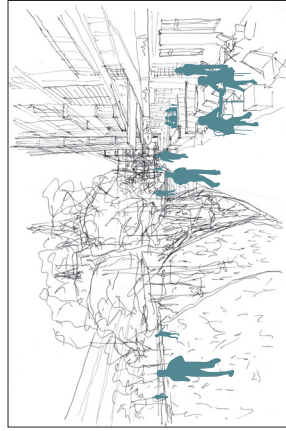
Figure 130: Station Park site plan



Figure 131: Hall Boulevard and Commercial Street sections and plans



ASH PARK + COMMERCIAL SECTION



FOUNTAIN + COMMERCIAL SECTION

Figure 132: Ash Park and Fountain Plaza sections and renderings

Conclusion

The city of Tigard has an exciting opportunity with a new transit line, which has the potential to support population growth and spark new development. This report can serve as a resource and guide as to how to direct that development. Tigard has made strides towards a new downtown district with improvements to Burnham and Main Streets. Sustainable street design elements such as new street trees, bioswales, and bulb-outs show that the city is aware of the benefits of sustainable efforts. The student proposals each have their own design ideas, but common themes are apparent across schemes. Collectively, key ideas include:

- Break down large block structure by introducing new roads and restructuring parcels within the blocks.
- Create a strong connection between the new transit station and the existing commercial district.
- Pay attention to Fanno Creek and the benefit it provides as a natural resource.
- Sustainable street design can become a catalyst for walkability, economic vitality, and successful development.

The goal of this report is to show how sustainable urban design efforts can drastically improve a city. By adopting new forms of sustainable urban design, the city of Tigard can set a precedent for good urbanism and spark change in other cities. Throughout the process it is important to understand the needs and priorities of the people of the community. In order to create a successful development, the amenities should support and improve the established community.

ARCH 407/507

Sustainable Urbanism Seminar

Introduction

Students in the Sustainable Urbanism Architectural Seminar investigated trends and thinking about “Sustainable Urbanism.” Students then performed a site analysis to evaluate the applicability of these trends to the area surrounding the planned site of a new transit stop in downtown Tigard that will be part of the TriMet Southwest Corridor Expansion.

The trends students examined included transportation and land use, water resources, ecology and habitat, energy use and production, and equity and health as outlined in the Sustainable Urban Design Framework (see Appendix A). Each student explored a different element of the framework in depth, generated design recommendations, and identified opportunities for co-benefits with other components of the framework. These recommendations informed the work of the Sustainable Urban Design Studio.

1.11 Robust Transit Networks & 1.12 Robust Bicycle Networks

Energy Use & Greenhouse Gas

Kevin Neuman

Topic Description

Tigard and its surrounding area have an extensive bus network that stretches out into surrounding cities and connects back into Portland to move commuters in and around the area. A robust bicycle network within the city helps move people through the city without causing a large amount of congestion and traffic during peak hours. Bicycle and transit networks offer large energy savings and reduction in greenhouse gas emissions as well as reducing the need for vehicles. If done properly, transit networks function well when incorporated with multiple modes, while safe, well-buffered bike lanes and sidewalks can move people in and around the city to get to these transit networks, further cutting down on the need for vehicular transportation.

Current Conditions

One transit center currently serves Tigard and is positioned near the edge of the city center. Multiple bus lines run through this single stop and allow people to ride around the city of Tigard and neighboring communities and connect to Portland. This transit center is also situated near the WES line, allowing people to transition from bus to commuter rail line easily. However, movement through the city by bus can be difficult because not all areas are serviced due to lower density development that results in reduced transit travel demand. The bicycle network within downtown Tigard is well connected on larger streets with bike lanes, while some smaller streets do not have a designated lane for bicycles. It can also be difficult for Tigard residents to get from their neighborhoods to the city transit center due to some large arterial streets either lacking bike lanes or restricting bike lane crossing access.

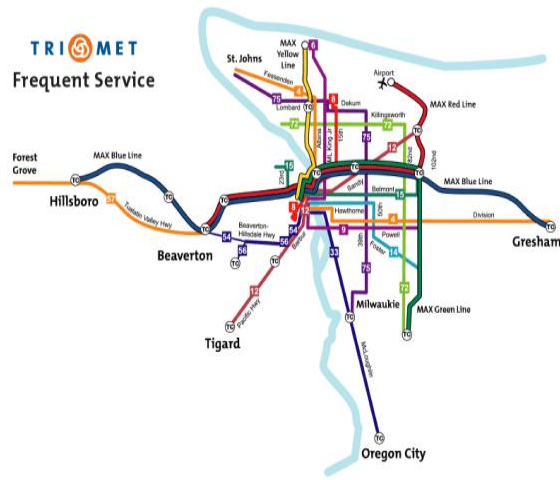


Figure 1: Tigard connection to Portland via bus

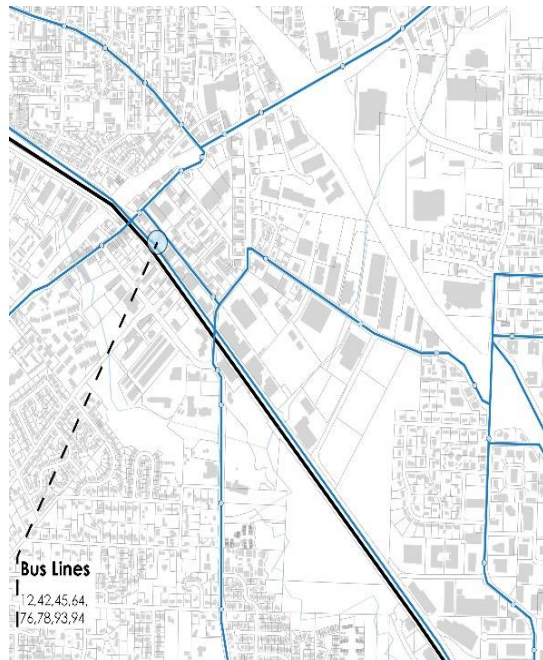


Figure 2: Tigard Transit Center with bus lines

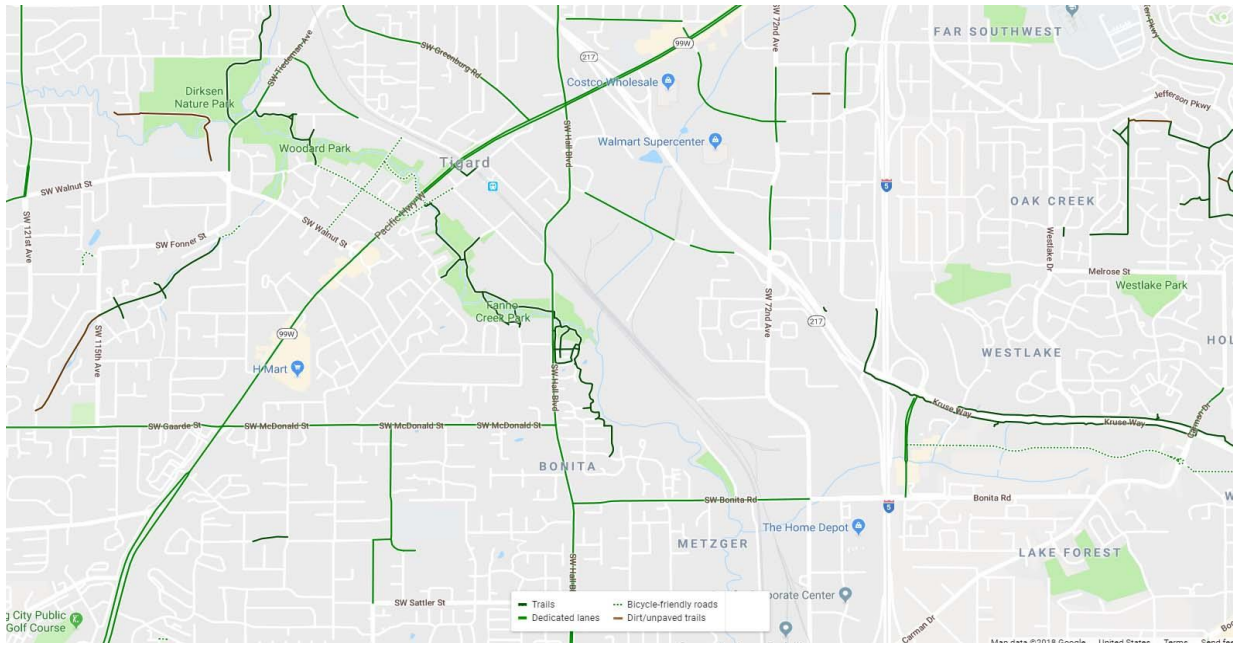


Figure 3: Bike and trail network through Tigard

The overall bike network through the town of Tigard has large arteries that connect neighborhoods to the city center and allow easy connection to the network of trails that run along creeks and streams in the area. These creeks and parks are not connected by trail, so it can be difficult to ride the full length of a park without going onto a major roadway. This may inhibit leisure riding with children. Many of the main roads are not bicycle-friendly because of fast moving cars with no buffer between the automobile and bicyclist. This can make a rider feel unsafe, deterring them from using this mode of transportation around the city.

Transit Suggestions

Robust transit networks rely on large scale cohesion to be efficient enough to be viable for residents to choose these methods over driving personal vehicles. It is imperative that these systems are linked and functioning as intended. The addition of a new MAX line that will stop in Tigard will increase ridership and bring a higher volume of people through the city every day. Incorporating the new MAX stop into the existing transit network and including a park-and-ride in the new transit hub will make it extremely easy for individuals to come into the city of Tigard from surrounding neighborhoods and ride into the city of Portland. This could become a major asset for the city of Tigard if the city starts planning the MAX stop to become a large new transit hub with easy accessibility. If this new network of connected transit options can be connected more closely with the WES that is located a few blocks from the proposed new transit center, the rail line station could eventually be moved to be part of this large transit center. Alternatively, access could be provided through the few blocks that currently separate the two modes of transportation to make it more integrated. This would then create a strong connection through the southwest corridor into Tigard and back to the city of Portland.



Figure 4: Existing bike lane on Hall Boulevard

Bicycle Network Suggestions

The existing network of bikeable streets could be improved by connecting street and trail networks to fully integrate the system. Many smaller streets could add bike lanes for ease of access through the city, and the addition of bike lanes to arterial streets would allow commuters to ride directly from their homes to the new transit hub at the city center of Tigard. Proactively providing buffers on streets with heavy traffic would protect the bicyclists and provide a sense of safety to make it more comfortable for all riders. The redevelopment of SW Hall Boulevard due to the MAX line may facilitate the addition of small features to accomplish this. Furthermore, new bike networks along Pacific Highway N could connect nearby residential areas into the city center and incorporate new transit networks.

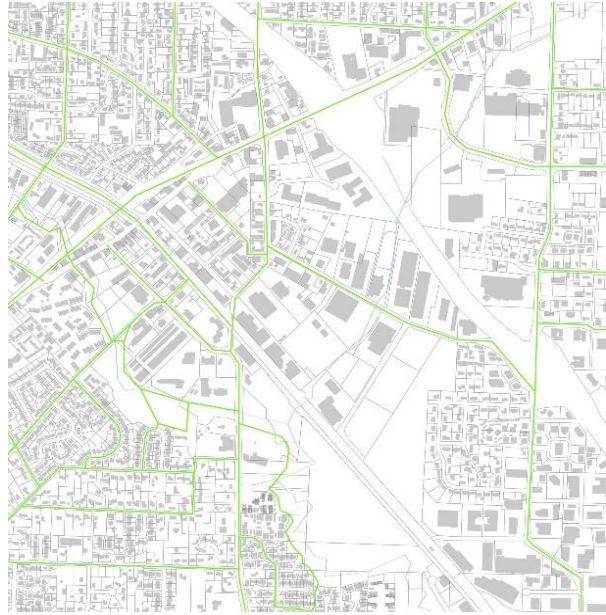


Figure 5: Existing bicycle network

Related Elements / Opportunities for Co-Benefits

Compact Development: Mixed-use high density produces more efficient/effective transit networks.

Multimodal Street Design: Can help with the productivity and connectivity in street design incorporating transit into existing road networks.

Limiting Motor Vehicle Impact: The more people taking public transit is directly correlated to fewer individuals driving automobiles for transportation.

Macro/Micro Parking Management: The more people taking public transit, the less need for parking due to the decrease of automobile users.

Extensive Green Stormwater Management: Transit stops on the side of roads can become a place for trees, permeable materials, or passive stormwater management practices.

Vehicular Network

Design for Ownership & Surveillance: Transit stops and more pedestrians on the streets provide more sets of eyes watch for activity and create safer environments with the introduction of lights around transit stops.

Non-Polluting Lighting Design: Lights designed for enhanced rider visibility.

Micro-habitat creation: Green areas around bicycle and transit stops can produce microclimates along streetscapes.

Active and Attractive Open Space: The addition of bicycle lanes produces more opportunity for physical activity, and more open/attractive areas within street design.

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1.20 Robust Pedestrian Networks

Energy Use & Greenhouse Gas / District & Neighborhood

Cole Knight

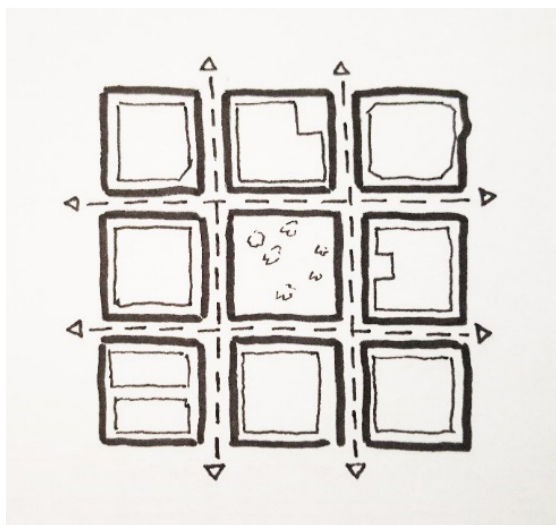
Topic Description

As it pertains to the district and neighborhood scale of urban intervention, the concept of robust pedestrian networks involves two main co-dependent aspects. These two aspects are “Small & Defined Blocks” and “High Network Connectivity.” Network connectivity is the concept of streets being continuous and connected to one another rather than forming dead ends or independent loops. When block sizes are smaller, legibly defined, and arranged via clear patterns of organization, pedestrian experience of space and ease of orientation is greatly increased. Ensuring high levels of connectivity through a network of these pedestrian-scaled blocks promotes wayfinding and creates efficient pedestrian travel routes.

Current Conditions

The current condition of Tigard’s block grain is illustrated by the block figure ground study below. The residential neighborhoods on the borders of the illustration show some level of fine grain block size. However, in these residential areas the block definition is loose and irregular. Street connectivity in these areas is lacking due to the occurrence of dead end paths and dependence on select through streets. These factors could make pedestrian navigation through the surrounding residential areas disorienting and inefficient.

Block definition in the area expanding from the new transit stop to the finer-grained residential areas is shown in red in the diagram below. This portion of Tigard is composed of a large, automobile-oriented block layout. The transportation network relies primarily on a few major roadways for travel through the area. The scale and arrangement of these block is inefficient for pedestrian travel; this is compounded by the highway and rail line that pose additional obstacles to pedestrian navigation.



Block Definition & Street Connectivity Diagram



Portland
1"=2,000' 500' 1,000' 2,000' 3,000'



Tigard
 1"=2,000' 500' 1,000' 2,000' 3,000'
 Block Definition Surrounding Transit



Tigard
 1"=2,000' 500' 1,000' 2,000' 3,000'
 Potential Block Patterns

Design Guides / Suggestions

- Identify underserved areas of isolation and irregularity. This would largely pertain to the portions of residential blocks that lack efficient and straightforward travel routes to the transit stop. These areas require pedestrians to take meandering paths or travel extra distances to reach their destinations.

- Identify potential block patterns and frameworks for developing. Identifying existing block pattern frameworks allows for repetition. This could yield some level or regularity and continuous axial connection, thus improving wayfinding.

- Strategically add pedestrian-friendly roads.

The previous steps allow for the strategic addition of roadways in locations where they will best serve the surrounding areas. Additional roads may be utilized to break up mega-blocks and make connection through existing land barriers.

- Add alleys, pedestrian paths, and easements.

Similar to the addition of roads, alleys and pedestrian paths may bolster network connectivity. Pedestrian paths have the benefit of being more spatially economic and less capital intensive, making them a feasible choice where conditions would prohibit the construction of roadways.



Related Elements / Opportunities for Co-Benefits

- 1.10 Compact Development:** Finer block grains facilitate compact development.
- 1.13 Balanced Vehicular Networks:** Blocks are formed by street networks. Finer block grains yield higher street counts that disperse automotive activity.
- 1.202 High Network Connectivity:** Smaller blocks create a finer connectivity network.
- 1.21 High Density Zoning & Platting:** Smaller blocks yield smaller parcels.
- 1.21 High Density Zoning & Platting (Building Density):** Smaller blocks and parcels facilitate dense development.
- 1.31 Dense & Street-Activating Building Typologies (Public Realm Design):** Finer block grain creates a more human-scaled pedestrian environment.
- 5.11 Equitable Distribution of Uses & Services:** Smaller blocks sizes and better network connectivity facilitates compact development and eases mobility, thus improving the accessibility of urban amenities such as food and healthcare.

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1.22 Macro Parking Management & Design

Energy Use & Greenhouse Gas / District & Neighborhood

Sabrina Ortiz Luna

Topic Description

Macro parking management and design pertains to the amount, distribution, and management of parking in the design of a district or neighborhood. Although we view cars as a detrimental catalyst for urban design as they relate to pedestrians, cars will remain an important part of our livelihood because they support local, regional, and global economic and social activities of merchants and residents. The problem arises when we fail to manage parking properly at the macro scale by providing large amounts of free and unregulated parking that lead to increased car dependency. The aim cannot be to eliminate parking from a neighborhood. Instead, parking ratios should be decreased to encourage other transportation options. If we want to fulfill Tigard's vision to "become the most walkable community in the Pacific Northwest where people of all ages and abilities enjoy healthy and interconnected lives," then we should focus on designing multi-modal networks that balance the use of vehicles and provide people with options and access to other forms of transportation.



Figure 1: Mayor John Cook opening free parking lot in downtown Tigard in 2013. Image taken from Oregon Live, July 2013

Current Conditions

Currently, Tigard does not have any paid parking in the downtown area. Tigard has a history of providing free and plentiful parking in the area. In fact, in 2013, when the Main Street Green Street project displaced parking on Main Street, the city built a free parking lot on city-owned property without a time limit to make up for the spots that were lost. Despite being a major transfer center, the city of Tigard is still very dominated by cars and the wide availability of free parking. Driving is often viewed as a marginal expense because car payments and insurance are sunk costs, so we only consider parking fees and fuel charges. Thus, free parking encourages driving over other modes of transportation because it makes it the most convenient option due to the perceived lower upfront price. For this reason, other modes of transportation may not be as widely used as they could be. The surface parking lots that currently exist are shown in red in Figure 2.



Figure 2: Amount of surface parking in downtown Tigard

Parking ratios in the development code of a city can determine how much surface parking can exist. Excessive minimum parking requirements reinforce the notion that parking should be widely available and therefore creates conditions in which parking dominates the open space of a city, which in turn creates unappealing places for pedestrians. As shown in Figure. 2, parking ratios can be a very dramatic guide for the area surrounding a building. The current parking ratios of general uses in Tigard’s downtown are listed on Table 1. These ratios are very reasonable for new construction. Tigard revised its code at the end of 2017 to reflect its efforts to create the most walkable city in the Pacific Northwest. However, it will still be important to consider the existing parking availability and how a district parking approach might create opportunities to redistribute existing parking.

Use	Downtown
Multifamily	1 space per unit
New Commercial up to 20,000 sf	No requirements – 1 space per dwelling if Multi-family
Office	2 spaces per 1,000 sf
Industrial – Manufacturing and Production	1.2 per 1000 sf
Eating and Drinking Establishments	5.25 per 1000 sf (Fast Food) 6.75 per 1000 sf (Others)
Retail	2.25 per 1000 sf (Sales) 1.875 per 1000 sf (Services)

Table 1: General parking ratios in downtown Tigard from Tigard Development Code 18.310

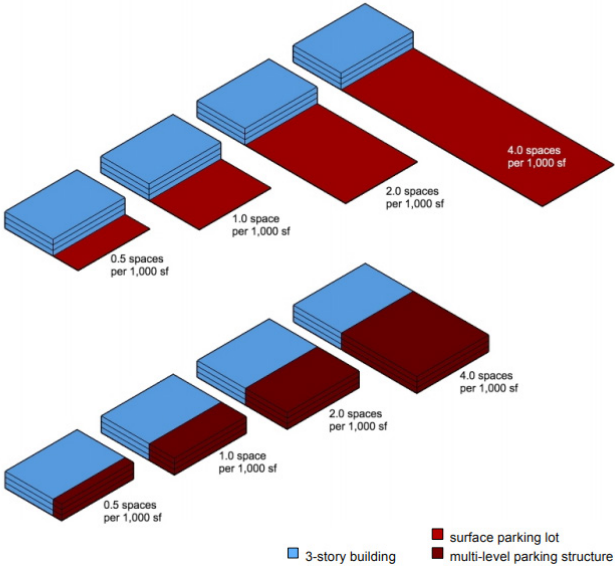


Figure 3. Land use balance depending on parking ratios for the same sized building

Downtown Tigard offers a variety of on-street parking with varying time limits, especially surrounding the transit center. As Figure 4 demonstrates, on-street parking is used extensively, which helps improve walkability by using parking as a buffer for traffic. This is a good way of utilizing parking to encourage another mode of transportation such as walking. Figure 4 also indicates that “bike parking is plentiful along Main Street.” This is a great resource to provide for the city because it can encourage bike use. Despite some of these positive conditions, the convenience of parking in downtown Tigard continues to make driving the most convenient form of transportation in the area. As the city begins to plan for the new MAX line, it will be important to consider parking management to encourage more transit ridership.

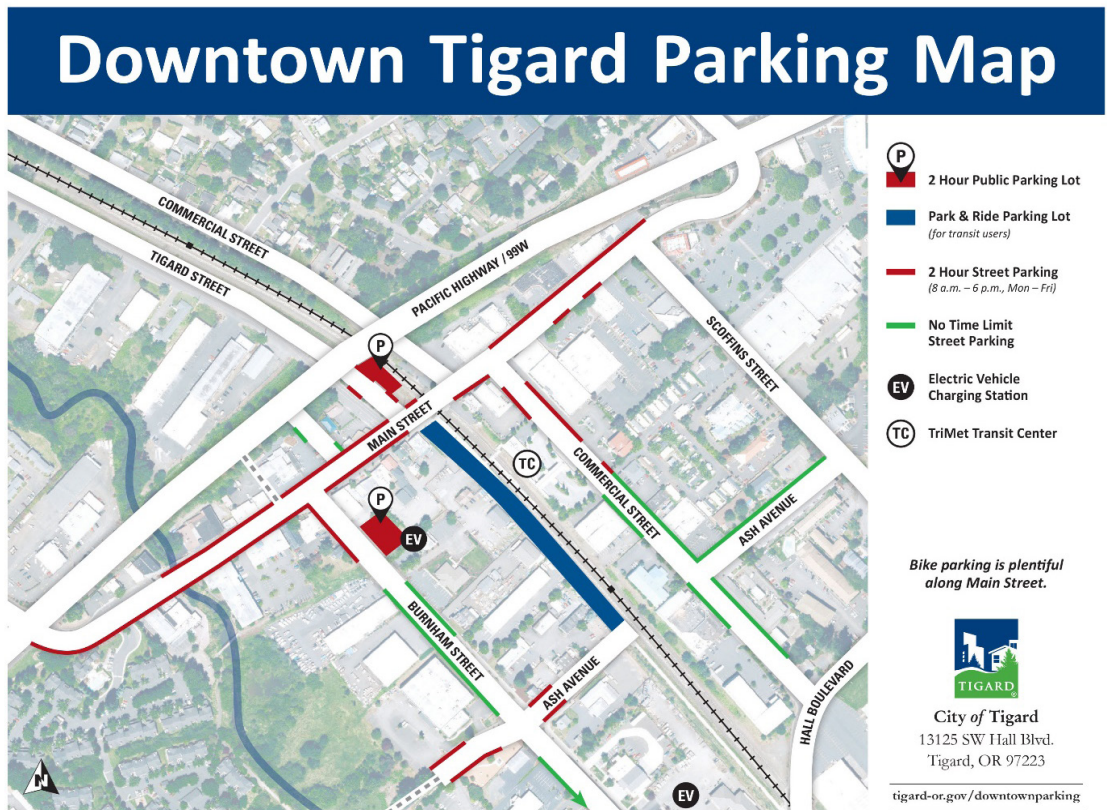


Figure 4: Existing parking policies in downtown Tigard from the city of Tigard’s website

Related Topics

1.20 Robust pedestrian networks: “Robust pedestrian networks” mean that continuous pedestrian paths connect pedestrians to destinations within a neighborhood, district, or city. Large amounts of parking, particularly surface parking, is detrimental to these pedestrian networks because they expand distances between destinations. Even when these distances are not too long, parking creates empty, uninteresting spaces that discourage people from walking. Macro parking management could provide district-wide strategies to mitigate the damage to pedestrian networks by reducing the amount of surface parking required and ensuring connectivity of pedestrian paths.

1.40 Engaged building and street relationship: An engaged building and street relationship refers to the activated space that is created when a building can interact with the street and pedestrians. Street and building relationships can create pleasant and interesting environments for pedestrian and bicyclists, but when there is too much parking separating the two, that relationship can be negatively affected. If these relationships are not strong enough to create a pleasant environment for pedestrians, it is likely to discourage other non-driving modes of transportation. Careful macro parking management could provide guidelines for better parking ratios and options to preserve the engaged relationship between building and street.

2.20 Robust stormwater management network: A robust stormwater management network means that a district has a strong stormwater system to manage stormwater so that runoff does not pollute water sources. Parking lots are generally large areas of impervious surface that create fast-moving, dirty runoff. When this runoff is not managed, it can travel quickly, straining existing stormwater infrastructure and polluting ecological areas such as Fanno Creek in Tigard. When designed properly, parking lots have the opportunity to be sites for green stormwater infrastructure that uses natural elements to slow down runoff and clean it before it enters back into creeks or aquifers. Macro parking management could encourage robust green stormwater networks in the parking lots of a district.

3.34 Nonpolluting lighting design: Parking lot lighting can have damaging effects when it spills into ecological habitats nearby. Macro parking management can inform parking designs with non-polluting lighting.

5.32 Affordable housing strategies: Parking requirements are a great expense for developers, especially when the parking will be provided free of charge. Reducing and managing these requirements could lead to more feasibility of housing projects and therefore help drive down the affordability of those developments. This could ensure that the city of Tigard can provide affordable housing for its residents.

1.11 Robust transit network - parking: The parking required for a robust transit network refers to the park-and-ride lots that serve bus, train, and future MAX stations in Tigard. Macro parking management may ensure that this parking is well-connected to transit so that it encourages multi-modal connectivity.

1.30 Multimodal street design: Cars are vital to the livelihood of a city because they support local, regional, and global economic and social activity of merchants and residents. Parking, therefore, is necessary for a city to thrive. However, the goal of parking should be to encourage multimodal street design so that driving does not become the only mode that can work in a city and open up opportunities for pedestrian and bicycle activity.

Design Guides / Suggestions

Parking Management should achieve two key goals:

1. Reduce the amount of parking used to serve a population.
2. Improve the efficiency of parking use.

The following are some suggestions for approaches to managing the parking in Tigard while also ensuring that the people of Tigard have the amenities and accessibility that they need.

1. Tigard should consider introducing carshare vehicles that could give people an alternative to having a personal vehicle (Figure 5).



Figure 5: Car2go is an example of carsharing

2. The city could designate carpool parking to encourage people to share rides, thus maximizing the number of people that can be served by a parking lot (Figure 6).



Figure 6: Designated carpool spots could encourage ride sharing

3. Increasing bike parking past Main Street could encourage more biking as a mode of transportation by making it a more convenient option for commuters (Figure 7).



Figure 7: Bike parking

4. Implementing smart parking technology could optimize available parking and give people the added convenience of knowing where parking is available and how much it costs (Figure 8).



Figure 8: Smart parking technology

5. District parking would consider sharing private parking lots with adjacent uses. District parking could optimize parking allocation by distributing it throughout the city or sharing parking based on peak demands. Currently, Tigard code 18.310.070 specifies that “Parking spaces in the public street or alley shall not be eligible as fulfilling any part of the parking requirement,” which increases the requirements for off-street parking. Considering opening up opportunities for district parking could help minimize the empty, unappealing space created by parking lots.

6. Lastly, although current downtown parking ratios are low, it would be beneficial for the city to consider further lowering or eliminating them for certain uses. This could help avoid over-supplying of parking spaces. This consideration will be particularly important as a new MAX station is introduced because a decrease in parking would make light rail transportation more appealing, thus maximizing travel mode options.

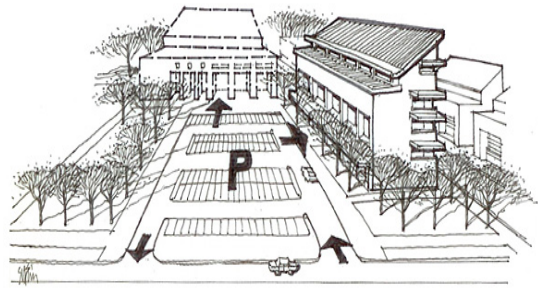


Figure 9: District or shared parking

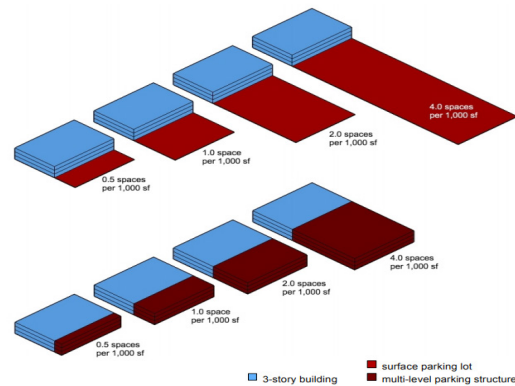


Figure 10: Building-to-parking proportions depending on parking ratios

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1.23 High Micro Scale Land Use Mix

Energy Use and Greenhouse Gas / District and Neighborhood

Douglas Greene

Topic Description

High micro scale land use mix is a development pattern at the district or neighborhood scale that promotes a diversity of activity. Developing land in this way can decrease the need for automobiles because they are located within proximity to each other.

Current Conditions

The downtown district in Tigard, Oregon is currently divided into five distinct character types, each intended to serve a necessary purpose of everyday life.

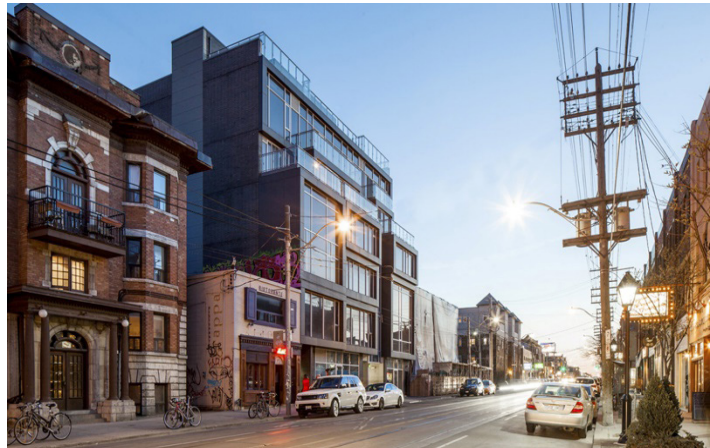


Figure 1: Building-to-parking proportions depending on parking ratios

Industrial and office buildings ring the northeastern edge of downtown, within a short walk of the traditional Main Street that bustles with shops and small businesses. Low density residential structures surround the downtown in typical suburban-style neighborhoods, and a small community of residents inhabits a naturally occurring affordable housing district near the center of downtown.

Main Street in downtown Tigard was originally developed at a time before the automobile was prevalent in the culture. However, much of the rest of downtown was developed to suit the needs of personal vehicles. This has led to a neighborhood that does not score well overall as a high micro scale land use mix development.

A way to productively use the principle of high micro scale land use mix is to create a place that is walkable. Although the entire district itself is within a comfortable walking distance, the lack of pedestrian magnets damages the desirability of this area for walkability. The existing businesses found here, such as restaurants, barbershops, places of worship, and a local bank, offer a few magnets, but the lack of vertical mixed-use and the location of most residents beyond the edge of the downtown district means there are few locals to use these businesses.

A major advantage of downtown Tigard is its high level of accessibility to public transit. This area has an above-average influx of potential pedestrians that would engage if more magnets were available.



Figure 2: An existing low density mixed-use area in downtown Tigard

Design Guides / Suggestions

Downtown Tigard has great potential to capitalize from high micro scale land use mix. The downtown serves as a hub of transfers for the southwest Portland suburbs, which presents opportunities to serve people from a wide swath of populations as they commute daily.

1. Develop higher density mixed-use projects to provide a larger population base for the neighborhood.
2. Establish businesses that provide necessities for the community such as supermarkets, hardware stores, dry cleaning services, and markets.
3. Provide social or physical uses that may be marketed both to locals and daily commuters for activity such as gyms, community centers, museums, and theaters.
4. This community may be able to support more shops such as book stores, florists, and clothing sellers.
5. Introduce institutions that are beneficial for the community such as schools, daycare facilities, senior care facilities, libraries, parks, and medical professional offices.
6. Densify surface parking into a stacked garage and provide adjacent pedestrian magnets.
7. Develop industrial zoning for emerging economies such as web development, marketing, medical device production, and craft or artisanal goods.
8. Embrace the diverse character of the neighborhood, allowing for equitable development of business and generating a more walkable district holistically.

Related Elements / Opportunities for Co-Benefits (if possible)

Influences:

1.10 Compact Development: Higher density buildings allow for projects to be catalytic.

1.12 Robust Bicycle Networks: Mixed-use development can connect with other regional bicycle transit networks.

1.30 Multimodal Street Design: Neighborhood has access to a variety of transit options with potential for more growth.

1.31 Dense & Street Activating Building Typologies Building Street Interaction: Increasing density and varying typologies that engage the street will engage the public and promote new business.

1.40 Engaged Building and Street Relationship: People on the street creates interest for others to engage and explore.

4.21 Block Size & Street Orientation for Micro Climate Mitigation: Creates pleasant spaces where the street can become activated.

5.10 Compact Development: Increases accessibility to essential resources.

5.11 Equitable Distribution of Uses & Services: Increases access to resources for local affordable housing development and others who may be limited to public transit as their sole transportation option.

Influenced by:

1.10 Compact Development: Compact development begets compact development, increasing desirability to continue this trend.

1.11 Robust Transit Networks: This area is rich in transit resources, making it a great candidate for further micro scale land use mix.

1.13 Balanced Vehicle Networks: This area has good transit, allowing locals to divest or offset their personal vehicle use.

1.30 Multimodal Street Design: If this is promoted, it will increase desirability for new business because more people will be on the street.

1.41 High Internal & External Connectivity High Network Connectivity: This neighborhood has good access to many parts of the city by transit and highway.

Water, ecology, and energy use can be optimized through increased density and increasing walkability. Sensitive approaches can protect existing resources and improve the health of the Tigard ecosystem and its citizens alike. These features, especially approaches to ecology and habitat such as high urban forest connectivity, high surface permeability, non-polluting lighting design, and robust ecological buffers can make an area more aesthetically desirable, promoting walkability and increasing mixed-use.

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1.301 Walkable Streets

Energy Use & Greenhouse Gas / Block & Street

Emily Buckberg

Topic Description

While walkability is often a goal of urban development, the exact components that define walkable streets are difficult to pinpoint. It is pedestrian activity that brings life and excitement to an area. Prioritizing pedestrians in plaza and street design often benefits both the ecological and social environments of a city and has the potential to engage space in way that vehicular activity cannot. Pedestrian activity is the beginning and end of all daily trips, and if we prioritize the human experience of cities and urban areas over that of the vehicle, we will be able to provide safe, exciting, and vibrant urban development throughout cities.



Figure 1: Las Ramblas in Barcelona is often considered an exemplary walkable street

Current Conditions

Like most of small-town America, Tigard is a suburb developed as a result of the car. While its historic Main Street is beginning to represent some of the town's goals and values, the majority of Tigard has not yet seen these same improvements. Disregarding the current physical conditions for a moment, the town's current political will and direction is supportive of walkability. The city, after extensive public process, has introduced a goal to become the most walkable city in the Northwest. While their enthusiasm and aspirations are something to be admired, the barrier between the existing street network and the future's thriving, connected network of pedestrian access is currently quite large.

Most of Tigard is currently sidewalk-less. While Main Street and Burnham Street show clear indications of the city's movement toward their goals, much of existing Tigard, especially in the single-family residential areas, not only prioritizes vehicles, it seems to disregard pedestrians altogether. The town's attachment to Fanno Creek Park also indicates a desire for biophilic, pedestrian-friendly activity in the downtown, but access to the park becomes largely segmented by large roads aside from the stretch that runs parallel to Burnham Street. Aside from the large set of WES tracks that runs through the absolute center of the current town, the downtown areas shows promise for pedestrian development. The streets that have been upgraded, primarily Main Street and Burnham Street, use ecological infrastructure such as street trees and bioswales to buffer pedestrians from moving vehicles and use street parking as an additional safety buffer in select locations. Some of the

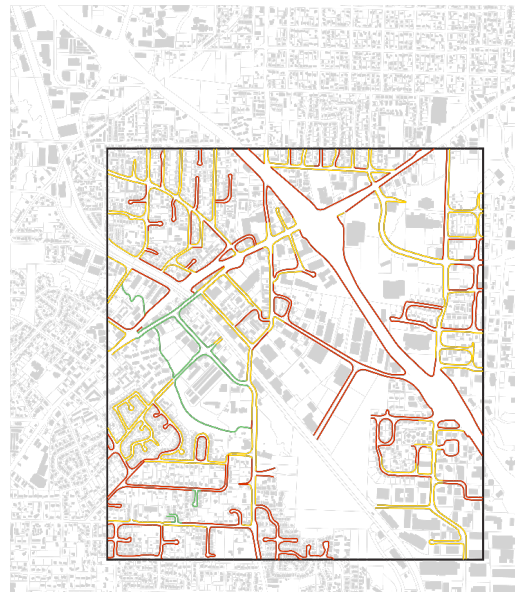


Figure 2: Current sidewalk access in Tigard

more active storefronts along Main Street also utilize furniture such as benches or tables for outdoor dining as buffer zones and are lined with elements such as trash receptacles.

Tigard is already showing pedestrian access improvement. As shown in the diagram above, much of the town is either inaccessible or not prioritized for pedestrians in terms of sidewalk access and human experience. However, the most recent street redesign and development

(Main and Burnham Streets, as referred to earlier) shows great promise as Tigard moves toward its goal of walkability. These streets are abundant in terms of their pedestrian throughway, providing anywhere from 12'-16' for travel space, and have some kind of ecological buffer, either a bioswale or recently planted street tree, separating the pedestrian mobility from the intimidating car activity beyond. Both Main Street and Burnham Street use street parking as an additional safety buffer in select locations. Some of the more active storefronts along Main Street also utilize furniture such as benches or tables for outdoor dining as buffer zones and are lined with elements such as trash receptacles, street lamps, and the occasional street art. Abundant trash cans, while seemingly mundane, prevent littering and facilitate clean and positive pedestrian experiences. Street lighting, especially the relatively human-scale street lamps along the improved streets, create a feeling of safety and security for pedestrians walking at night. These will become abundant as Tigard begins to densify. At primary pedestrian crossings, bulb-outs and clearly marked crosswalks are used to ensure cars travel at a speed safe for pedestrian travel. All of these components will be discussed further in the design section of this analysis. However, the presence of streets like Burnham (Figure 3) show that Tigard has goals of moving toward increased pedestrian connectivity and is currently working to achieve that.

While Burnham and Main Streets are both excellent examples of well-designed pedestrian streets, much of Tigard has not yet followed this example. The areas highlighted in yellow on the pedestrian access diagram (Figure 4) indicate sidewalks on streets that exist but are not pedestrian-focused, usually meaning that while there is a sidewalk present, there is no buffer to increase pedestrian safety and little to no lighting or frontage activity. The areas highlighted in red are street edges that have no sidewalks. This lack of pedestrian prioritization and enjoyment is particularly troubling in the existing downtown area, because it is the area most likely to thrive with some additional consideration and development.



Figure 3: Burnham Street, a recently developed street in Tigard. Photo by Ethan Zagorec-Marks



Figure 4: Tigard Downtown area primed for development

The streets that are prime for pedestrian improvement are Commercial Street, a north-south road which runs perpendicular to Main Street; Scoffins Street, which runs in the same direction; and Hall Boulevard, which is currently owned by the state and runs through the bottom of the downtown core. Hall Boulevard in particular, because it is currently such a major thoroughfare compared to the rest of Tigard, needs to become more pedestrian-friendly if the town wants to realize its goal of creating a truly pedestrian network throughout the city.



Figure 5: Opportunity streets



Figure 6: Current street conditions from left to right - Hall Boulevard, Commercial Street, Hall Boulevard

Design Guides / Suggestions

Tigard has created a framework for its future walkable streets through its redevelopment of Main and Burnham Streets. Through the application of principles used there, as well as select other design elements, the overall walkability and pedestrian experience in Tigard could drastically improve.

1. Increase connectivity through intersections.

The current connectivity in Tigard is limited. Even within the focused downtown area, many streets are only crossable at select points. Limiting connectivity makes the city feel vast and vacant and increases the scale of the area in the minds of pedestrians.

For Hall Boulevard in particular, adding pedestrian crossings that feature elements such as bulb-outs can increase the feeling of safety for pedestrians crossing into any future development south of Hall Boulevard.

2. Improve street frontage along pedestrian routes.

When sidewalks are met with empty seas of asphalt and large swaths of parking on either side, it can distort the scale of the city for those on foot. Creating a more defined street edge on both sides of the street makes the space between the buildings feel more like a defined place and could help reduce some of the anonymity of current Tigard. Applying this particular principle to Hall Boulevard specifically, moving more active retail frontage to the edge of the parcels along the street would activate the pedestrian experience and may help serve the city's goal to feel more walkable.



Figure 7: Existing intersections

3. Base street design on sidewalk zones specified by the National Association of City Transportation Officials (NACTO). NACTO created a street design guide that explains the four different “zones” of streets, including widths for each of the main zones. They are:
 - Frontage Zone (2'-6')
 - Pedestrian Through Zone (minimum 5', preferably 8' or larger)
 - Furniture/Curb Zone (4'-8')
 - Buffer/Enhancement Zone (2'-6')

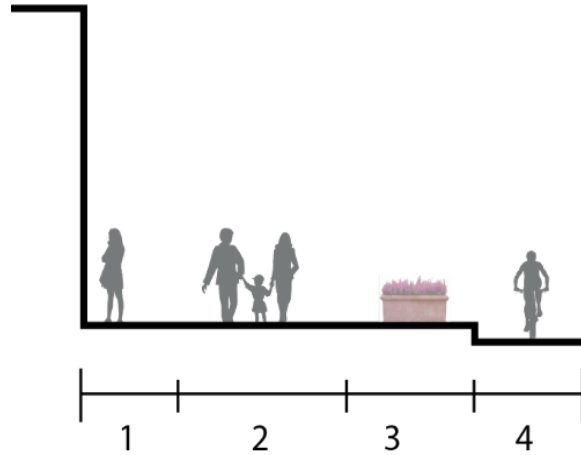


Figure 8: Street broken into NACTO zones

4. Create visual interest along pedestrian corridors. Adding elements like street art or landscaping is another opportunity for improving pedestrian experiences along streets. Currently, Burnham Street is lined with bioswales filled with colorful plant life, and Main Street has art by local artists distributed along sidewalks and hanging from lamp posts. This is a simple way to help define place along the street.

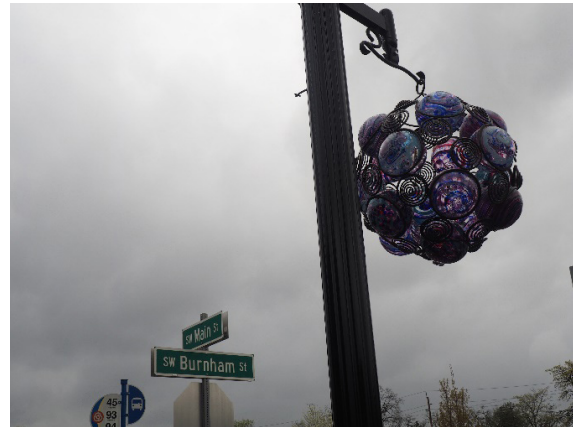


Figure 9: Street art along Main Street

5. Improve sidewalk width. Use information specified by NACTO to increase pedestrian through zone width and make streets more comfortable.

6. Create a buffer between pedestrians and vehicles. While Burnham Street already has this, the rest of Tigard could use an improved buffer between pedestrian activity and vehicular activity. This buffer can include elements such as a bike lane, bioswales, street trees, street furniture, or on-street parking. Even simple elements such as street lamps and trash cans are crucial to ensuring an overall positive experience for pedestrians.



Figure 10: Bioswales as buffer zone along Burnham

7. Ground floor transparency.

Lining the streets with active storefronts is easier when the transparency of the ground floor is substantial. This visual access helps create both a feeling of safety and a sense of place along pedestrian corridors.

8. Include natural elements along pedestrian path.

The principle of biophilic design suggests that human beings feel more comfortable and happier around greenery. Particularly as Tigard becomes denser and more walkable, this will be essential in creating human-friendly spaces and streets. Adding street trees and bioswales or a buffer of hedges and flowers improves biodiversity and human experience along streets.

9. Improve lighting conditions along streets.

Well-lit streets feel safer for pedestrians and help to create the desired walkability throughout areas of Tigard that are currently vehicle priority areas.

Related Elements / Opportunities for Co-Benefits

Within the rest of the Sustainable Urban Design Framework, walkability is an important element that can create symbiotic relationships with other components of sustainable urbanism.

1.201 Small & Defined Blocks: Smaller blocks help improve connectivity and make a variety of amenities feel more accessible to the human scale. Defined blocks help improve the sense of place and feeling of connectivity in urban areas.

1.202 High Network Connectivity: Improving connectivity can make the scale of an area feel more accessible for pedestrians and encourages use of various building types without driving from place to place.

1.23 High Micro Land Use Mix: A mix of building types and programs creates draw for people to spend time in walkable neighborhoods and improves safety through the “eyes on the street” phenomenon. It also helps create the idea of the “complete neighborhood” where every necessary amenity is within walking distance.

1.302 Bike Friendly Streets: Bike lanes can be used as buffers between pedestrians and other modes of transit, and some street furniture is beginning to incorporate bike racks into seating design.

1.303 Design for Transit: Creating a robust transit network that moves people between areas of buzz can improve peoples’ non-vehicular access to walkable neighborhoods and encourage lingering and walking in these areas.

1.304 Limiting Motor Vehicle Impact: Narrowing lane widths causes cars to move more slowly and creates a greater feeling of safety for pedestrians. Creating sources of parking besides surface lots that run up against sidewalks improves the sense of place in an area.

1.40 Engaged Building & Street Relationship: Creating engaging building fronts and incorporating principles like ground floor transparency improves commercial activity in the area and creates a more interesting pedestrian experience.

2.31 Extensive Green Stormwater Infrastructure (GSI): Bioswales along streets act as stormwater infrastructure and as a buffer zone that increases pedestrian safety. They also create visual interest along pedestrian corridors.

2.32 Extensive Urban Forest Canopy: Street trees help create shade and visual interest along sidewalks and improve safety for pedestrians by creating a buffer between walkable areas and areas for other modes of transportation.

3.21 High Urban Forest Continuity & Diversity: While many of the trees recently planted in Tigard are young and small, the urban canopy will eventually provide both shade and shelter for pedestrians, which will in turn increase walkability. Providing a variety of trees in the canopy also encourages uses of different trees that provide a variety of functions and creates visual interest.

4.312 Urban Forest & Robust Vegetation: Connections to nature provide positive pedestrian experiences and encourage walking from place to place.

3.313 High Street Height vs. Width Ratio: The proportion of building height to street width is often a determinant of pedestrian experiential quality. Areas with lower buildings and wider streets feel vast and often placeless, while buildings that are overwhelmingly tall compared to narrow streets can create a wind tunnel that also creates an unpleasant human experience.

References

Larco, Nico. Sustainable Urban Design Framework: Walkable Streets. 2018. University of Oregon Urban Street Design Guide. National Association of City Transportation Officials, New York. <http://nacto.org/cities-for-cycling/design-guide/>.

1.302 Multimodal Street Design – Robust Bicycle Infrastructure

Energy Use & Greenhouse Gas / Block & Street

Colton Groves



Figure 1: Two-way cycle track on Dunsmuir Street in Vancouver, BC (Photo credit: Livable Cities)



Figure 2: Buffered bike lane in Seattle, WA (Photo credit: NACTO)

Topic Description

Robust bicycle infrastructure is an integral part of multimodal street design. It creates streets and infrastructure that prioritize cyclists of all ages and abilities by ensuring safety and comfort. These can be developed as existing street improvements, using an entire street, adjacent and parallel to major streets or highways, or be removed completely from the street with its own right-of-way. When combined with other local and regional routes, a robust bike network can be accomplished. Keeping cyclist safety and comfort a priority will also maximize the returns on bicycle infrastructure investment. This is best achieved when cycle tracks or lanes are protected or separated from automobiles but kept near and visible to other traffic. Good bicycle infrastructure is more than signage and rights-of-way; it ideally separates and protects cyclists from automobiles and transit. It also includes intersection design and treatments, and can increase mobility, activate public spaces, reduce accidents on roads, reduce congestion, and reduce Greenhouse Gas emissions (GHG) for a more sustainable community.

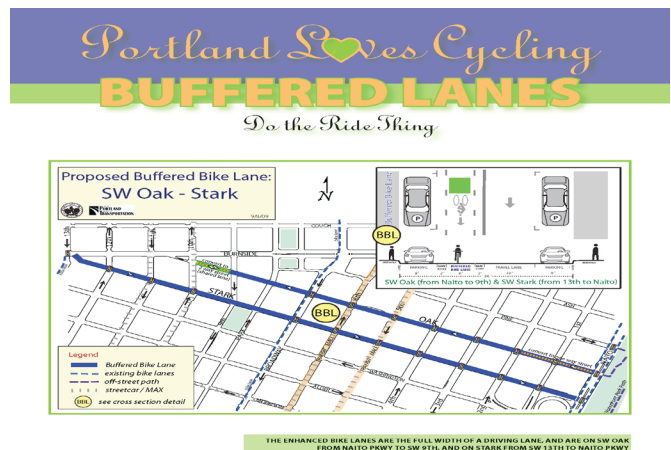


Figure 3: Buffered bike lane diagram in Portland, OR (Photo credit: Portland Bureau of Transportation)



Figure 4: Map indicating current bike infrastructure in downtown Tigard (Photo credit: Colton Groves, Google)

Current Conditions

There are several streets in the Tigard study area that include bike lanes or shared roadways with automobiles. The Fanno Creek trail restricts automobiles and provides a unique multimodal path that connects the area to a network of other pedestrian and bike pathways throughout the city (Point E). Burnham Street has less automobile traffic and bicyclists have some markings for a shared roadway (Point F). Other similar streets like Commercial Street do not have bicycle markings or signage (Point A). Main Street does have bicycle markings on the pavement indicating a shared roadway (Point D). One of the busier streets in the area, Hall Boulevard, includes a bike lane on each side of the road, but there is no buffer between them (Point B). With traffic traveling at higher speeds on this street, it can be both physically and psychologically unsafe for cyclists, potentially causing fewer to ride. Hall Boulevard also does not have bike lane paving at intersections – see the intersection of Commercial Street and Hall Boulevard, for example (Point C).

In between the existing Tigard Transit Center and City Hall is a Park & Ride surface parking lot that is connected to a paved shared use path for pedestrians and cyclists (Point G-1). The connection from the surface parking lot and the shared use path is disconnected and forces cyclists and pedestrians into the travel lane of the parking lot (Point G-2). This can cause conflicts or potential collisions between cyclists and automobiles. Hunziker Street also has a conventional bicycle lane on each side of the street (Point H).



Figure 5: POINT A. Commercial Street looking south. No bike lanes or signage (Photo credit: Colton Groves)



Figure 6: POINT B. Hall Boulevard looking west. Bike lane and markings on the street (Photo credit: Colton Groves)



Figure 7: POINT C. Hall Boulevard and Commercial Street intersection looking west. Large intersection with no continuous bike lane markings (Photo credit: Google)



Figure 8,9: POINT D. Main Street looking east (left) and west (right). Shared roadway with bike markings on the street (Photo credit: Ethan Zagorec-Marks)



Figure 10: POINT E. Fanno Creek Trail signage and shared use path (Photo credit: Colton Groves)



Figure 11: POINT F. Burnham Street looking south. Shared roadway with some bike markings on the pavement (Photo credit: Ethan Zagorec-Marks)



Figure 12: POINT G-1. Pedestrian and bike path between park-and-ride lot and Hall Boulevard looking north (Photo credit: Colton Groves)



Figures 13, 14: POINT G-2. Park-and-ride lot looking north (left) and south (right). No pathway dedicated to cyclists or pedestrians (Photo credit: Colton Groves)

Design Guides / Suggestions

Design suggestions are ordered in priority of most important and impactful changes. Please see the map below for location references.

1. Ideally, the bike lane on Hall Boulevard should include a protecting element from such a busy street to increase safety and encourage bike ridership. This could be a paving marking change or could include a physical grade change or barrier such as planters.



Bike lane buffer (Photo credit: NACTO).



Figure 15: Bike lane buffer in Fairfax, CA (Photo credit: NACTO)

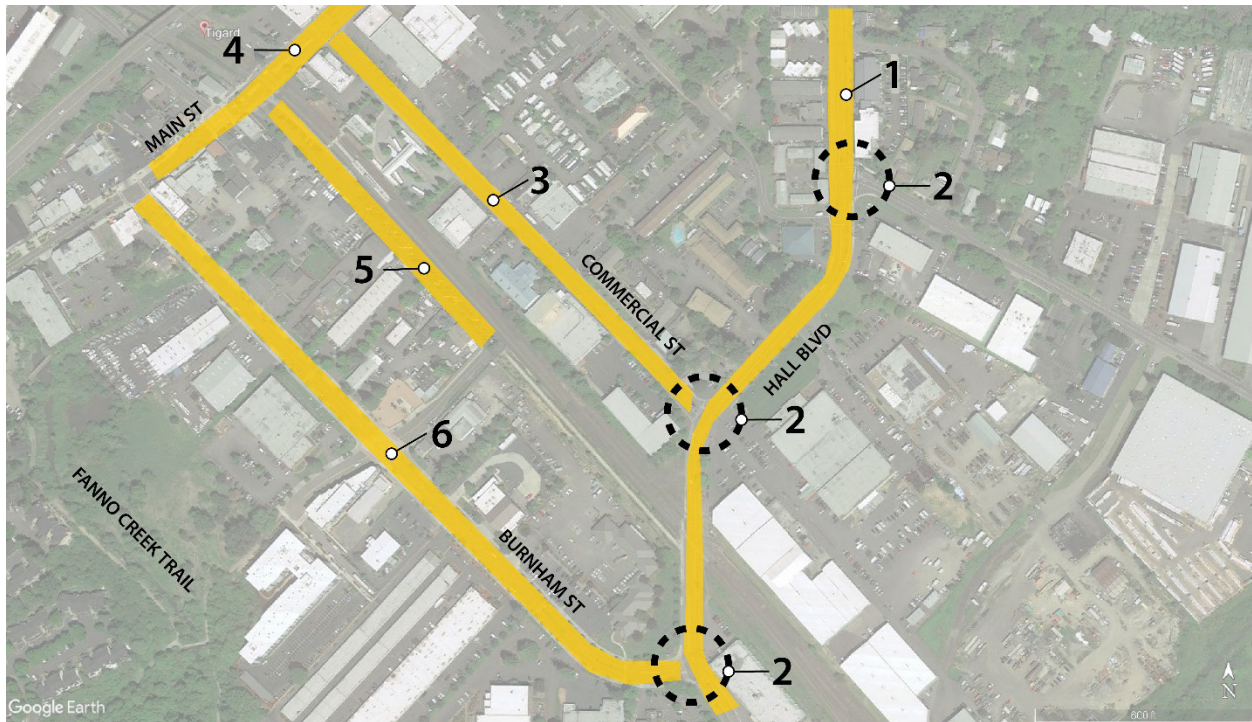


Figure 16: Map indicating proposed bike infrastructure improvements for downtown Tigard (Photo credit: Colton Groves, Google)

2. The intersection at Hall Boulevard and Commercial Street would increase bicycle safety if there were markings that designate the bike lane in the intersection. This would increase automobile driver awareness of bicyclists on the roadway. This should be applied to all larger intersections on Hall Boulevard (at Burnham Street and at Hunziker Street, for example). Ideally, using a setback crossing for cyclists will also increase bicycle safety and reduce the chance of a collision. A setback crossing increases the space between the bike lane crossing and the vehicle travel lane and requires a tighter turn radius (typically 90-degrees) before crossing the bike lane – increasing visibility and reaction times.





Figure 17: Bike lane setback crossing intersection (Photo credit: Sustainable Urban Design Handbook Draft by Nico Larco)

3. Since Commercial Street does not currently have existing bicycle infrastructure, a bike lane should be installed. This will improve cyclist safety and encourage more ridership.
4. On the west side of the railroad tracks on Main Street, street improvements emphasize a shared roadway for cyclists. These should be extended east across the railroad tracks to the remainder of Main Street to ensure a continuous experience for cyclists.
5. Introduce a bike and pedestrian pathway that is separated from the parking lot aisle in the existing Park & Ride lot at Tigard Transit Center. This will create a continuous experience for cyclists and pedestrians travelling from Hall Boulevard to the transit center or from the transit center to Hall Boulevard. Building from and extending the existing pathway connection just south of the parking lot would be ideal.
6. Burnham Street has improved sidewalks, bioswales, some bike markings on the street, and pedestrian crossings. Increasing the amount of bicycle signage and paint on the street paving will help increase automobile awareness of cyclists on the road. Ideally, this street should have a separate bike lane for cyclists.

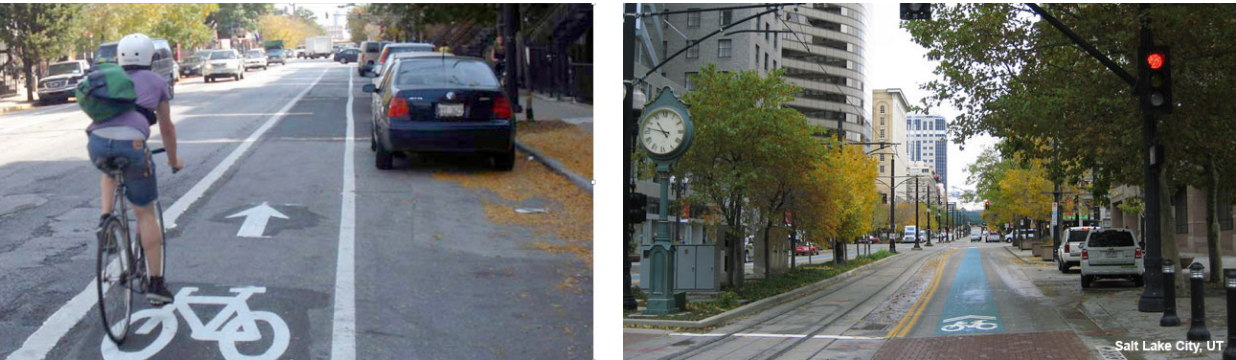


Figure 18: Conventional bike lane in Chicago, IL (Left), Shared roadway marking in Salt Lake City, UT (Right) (Photo credit: CDOT, NACTO)



Figure 19: Conventional Bike Lane layouts (Photo credit: NACTO)

Related Elements / Opportunities for Co-Benefits (if possible)

1.10 Compact Development: Increasing the density in the neighborhoods within and around Tigard, while also increasing connectivity between these areas, will increase the ease and mobility of cycling (Larco).

High Network Connectivity Increased network connectivity allows for more direct routes within a regional network.

1.11 Robust Transit Networks: Since most transit riders begin and end their trips as a pedestrian, increasing bike networks and connectivity can increase transit ridership. Increased bike infrastructure would allow more pedestrians to bike to transit for their first/last mile as opposed to walking.

1.12 Robust Bicycle Networks: Inherent in creating robust bicycle infrastructure, it is important to also increase the networks for cycling at the block scale. If bike infrastructure is not at each block, but scattered and sparsely connected, there may be less ridership – with cyclists choosing different modes of travel such as driving an automobile. This would increase GHG emissions rather than reduce them and could also have negative implications on the equity and health of the people in the community.

1.201 Small & Defined Blocks: When blocks are small and well-defined, cyclists, motorists, and pedestrians all have increased options for travel. This increases mobility and can also increase equity since it opens more direct access to an area – benefiting all scales noted in the Sustainable Urban Design Framework.

1.30 Multimodal Street Design: Multimodal street design involves more than bicycle networks. It also includes walkable streets (1.301), transit (1.303), and motor vehicles (1.304). Since bicycle infrastructure is one component of many, it is important to integrate the other modes of transportation to create a more complete street. A balanced and complete street that doesn't prioritize automobiles over other modes will increase safety and can also encourage walking and cycling since these modes will be more convenient, accessible, and comfortable.

Additionally, “bicycling contributes to pedestrian street vitality, safety, and activity” (Larco). Bike lanes will also serve as both a physical and psychological buffer between pedestrians and vehicles, increasing walkability (1.301).

1.32 Micro Parking Management & Design: Another way to encourage bicycle ridership is to increase the number of bicycle parking stalls available to cyclists. These should be placed in areas that are convenient and easily accessible to cyclists. Bike parking should be logically placed near amenities or attractions such as near shops or parks, for example. Bike parking can also be placed strategically to serve as a buffer for pedestrians on sidewalks or even cyclists on the roadway, depending where they are placed. This increases safety and will draw more ridership from different types of cyclists such as families and children.

2.31 Extensive Green Stormwater Infrastructure (GSI): When creating buffers for bike infrastructure – such as between the roadway and a bicycle lane – adding stormwater infrastructure can help mitigate runoff. This serves a dual purpose and would create a more sustainable community by keeping stormwater in the existing groundwater rather than piping it to the nearest river through a storm drain. Stormwater infrastructure can include planters, vegetation swales, or other permeable plantings and surfaces.

3.31 Micro-Habitat Creation: Like the Fanno Creek shared-use in Tigard, adding green space near cycling routes can create microhabitats. When combined with connections to greater patches and corridors of habitats, these have potential to increase the resiliency of the habitats in the area.

5.31 Site Design for Ownership & Surveillance: Increased visibility for cyclists increases safety. This includes increased lines of visibility from the roadway to cycle routes/lanes and involves well-lit cycling areas. This is also enhanced at times of low light visibility when non-polluting lighting is used (3.34). When there are cyclists on a roadway, including streets with less vehicle traffic, they can provide some “eyes on the street” to increase the safety in neighborhoods and blocks. Residents in neighborhoods and people in streets can also provide similar surveillance for cyclists to increase safety.

References

International Making Cities Livable, LLC, & Bates, K. (n.d.). Do You Want More Bicyclists in Your City? Then, It’s Time to Install a Network of Cycle Tracks. Retrieved April 17, 2018, from <https://www.livablecities.org/articles/do-you-want-more-bicyclists-your-city-then-it’s-time-install-network-cycle-tracks>

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1.303 – Designing for Transit

Energy Use & Greenhouse Gas / Block & Street

Angelo DeBlase

Topic Description

Designing streets that prioritize transit strengthens both the quality of the street and the quality of life within a city. Enhancing the quality of the design of the transit stops and lines can help transit become the desired form of transportation over vehicles. Designing streets around transit, the street life, sense of place, mobility, and accessibility are all increased. When connected to multiple types of transportation, urban sprawl is condensed, creating a framework for a more sustainable city and lifestyle.

Current Conditions

Currently in Tigard, the main source of transit for the city is their bus line. The transit hub for the bus lines is the Tigard Transit Center, located on SW Commercial Street, which is connected to the city’s historic Main Street. The bus lines are minimal, reaching few areas of the city. The areas they do reach are the residential areas south and north of downtown, and a few streets near the Transit Center that are commercially programmed. The main bus line runs through Main Street and terminates in both Portland and Sherwood.

In the downtown area, some of the bus stops and lanes are not suitable for pedestrians. There is no buffer between the bus route and the sidewalk, and the lanes share a lane with vehicles on a two-lane road, causing congestion on the street. Also, the stops on these routes are not designed; they consist of a sign and maybe a bench. Between this and the congestion, the pedestrian experience is not a desirable one.



Figure 1: Image courtesy of NACTO

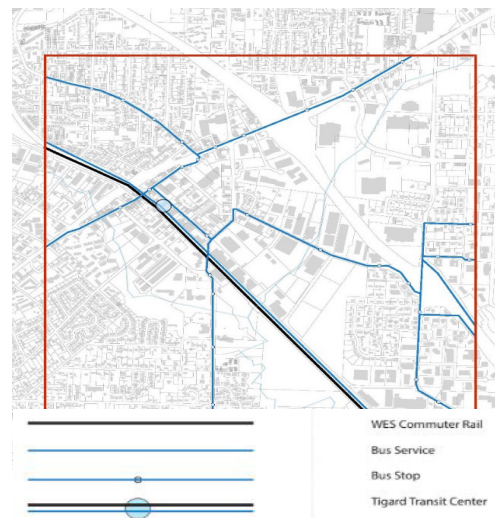


Figure 2: Current public transportation routes (Diagram by Chelsea Clark)



Figure 3: WES commuter rail platform (Photo by Ethan Zagorec-Marks)



Figure 4: Tigard bus route (Photo by Ethan Zagorec-Marks)



Figure 5: Bus stop on SW Main Street (Image: Google Maps)



Figure 6: Bus stop on Commercial Street (Image: Google Maps)

The only street where the bus line interacts with a different mode of transportation that is not vehicular is at Hall Boulevard and Hunziker Street. There is a painted bike lane on these streets adjacent to the vehicular lane. This painted stripe is the only thing separating the two lanes. Because of the lack of a buffer between the two, the cyclist may feel uncomfortable when riding next to vehicles. And because of the design of the stops, the bus crosses into the bike lane to pull over for drop off and pick up.

The transit center is also the stop for the WES Commuter Rail that runs from Beaverton to Wilsonville. The rail primarily transports people commuting in and out of the city for work. Because of the transit center's location, it is easy for commuters to access Main Street once they arrive in Tigard, but when they arrive there by commuter rail, the platform they step onto is an undesirable place. The platform is separated from the transit center and placed between the two rail lines, causing a sense of isolation. There is minimal shelter on the platform, potentially leaving commuters exposed to the elements, and there is nothing to engage with while waiting, making the wait a boring experience.

Design Guides / Suggestions

1. **Curb Side** – On-street next to the curb where no on-street parking exists.

Benefits: Easy for pedestrians to board the bus. No stops caused by vehicles, making the process more efficient.

Challenges: Removes the opportunity for a parking / freight lane. Can conflict with the bike lane.

Typically used: Width of street does not allow for off-set lands and street parking is not an obstacle.

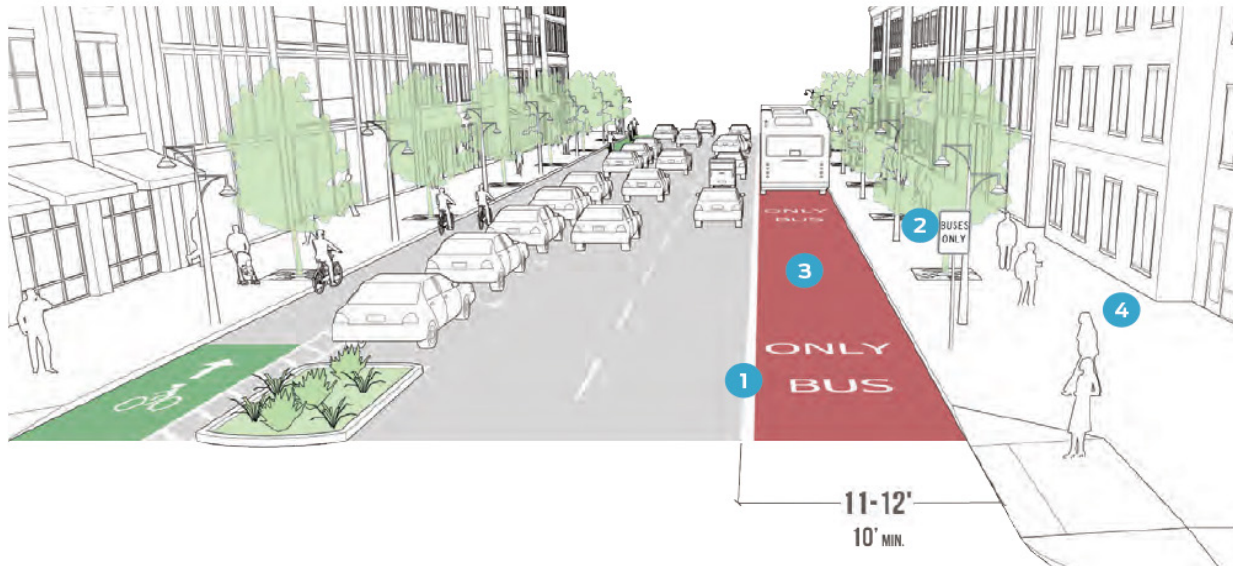


Figure 7: Curb side transit design strategy (Image: NACTO)

2. **Off-set** – Creating separation between the transit lane and the sidewalk with a barrier (bike lane, parking, etc.).

Benefits: Avoids confronting with bike lanes and parked cars. Does not require the subtraction of parking lanes/freight lanes.

Challenges: The design of the stop itself and the pedestrian crossings become more challenging.

Typically used: On multi-lane streets that are programmed with retail or something that suggests including parking and freight lanes.

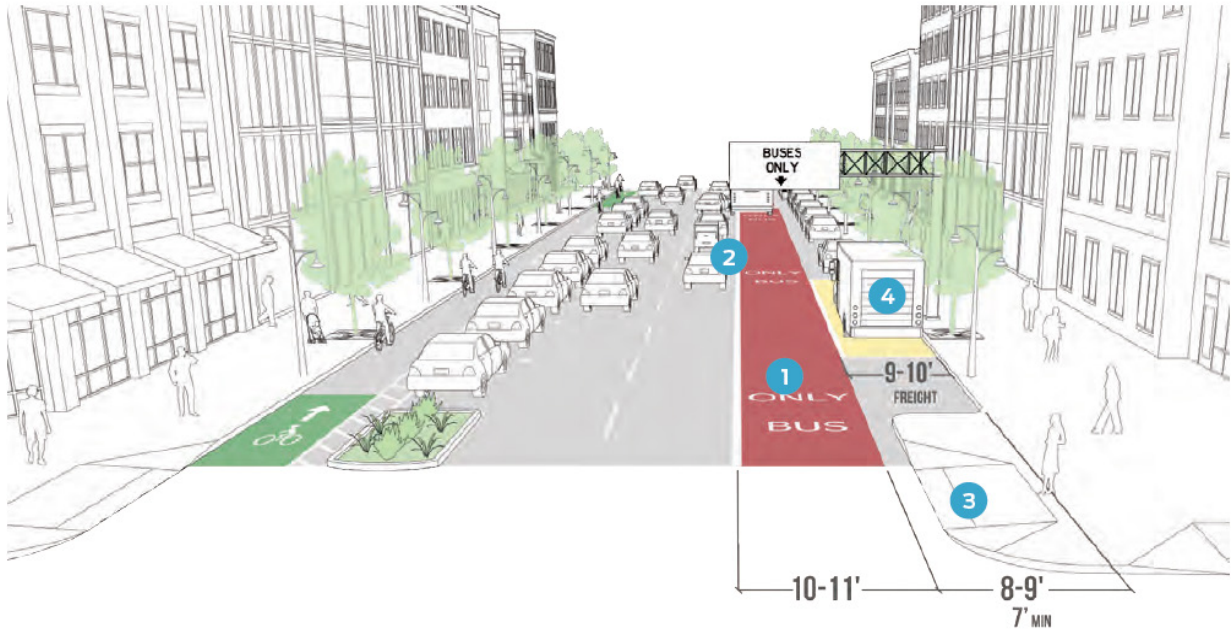


Figure 8 Off-set transit design strategy (Image: NACTO)

3. Peak Only – A designated lane for transit use during peak hours and traffic use during off-peak hours.

Benefits: Can have a variety of uses during off-peak hours such as parking, loading zones, etc., and can bypass traffic congestion during peak hours, making morning and afternoon commutes easier.

Challenges: Could cause complications for transit vehicles during off-peak hours when the lane is not designated for it.

Typically used: When streets have typical congestion during peak hours. When streets have no room for offset transit lanes because of parking.

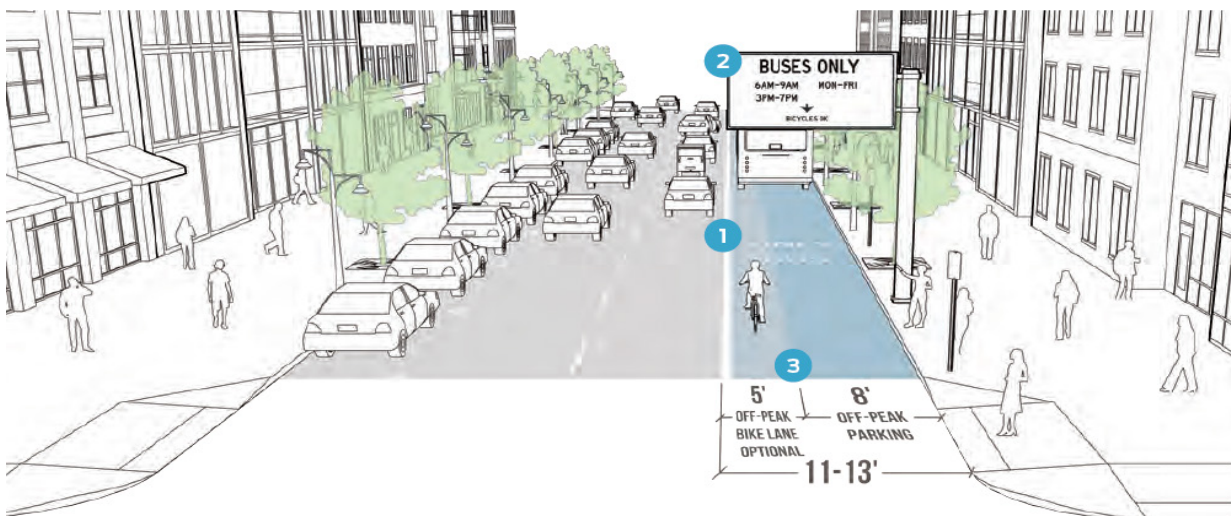


Figure 9: Peak only transit design strategy (Image: NACTO)

The streets that buses run on now in Tigard could use updated transit treatments inspired by the three examples above, especially on Hall Boulevard and Hunziker Street where there are bicycle lanes. Something as simple as a buffer (trees, street parking, or even bollards) could create a more enjoyable, safer experience on the street. The use of bulb-outs could be used to separate the bike lane from the pick-up and drop off areas at each bus stop. This would eliminate the need for buses to cross into the bike lane at the stops.

The bus stops themselves should be an enjoyable place for people while they are waiting on for the bus. While this would be beneficial at every stop, it is most important to include this at the stops along Main Street and Commercial Street, where there is more pedestrian activity. Something as simple as seating and shelter would make for a better experience at these stops. Having stops at places such as stores and parks gives the commuters something to engage with to make the time spent waiting for the bus more enjoyable.

The new transit center and MAX station being proposed in Tigard is an opportunity to learn from the choices made at the current WES stop. The new MAX station should be programmed and feel safe connected to the street.

Related Elements / Opportunities for Co-Benefits (if possible)

1.20 Robust Pedestrian Networks: Connecting a pedestrian network to a transit network could create an additional layer of efficiency. This would play off of the network's hierarchy, and would potentially allow an easier connection to a developed area with a finer-grain pattern. This would also contribute to the goal of Tigard becoming the "most walkable city in the Northwest."

1.23 High Micro Scale Land Use Mix: Planning dense development around transit stops creates a higher efficiency rate for the flow of the transit network, and for the pedestrians. Accessibility would increase, both for pedestrians, making it easier to get from their destination to a transit stop, and for transit, by creating the opportunity to plan closer stops around multiple destination areas.

1.302 Robust Bicycle Infrastructure: Well-designed infrastructure for cyclists would enhance the existing routes. This would allow for the opportunity to connect to more transit stops and destinations and could provide a safer experience for cyclists, pedestrians, and cars.

References

Larco, N. L. (2018). "1.303 – Transit Design Outline_MEK Edits." Sustainable Urban Design Framework Draft – January 2018.

National Association of City Transportation Officials. (2016). "Transit Street Design Guide." Island Press.

1.304 Multimodal Street Design - Limiting Motor Vehicle Impact

Energy Use and Greenhouse Gas / Block and Street

Shannon Hines

Topic Description

Streets should be designed for the use of placemaking and enjoyment for all forms of transportation, not just motor vehicles. Creating safe, accessible, and interesting places that people want to travel to throughout the day creates more enjoyable spaces. Streets not only provide access from place to place but create an identity for the area. People want to be on streets that make them feel safe and comfortable. Prioritizing vehicular traffic destroys that experience. A well designed street is not designed for the highest peak times for vehicles, but for all modes of transit.

Slowing down traffic through design strategies (curb extensions, smaller lane sizes, buffer zones and smaller curb radii) gives other modes of transportation a presence on the street.



Figure 1: Defined pedestrian crossings allow people to feel safe



Current Conditions

The city of Tigard has already invested in improving their street infrastructure. Burnham Street, from Main Street to Hall Boulevard, has undergone major improvements to change the priority of the street from cars to pedestrians and bikes. These improvements include adding on-street parking and making lanes narrower, forcing cars to slow down. Shared roadway signs have been added to the street to make motor vehicles aware that there are bicycles on the road. At intersections and street crossings, primarily Burnham Street and Ash Avenue, the pavement changes to red pavement and uses bulb-outs to make pedestrians feel safe while crossing. Bioswales have been added to create a buffer between vehicular traffic and pedestrians. This also creates a sustainable system by treating stormwater and holding it for aquifer recharge.

While Burnham Street allows for street parking, many surrounding lots have large parking lots that separate the building from the street. This prevents street parking from being utilized to its fullest capacity. Limiting the size of parking lots will encourage people to walk and bike more because driving is no longer the most convenient mode of transportation. It will also encourage future development to build at the property line to activate the street, allowing more pedestrian activities and activating the area.



Figure 2: Street and sidewalk improvements on Burnham Street. Large sidewalks, bioswales, street parking, and shared roadway



Figure 3: The intersection of Burnham Street and Ash Avenue changes pavement pattern and material to emphasize pedestrian crossing



Figure 4: Hall Boulevard is a major road for the city that prioritizes cars instead of pedestrians and bikes



Figure 5: Main Street has had street improvements but could use activated business to promote a walkable street

The same improvements have been made to Main Street. This involves widening sidewalks, adding buffers and bioswales, emphasizing crosswalks, and incorporating bikesharing with the road. The businesses that line the street could be more active with the street to encourage people to walk instead of drive. If the area encouraged local economic growth then it will become more of a destination.

Hall Boulevard is a two lane road that has an average daily traffic count of 10,000-15,000. The city of Tigard views this as a large barrier that separates the city. While Hall Boulevard has narrow driving lanes, there are not any accommodations to other modes of travel. The bike lane that runs along the road does not have a consistent width, which makes the bike lane a lower priority. There is also no buffer between the traffic lane, bike lane, and sidewalk. This gives cars priority on the road and is not safe for pedestrians or bicycles. There is also only part of a sidewalk along Hall Boulevard as well as no crosswalks, making pedestrian traveling difficult. Hall Boulevard can benefit from being redesigned to be a complete street by adding vegetation, buffers, bicycle lane, sidewalks on each side of the street, and crosswalks.



Figure 6: Hall Boulevard is a major road for the city that prioritizes cars instead of pedestrians



Figure 7: There is no buffer between cars and bicycles on Hall Boulevard

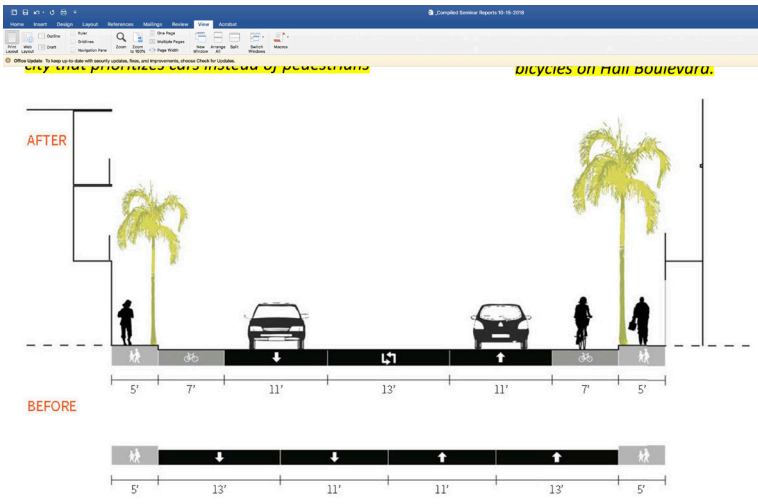


Figure 8: Rethinking Streets redesigned a street with similar ADT with fewer lanes, larger bike lanes, and safer pedestrian sidewalks

Commercial and Burnham Streets have the potential for similar design strategies. While there is room for cars to park on the street, there are very few cars that do. This makes the lane size feel twice as large, allowing cars to drive fast. There is no buffer between the sidewalk and traffic lanes, which makes pedestrians feel unsafe. By giving Commercial Street a road diet, the street can accommodate more modes of transportation than just vehicular.



Figure 9: There are no buffers between moving traffic and pedestrians, creating an unsafe environment



Figure 10: Commercial Street has large lanes that allow vehicles to drive fast

Design Guides / Suggestions

1. Create bike infrastructure to separate bicycles from vehicle traffic.
By creating buffers between different modes of traffic it not only becomes safer for everyone but encourages people to bike.
This would be most useful on Hall Boulevard where there is a higher ADT and a larger right-of-way.
2. Create more walkable streets by limiting building setbacks from property lines.
Instead of having a large amount of parking in between the buildings and sidewalks, limiting that distance encourages economic growth because people feel more comfortable walking into stores.
By limiting parking lots, cars are pushed to stay on the street, creating a barrier while also slowing down traffic.
On commercial/mixed use streets like Main, Burnham, and Commercial Streets this would activate the street front.



Figure 11: (Source: NACTO.org)

3. Create more pedestrian crossings across streets.

This can be implemented along Hall Boulevard to make drivers more aware of their surroundings.

Create speed bumps to encourage vehicles to slow down.



Figure 12: (Source: NACTO.org)

Related Elements / Opportunities for Co-Benefits

1.10 Compact Development: Creating dense environments allows for there to be more pedestrians, which causes slower moving cars.

1.20 Robust Pedestrian Network: By encouraging more people to walk or bike, the amount of people that will drive will decrease.

1.30 Multimodal Street Design: By creating more opportunities for getting around, people are less dependent on their cars.

1.40 Engaged Building and Street: If people are interested in the buildings around them, then the driver is more likely to stop and get out, encouraging people to support their local economy.

3.30 High Surface Permeability: Smaller lane widths decrease the amount of pavement, causing there to be more space for permeable surfaces.

5.20 Balanced Block Size: Creating smaller blocks creates more places that cars have to stop.

References

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1.31 Dense & Street Activating Building Typologies

Energy Use & Greenhouse Gas / Block & Street

Kelsey Roybal



Figure 1: Boulder, CO – Pearl Street Mall

Topic Description

Urban environments have many different typologies of buildings, however not all of these help to liven up the street life and walkability. The density of buildings can influence whether there is an activated street life, including transparency of the façade, program of the space, hours of operation, density of surrounding area, visibility of the entrance, and surrounding building uses. These are just some of the factors that can make a difference in the activity occurring on the street level in an urban setting.

Current Conditions

The current condition of the site as it relates to density and street activating building typologies is poor. There are not a lot of buildings that engage the street to make this a vibrant and walkable neighborhood. This area consists of a variety of building typologies, ranging from warehouses to single family homes. In the diagram below, it is clear that most of this area consists of buildings with an industrial program, which does not allow for a lot of street activation. These buildings are typically low in density and do not incorporate elements that help to activate the façade. These façades are long walls that are one to two stories in height and little to no articulation. In Figure 2, there are no windows and nothing to engage pedestrians. The architecture of the building has some articulations that could help to create an activated façade, such as the portico/overhang feature that gives the building a sense of entry. However, this feature of the building fails to engage the public because there is no transparency along that façade. In Figure 3 below, there are more features that lend to

an activated street front, such as the transparency and scale of the buildings. Although, considering these buildings are on Main Street, they are not doing enough to activate the street. As you can see from the photo, these shops are closed on a Sunday morning, so even on a weekend this place has little to no pedestrian activity.



Figure 2, 3: Main Street

Some places are more successful than others, such as Main Street. This street provides an opportunity for an activated and walkable street. The elements that make this an activated street are related to the typology of the buildings along it. These buildings all contain some type of program that allows for public use and activity. However, this area is not very dense, so the amount of activity is lower than it could be if there was a greater amount of density within and surrounding this area. Some examples of buildings that are achieving street activation are Figures 4-6. Although these buildings are low density, they still have features that help to activate the street and pedestrian vibrancy. A common theme between the three of these is adequate sidewalk space in front of them with an element that engages the pedestrian. Figure 5 is a sandwich shop with vibrant signage and a transparency. These features help to activate the street life by clearly showing the typology of the building and lending itself to the public realm.



Figure 4: Musi's Boutique



Figure 5: Beach Hut Deli



Figure 6: Sherrie's Jewelry Box

A counter example of where density occurs, but where street activation does not, is at the Attwell Off Main apartments on SW Burnham Street (Figure 7, 8). The large 4-story apartment building helps to increase the density of the area, however there is not enough mixed use within this building to provide street activation. Pacific Rim Martial Arts Academy is located directly adjacent to the apartment complex (Figure 7). This type of use / building does not create an activated use by the general public, but even so, the way this building addresses the street does engage the public because of the transparency provided at the ground floor. In terms of a building typology, this apartment complex is in need of mixed use and commercial space on the ground floor that provide amenities for the residents, as well as the surrounding community.



Figure 7: Pacific Rim Martial Arts Academy



Figure 8: Attwell Off Main Apartments

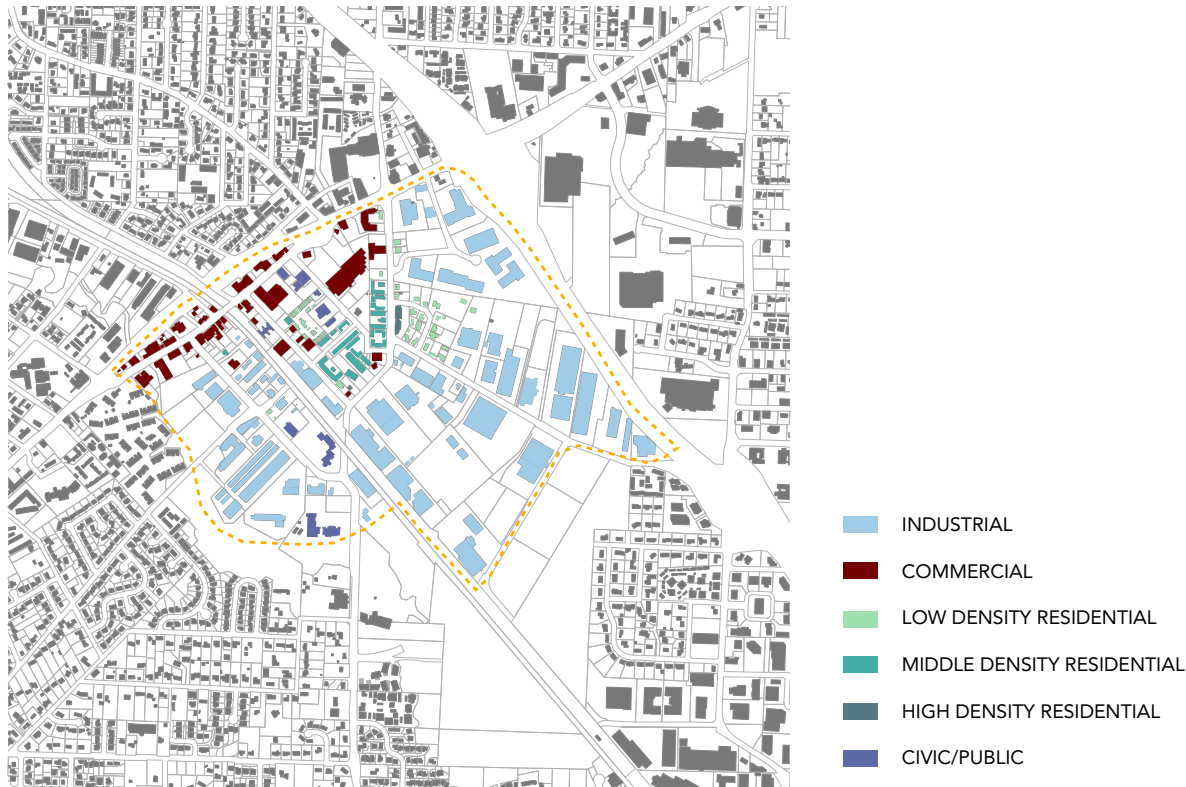


Figure 9: Building typologies



Figure 10: Industrial



Figure 11: Main Street commercial



Figure 12: Attwell Apartments

Design Guides / Suggestions

1. Density of the overall area should be increased to help create a vibrant neighborhood.

The higher the density of a neighborhood or city, the more activity will occur and the more opportunity there is for different building typologies.

2. Focus the design and planning around pedestrians rather than cars.

The example above of the Attwell Off Main apartments, demonstrates that the car is favored, missing an opportunity to have a pedestrian-focused ground floor.

Focusing on designing for pedestrians helps to create a walkable neighborhood, which encourages people to walk instead of drive.

Designing for pedestrians is usually done at a smaller and more intimate scale, which adds more interest and activating elements to the context.

3. Wide sidewalks to allow for pedestrian activity.

More pedestrian activity means that the public can use more of the buildings and stores. If you do not create sidewalks that are pedestrian friendly and active, then there will be no activation of the buildings that are along that sidewalk. The first key point to making a walkable city is a pedestrian friendly sidewalk, and the second step is to design buildings that can foster and activate that well-designed sidewalk.

4. Increase the ground floor transparency and include typologies that allow for public activity.

If a building provides public amenities, then the public will want to use it, which helps to activate the street. Transparency plays a large role in how people interact and engage with a building.

5. If it is not possible to have a public use in the building, design the façade to be pedestrian friendly and street activating.

For housing projects, provide opportunities for eyes on the street, such as balconies, community rooms with transparency, roof tops. Also consider scale of building and window sizes as it pertains to pedestrians.

6. Reduce the amount of parking.

Providing less parking encourages people to walk and experience the area in another way other than by car. Making parking difficult encourages people to use other modes of transportation to access areas of importance.

7. Have a clear sense of entry into public spaces.

By creating a clear sense of entry, people know that this space can be used by the public and will in turn be a much more activated building.

Related Elements

1.10 Compact Development: On a larger scale, if cities focus on compact development this helps to have a variety of building typologies within a close proximity to one another. Compact development also encourages density, which helps to promote street activation.

1.30 Multimodal Street Design: By allowing different modes of transportation on a street you are allowing for it to be activated in more than one-way. Bikes, cars, and pedestrians can all have access to the same street, which creates more opportunity for activity. However, the use of cars can also have a negative impact on the street activity. In the photo above of Boulder, CO, one of the main reasons this street functions so well is because of the absence of cars.

1.40 Engaged Building & Street Relationship: If the building engages with the street well, it creates a positive and lively street life. If the building ignores the street, then people are less inclined to engage in that area.

4.21 Block Size & Street Orientation for Microclimate Mitigation: The block size makes a difference in the walkability of the neighborhood / city. Smaller blocks tend to be more activated and pedestrian friendly because it brings it down more to human scale.

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1.32 Micro Parking Management & Design

Energy Use & Greenhouse Gas / Block & Street

Fatemeh Eskandari

Topic Description

Parking spaces use up a significant share of valuable inner-city space. The ground on which they are located is expensive and scarce, and cars are only used for a small amount of time per day; they are parked for 23 hours a day. Overall, cars are also decreasing the life quality of a city, with the space they use as well as with their emissions. In the past municipalities merely expanded parking supply in order to attract more and more cars. As a result, parking areas are dominant elements in many urbanized areas and contribute to uninviting and hostile streetscapes with decreased urban activity. Contemporary parking policies have a more balanced view, include social and environmental goals, and want to improve the quality of life in cities. Micro parking contains the management and design of parking lots and spaces in districts and how they contribute to the urban streetscape. Parking management could be a powerful tool for cities to influence transport. By managing the supply, design, and price of parking spaces, cities can exert a high level of control over the qualities, quantities, and efficiency. We have to consider the size (of the lot and the parcel), the land use, location, access, climate (for vegetation), turnover rates, circulation paths, and more to design efficient parking lot areas that are visually pleasing and activating for pedestrians, cyclists, and transit users.

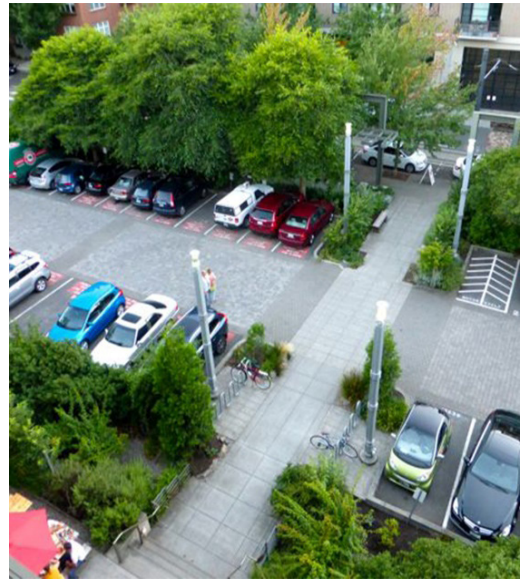
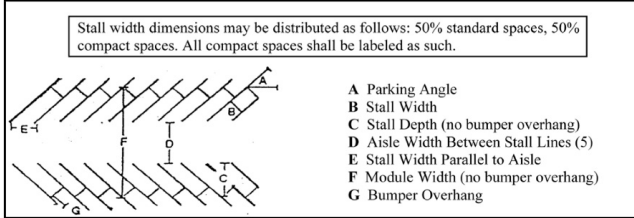


Figure 1: A parking lot at the EcoTrust Building in Portland, Oregon, built in 2001

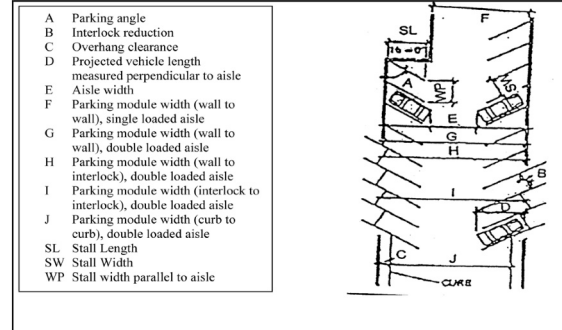
Current Conditions

Currently there are 100 two-hour on-street parking spaces, and 31 spaces in public parking lots, available in downtown Tigard. There are also about 800 private parking spaces owned by retailers and local businesses in downtown. As downtown Tigard continues to grow into a destination where people want to be, new development and businesses will attract more residents and visitors to downtown. There is an ever-growing need to manage downtown's public parking spaces. The city's goal is to have a parking management strategy in place and ready for implementation when needed. In fact, the City Center goals, which are established in the Urban Renewal Plan, focus more on the value of natural resources, multi-modal transportation system, and pedestrian-friendly streetscape and public spaces (which are not visually dominated by the automobile).

Off-Street Surface Parking Dimensions in Feet												
Compact Stall						Standard Stall						
A	B	C	D	E	F	G	B	C	D	E	F	G
45°	7.50	15.5	13.0	10.61	44.0	2.0	8.5	17.5	13.0	12.0	48.0	2.0
	7.75	15.5	12.0	10.96	43.0	2.0	9.0	17.5	12.0	12.7	47.2	2.0
	7.75	15.5	11.0	10.96	42.0	2.0	9.5	17.5	11.0	13.4	46.0	2.0
	8.00	15.5	11.0	11.32	42.0	2.0	10.0	17.5	11.0	14.1	46.0	2.0
60°	7.50	17.0	18.0	8.62	48.0	2.5	8.5	19.0	18.0	9.80	56.0	2.5
	7.75	17.0	16.0	9.01	46.0	2.5	9.0	19.0	16.0	10.4	54.0	2.5
	7.75	17.0	15.0	9.01	54.0	2.5	9.5	19.0	15.0	11.0	53.0	2.5
	8.00	17.0	14.0	9.20	44.0	2.5	10.0	19.0	14.0	11.6	52.0	2.5
75°	7.50	17.5	25.5	7.73	60.5	2.5	8.5	19.5	25.5	8.80	64.0	2.5
	7.75	17.5	23.0	7.99	58.0	2.5	9.0	19.5	23.0	9.30	62.0	2.5
	7.75	17.5	22.0	7.99	57.0	2.5	9.5	19.5	22.0	9.80	61.0	2.5
	8.00	17.5	21.0	8.25	56.0	2.5	10.0	19.5	21.0	10.3	60.0	2.5
90°	7.50	16.5	28.0	7.50	61.0	3.0	8.5	18.5	28.0	8.50	65.0	3.0
	7.75	16.5	26.0	7.75	60.0	3.0	9.0	18.5	26.0	9.00	63.0	3.0
	7.75	16.5	25.0	7.75	59.0	3.0	9.5	18.5	25.0	9.50	62.0	3.0
	8.00	16.5	24.0	8.00	58.0	3.0	10.0	18.5	24.0	10.0	61.0	3.0



Parking Structure Dimensions in Feet									
Compact Stall									
Angle A	Interlock Reduction B	Overhang C	Vehicle Projection D	Width E	F	G	Module Widths H	I	J
45°	2.0	1.41	15.25	11.5	26.75	42.0	40.0	38.0	39.16
60°	1.41	1.75	16.08	13.33	29.66	46.0	44.58	43.16	42.5
75°	0.75	1.91	16.5	16.0	32.5	49.0	48.25	47.5	45.16
90°	0.0	2.0	15.5	20.0	35.5	51.0	51.0	51.0	47.0
Standard Stall									
45°	2.4	2.08	18.0	13.0	31.0	49.0	46.66	46.33	44.83
60°	1.66	2.58	19.5	16.0	35.5	55.0	51.33	51.66	49.16
75°	0.83	2.91	19.75	20.0	39.75	59.5	58.66	57.83	53.66
90°	0.0	3.0	18.66	24.66	43.33	62.0	62.0	62.0	56.0



The city development code states that the purpose of developing off-street parking and loading is to provide sufficient vehicle parking in close proximity to the various uses for residents, customers, and employees and to establish standards that will maintain the traffic carrying-capacity of nearby streets. These regulations are also intended to establish vehicle parking areas that have adequate capacity and which are appropriately located and designed to minimize any hazardous conditions on the site and at access points. The current general parking ratios in downtown Tigard show that there are two spaces per 1000 sf of office use, one space per residential unit, 2.25 spaces per 1000 sf for retail sales, 1.875 spaces per 1000 sf of retail services, and 1.2 spaces per 1000 sf for industrial uses.

Earlier this year, the city held a series of hearings to update signage, fees, and enforcement practices. These updates were divided to three phases. Phase one is expanding 2-hour parking on Ash Avenue at Burnham Street. Phase two is expanding 2-hour parking to Tigard Street and portions of Burnham Street to accommodate high demand on Main Street. Phase three is about minor updates to the parking and abandoned vehicle ordinances, approval of updated cost of parking tickets, legislatively allowing the future creation of 4-hour parking areas, and approval of costs for potential parking permits at a future date. These phases are expected to be finished by summer 2018.

Downtown Tigard Parking Map

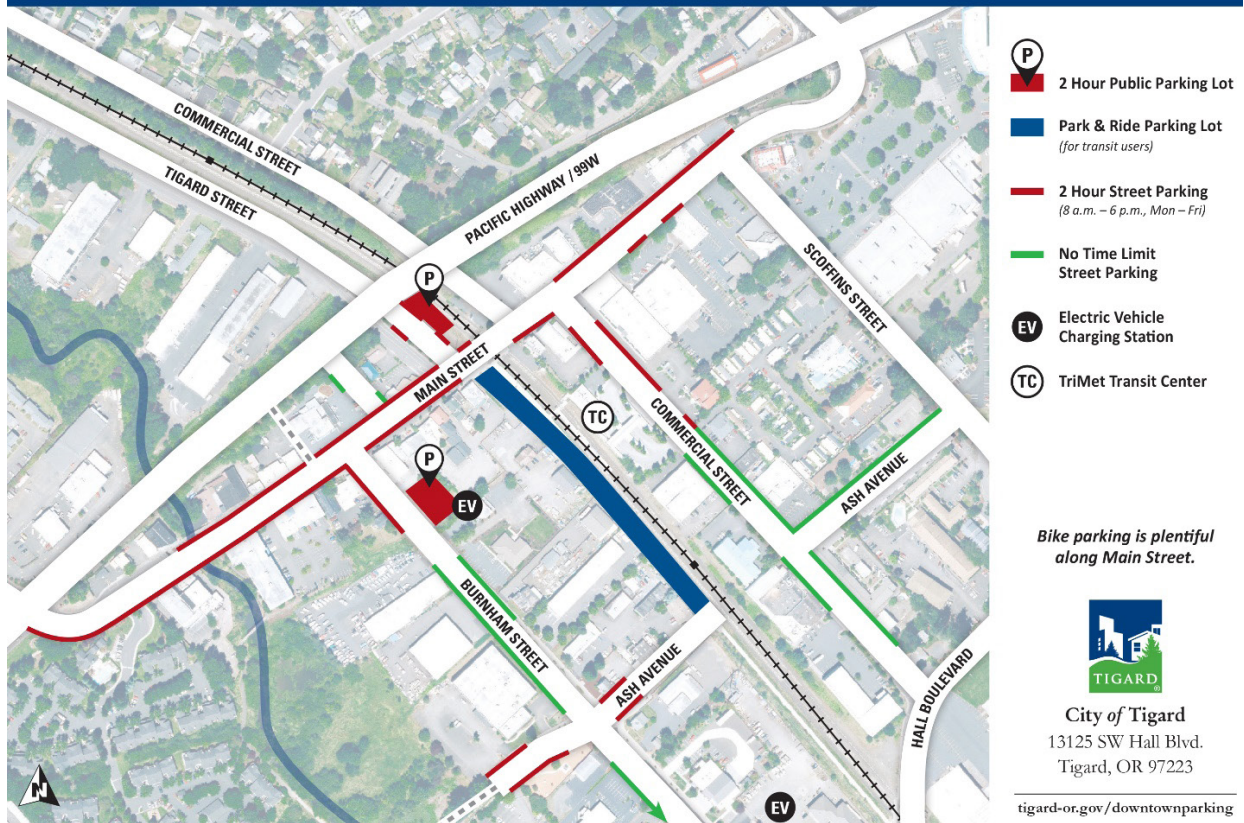


Figure 2: Proposed 4-hour street parking/permit parking

About 80% of parking on Main Street and downtown is privately owned, which makes adding additional parking difficult. The map above shows that bike parking is plentiful along Main Street, which is a positive for this area and can encourage people to use it as an alternative method of transportation, instead of cars. It also shows that there are sufficient park and ride parking lots along Tigard Street for transit users. According to TriMet’s improvement plans it could also encourage people to consider this type of transportation more than ever. It is also mentioned in the city development code that landscaped parking areas shall include special design features that effectively screen the parking lot areas from view. These design features may include the use of landscaped berms, decorative walls, and raised planters (landscape planters may be used to define or screen the appearance of off-street parking areas from the public right-of-way). All parking areas, including parking spaces and aisles, shall be required to achieve at least 30 percent tree canopy cover at maturity directly above the parking area as provided in the parking lot tree canopy standards in the Urban Forestry Manual. In addition to other standards, the setback shall be a minimum of eight feet between the parking lot and a public street. Although, a large part of the parking areas in downtown does not have these conditions yet, one of the good examples for tree canopy covered spaces could be the parking located on Southwest Hall Boulevard, which is incorporated with other uses like Tigard skatepark, Tigard Community Development, and Tigard City Hall.



Figure 3: A parking lot at Southwest Hall Boulevard



Figure 4: A parking lot at Southwest Commercial Street

Design Guides / Suggestions

By improving the overall quality of parking lots, considering the street definition and activity, and developing welcoming modes with more attention to the landscape and different groups of passengers, we can manage and design more efficient parking. The following are some suggestions for approaches to managing the parking in Tigard.

1. Adding more pathways and sufficient signs for pedestrians in parking lots to make parking more walkable and pedestrian-friendly.
2. Consider other modes of transportation including bikes, and increase bike parking lots to make parking convenient for all groups of people.
3. Adding urban furnishings and lights to increase the overall quality of street life and decrease the risk or fear of crime.
4. The integration of mixed-use space into parking facilities is a successful strategy to best utilize land, promote walkability, and create more attractive and vibrant destinations. Parking facilities that incorporate mixed-use spaces such as retail, offices, and even residential units can reduce the need for parking and decrease vehicle miles traveled (VMT).

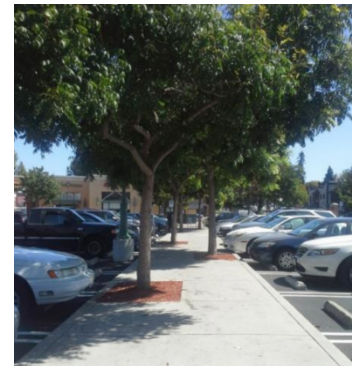


Figure 5: Pathways provide safe routes across the lots



Figure 6: Bike parking lots

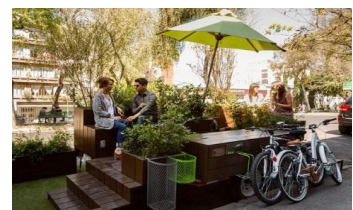


Figure 7: Urban furnishings



Figure 8: Parking lights

5. The area between the roadway and parking lot as the edge of parking can be defined by screening or have some kind of purpose to fill the gap. It could be landscaped according to the development code of the city or contain commercial uses like food carts or coffee shops.
6. The negative environmental impacts associated with large impervious surface areas can be reduced through the use of new permeable materials as substitutes for pavement. Types of permeable and semipermeable alternative pavers include gravel, cobble, concrete, wood mulch, brick, open-jointed pavers filled with turf or aggregate, turf blocks, natural stone, and pervious concrete.
7. Design parking lots to improve aesthetics and help connect parking lots to community design. Parking lots could be placed at the rear of a building, increasing the interconnectedness between pedestrians and the built environment.
8. Use vegetated filter strips and riparian buffers to increase pollutant removal effectiveness. Riparian buffers are vegetated strips along waterways that trap and filter contaminants, encourage infiltration, and slow stormwater flow. They also help to preserve streambank stability.



Figure 9: Mixed-use space (parking & retail)



Figure 10: Food carts in the parking edge



Figure 11: Permeable materials for pavement



Figure 12: Vegetated buffers

Related Elements / Opportunities for Co-Benefits

1.20 Robust Pedestrian Networks: Whether walking on foot or rolling in a wheelchair, the quality of the local pedestrian network is important to help people feel safe and comfortable walking to their destinations. Surface parking usually interrupts these networks and expands the distances between destinations. Micro parking management could provide pathways and sufficient signs for pedestrians through parking lots to create more connectivity in pedestrian networks.

1.40 Engaged Building And Street Relationship: Parking lots can discourage building and street activities, but by moving them to the backside of the building and siting them strategically on a block, defining the edges with appropriate uses like food carts, and incorporating spaces such as retail, the overall street life will not be interrupted.

2.20 Robust Stormwater Management: Managing stormwater helps to reduce streambank erosion, contamination of water sources, and harm to aquatic plant and animal life. Parking lots can be designed to receive, store, infiltrate, and evaporate stormwater. Installing permeable pavement surfaces and using vegetated filter strips and riparian buffers are the best solutions to manage stormwater in parking lots.

4.32 Efficient Street Lighting Design: Using efficient lighting for visibility at night makes users feel safer when walking to their cars, and at the same time it is not disruptive to nearby ecological habitats.

1.11 Robust Transit Network: Parking lots must be connected to the transit network and accessible to encourage multi-modal connectivity. It is important to serve buses, trains, and the MAX stations in Tigard.

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1.40 Engaged Building & Street Relationship

Energy Use & Greenhouse Gas / Project & Parcel

Brandon Glaviano

Topic Description

The relationship between the building and the street is critical to how pedestrians experience the urban environment. The public right-of-way created where these two elements meet is essential to creating successful pedestrian-centered design. A well engaged building / street relationship can encourage walking, safety, and vitality in a sustainable urban environment.

Current Conditions

Along Tigard's Main Street, the building / street relationship works well. The storefronts of the buildings have good ground floor transparency, engaging with the pedestrian right-of-way. The streets use parking along the sidewalks and bioswales to buffer pedestrians from traffic. There are also many examples of buildings utilizing the building frontage zone with seating and other places of rest.



Figure 1: Pedestrian right-of-way along Main Street



Figure 2: Engaged building / street relationship along Main Street

Other streets, however, tend to lack some key elements for good pedestrian rights-of-way. Many of the buildings have blank walls, place parking between buildings and the sidewalk, and do not engage the street at all. The streets do not have any significant buffers protecting pedestrians. Overall, there does not seem to be a significant building / street relationship.



Figure 3: Lack of interaction between ground floor uses



Figure 4: Blank walls and lack of transparency

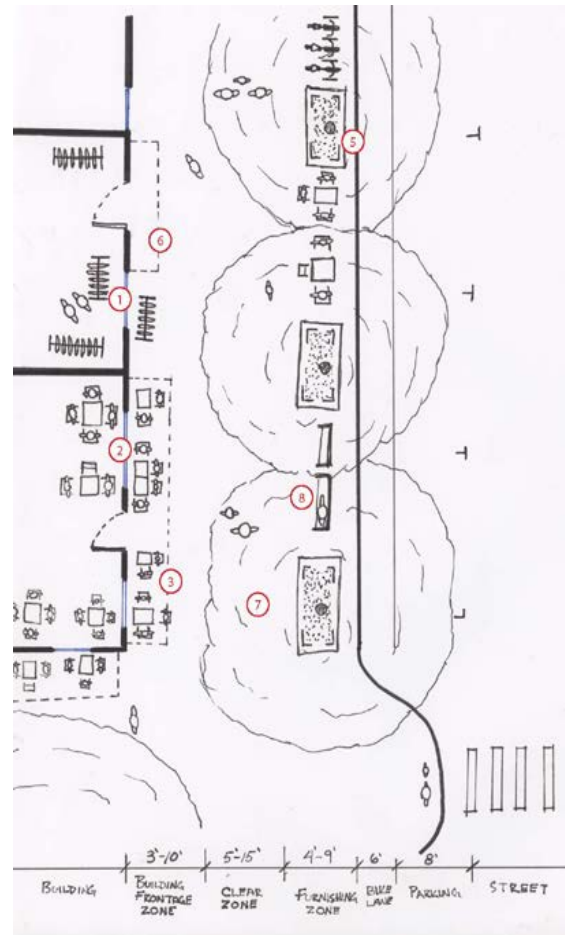


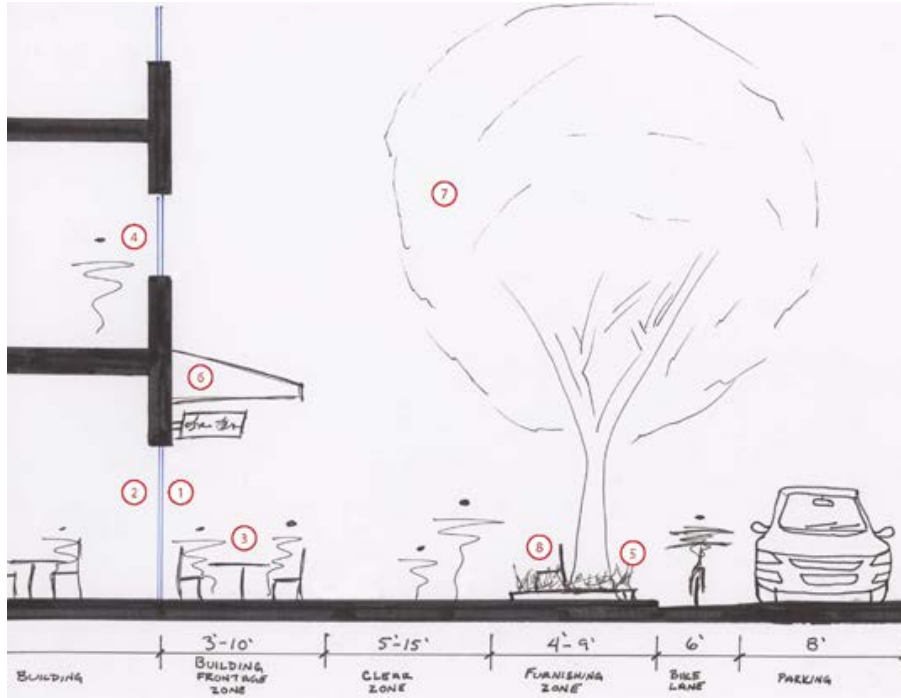
Figure 4: Building removed from street

Design Guidelines / Suggestions

The space between the building and the street can be broken down into distinct sections: the Building Frontage Zone, the Clear Zone, and the Furnishing Zone. The Building Frontage Zone is the area directly in front of the building. It can be used as an exterior extension of the building's ground floor use. This area usually contains outdoor restaurant seating, retail, overhangs, and signage. The Clear Zone is in the middle of the sidewalks and is the main thoroughfare for pedestrians. The Furnishing Zone borders the street. This area contains street buffers, street trees, bioswales, additional restaurant seating, and bike parking to name a few.

1. Minimize the amount of blank walls.
2. Maximize ground floor transparency.
3. Include ground floor uses that interact with the sidewalk.
4. Upper floors should provide opportunity for interaction.
5. Street buffers to protect pedestrians.
6. Pedestrian-scaled overhangs.
7. Street trees to protect pedestrians from the elements.
8. Comfortable and safe places to stay.





Related Elements / Opportunities for Co-Benefits

1.30 Multimodal Street Design: Variety of transportation modes results in varied visual interest in the street.

4.22 High Building & Housing Density: High residential density results in more people inhabiting the area.

1.23 High Micro Land-Use Mix: A variety of land uses will bring a variety of programs and users to the public realm.

1.202 High Network Connectivity: An understanding of pockets of activity will encourage people to keep moving along the street.

2.32 Extensive Urban Forsest Canopy: Quality placement and species of trees can enhance the public right-of-way.

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2.30 High Surface Permeability

Water / Block & Street

Matt Loudermilk

Topic Description

Surface permeability is the degree to which water can seep through a ground material and into the soils below. This allows for a natural hydrological cycle of restoring underground aquifers uninterrupted by impervious materials. Designing for high surface permeability also reduces the need for heavy stormwater infrastructure. By allowing water to naturally infiltrate the soil, stormwater runoff is reduced, thus minimizing downstream flooding and erosion.



Figure 1: A surface parking lot with low surface permeability

This can be achieved by purposefully leaving greenfields undeveloped in urbanized areas to effectively operate as drainage wetlands. It could also be achieved through the utilization of pervious materials such as brick or pavers wherever possible in the design. High surface permeability works best integrated into multiple stormwater systems, and including them in the design of cities is an easy and effective way to mitigate stormwater flooding and erosion, however it should not be implemented as a singular system.

Current Conditions

Many of the existing downtown streets in Tigard include newly-constructed bioswales and stormwater detention pits. Populated with absorbent soils, water-soaking plants, and back-up overflow drains, these are effective forms of stormwater management that can utilize soil infiltration and surface permeability well. There is also a generous amount of green space within the city of Tigard, allowing for more natural surface permeability and stormwater infiltration.

In order for a site to utilize soil infiltration strategies for minimizing stormwater runoff, the water needs to have a place to go beyond the permeable construction materials. Soil conditions must be permeable themselves for healthy soil infiltration to take place. Tigard is in an area rich with streams and wetlands, and it is easy to imagine the landscape's previous life as wild, naturally-occurring wetlands. As an urbanized wetland, downtown Tigard has an interesting relationship with water and permeable surfaces. It would seem to make sense for a city so full of creeks and wetland parks to find ways to effectively and sustainably manage excess water. However, a combination of a shallow, restrictive soil layer, shallow water table, and minimal soil infiltration potential undermines Tigard's position to utilize surface permeability as a high yield technique.

Techniques exist that Tigard can employ to mitigate the urban environment's negative impact on the sensitive watershed. Limiting building footprints and encouraging lower lot coverages can facilitate more open area, which allows for soil infiltration. Undeveloped areas, or leftover areas, are prime for allowing natural stormwater processes to take place.



Figure 2: An example of Tigard's new stormwater infrastructure

Currently, downtown Tigard has a considerable amount of open space for natural stormwater drainage. However, the existing development is less compact than would be advisable for environmental conditions. While it is helpful to avoid developing some areas entirely, there are some features of an urban environment that are unavoidable, such as minimum building footprints, roadway, and other hardscape features. While these cannot be avoided, future development in Tigard should consider smaller footprints, narrower streets, and limited surface parking areas.

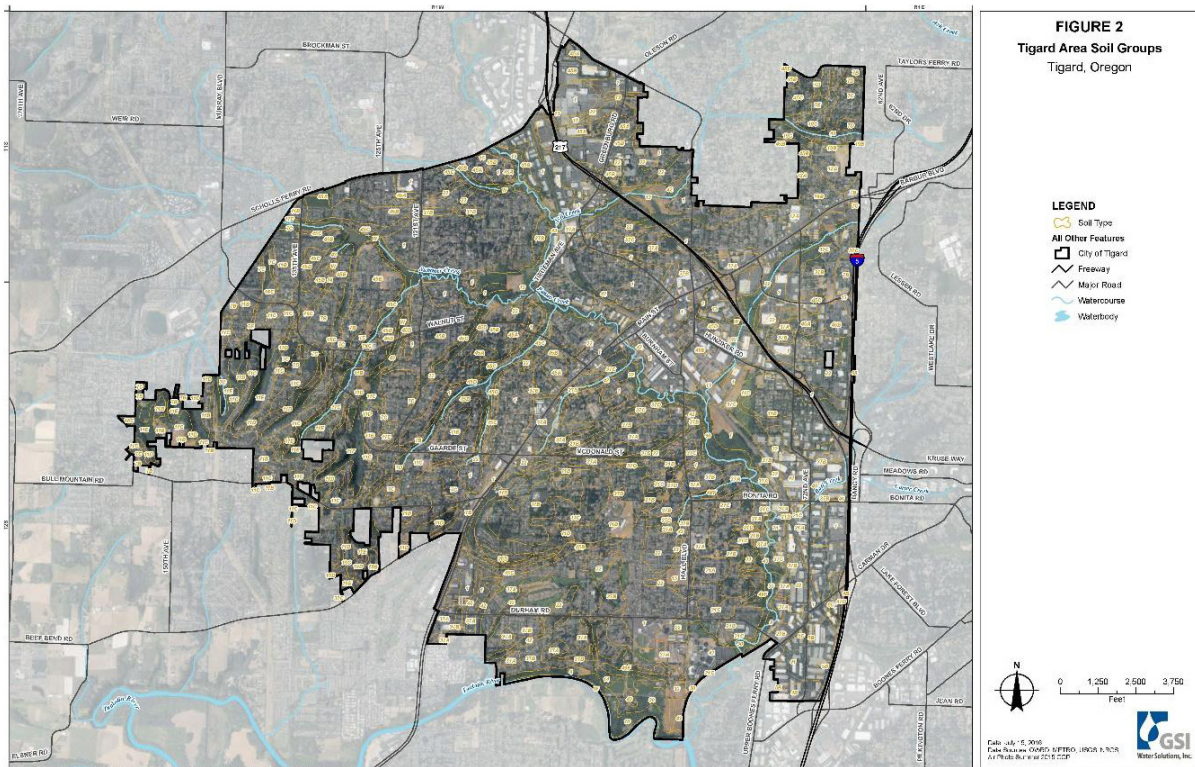


Figure 3: A map of soil types in Tigard



Figure 4: Surface impermeability causes standing water to accumulate

Design Guides / Suggestions

A few key directives can help Tigard take full advantage of high surface permeability materials and techniques for addressing excess stormwater.

1. Use more permeable materials wherever possible

While roads and other surfaces may require an impervious material, many elements, such as sidewalks or plazas, could benefit from the inclusion of permeable materials. Often, permeable materials such as porous pavers, gravel, or permeable concrete can be utilized in sidewalks along streets or as on-street parking strips. This can aid in mitigating the extra runoff caused by impervious streets.

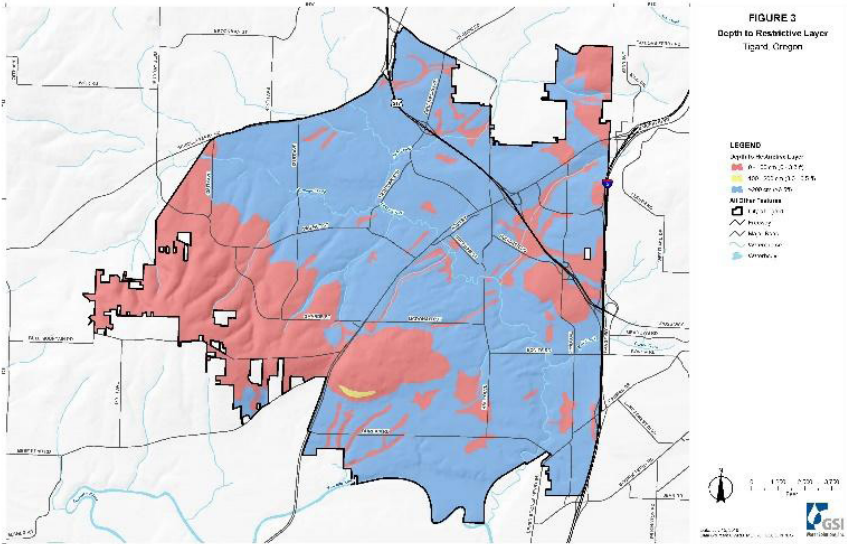


Figure 5: Depth to restrictive drainage soil layer (GSI Water Solutions, Inc.)

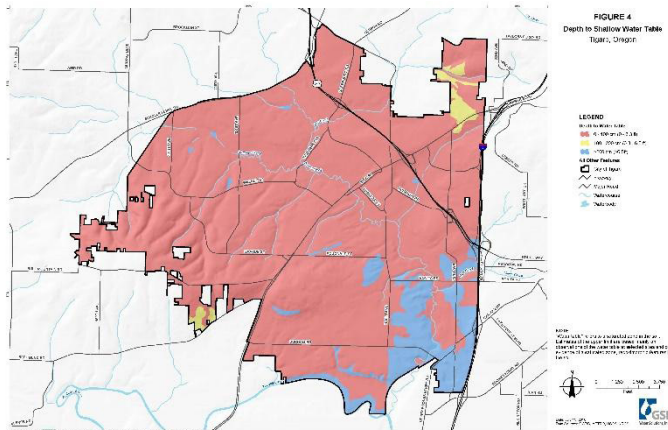


Figure 6: Depth to shallow water table (GSI Water Solutions, Inc.)

2. Understand the local soil composition and drainage patterns.

A combination of shallow soil and high water makes soil drainage difficult in Tigard. With nowhere to go, excess water can be difficult to get rid of, even when seemingly plenty of green space exists. However, a combination of swales, open space, and permeable hardscapes will allow the water to be dealt with and stored naturally rather than being controlled via an artificial stormwater system.

3. Minimize building footprints, street widths, and total lot coverage.

Where impervious surfaces are non-negotiable, minimizing their coverage of natural / pervious surfaces will minimize the impacts they have on natural stormwater drainage and infiltration. Tall, small-footprint buildings and narrow streets will allow the greatest amount of permeability to exist within developed land area, minimizing negative influences on natural processes.

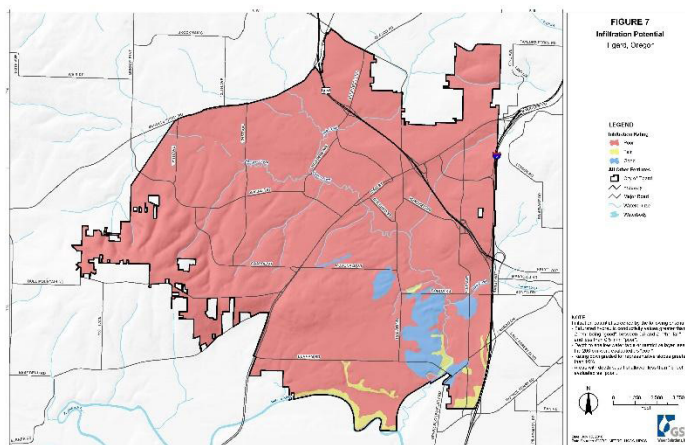


Figure 7: Infiltration potential (GSI Water Solutions, Inc.)

Related Elements / Opportunities for Co-Benefits (if possible)

Influences:

Stormwater Management Systems: Permeable surfaces that allow soil infiltration lessen the burden imposed on stormwater systems by excessive volumes of runoff.

Local Water Recharge: Soil infiltration techniques facilitated by Sustainable Urban Drainage (SUDs) allow stormwater and surface water to penetrate the soil surface in order to recharge natural water tables and aquifers.

Ecological Area Buffers: As development areas create more runoff, or land use types produce contaminated runoff, larger ecological buffers are required to protect natural areas and filter contaminants from stormwater.

Influenced by:

Compact Development: As sprawl requires greater quantities of infrastructure per capita, this increase in roads and other impervious surfaces creates excessive stormwater unable to infiltrate the soil over larger land areas.

Building Density: High-density areas reduce local permeability, while increasing permeability regionally.

Parking: Surface parking lots are a major source of impervious surfaces in urban environments.

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2.31 Extensive Green Stormwater Infrastructure

Watershed to Creek – Tigard, Oregon

Nate Carden

Topic Description

Hydrological systems are a fundamental part of the greater ecological web that weaves into the topic of sustainable urbanism. Water is the primary ingredient in the make-up of the biosphere. Stormwater management and runoff from developed areas is intrinsically a critical area of study with respect to city planning, design, construction, and ecology.

With overlapping relationships to habitat corridors and conservationist efforts, stormwater starts to integrate with the urban experience when coupled with biophilia. “Biophilia,” as introduced by Edward Wilson in 1984, is the “urge to affiliate with other forms of life.” In other words, it is a theory that people inherently want to be connected to the natural world around them.

From an infrastructure level, practicing stormwater management strategies and tactics can begin to decrease demands on expensive, centralized municipal water systems and rely more on natural processes. Green Stormwater Infrastructure (GSI) design should look for ways to mimic natural systems, increase permeability, and decrease the flows into piped systems for mechanical/chemical treatment.

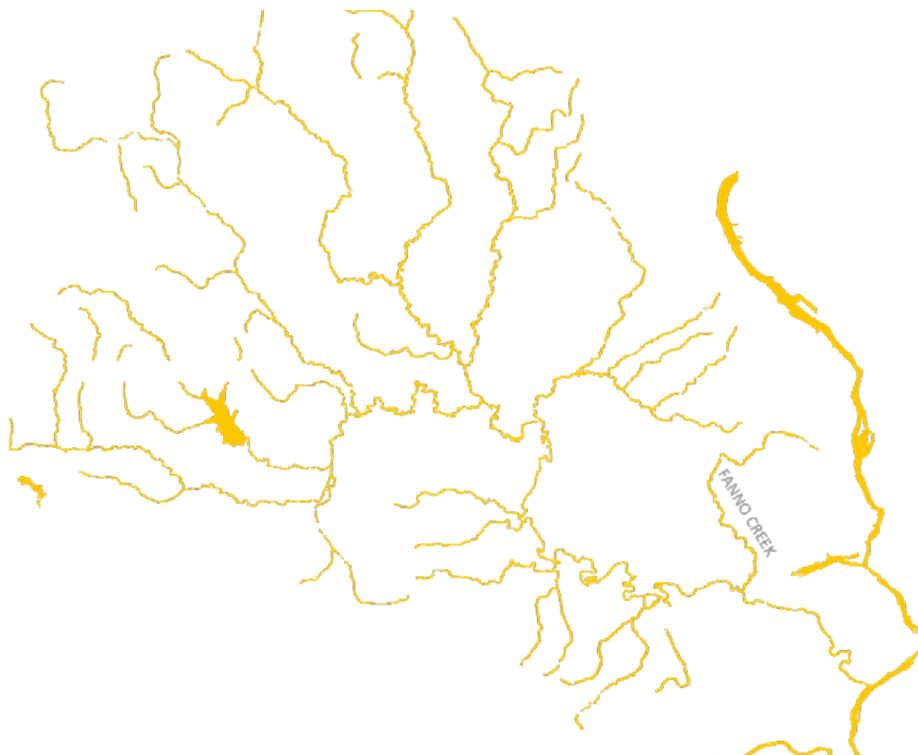


Figure 1: Tualatin River Watershed (diagram by Nate Carden)

Current Conditions

Stormwater design involves understanding hydrological processes more holistically than just at the parcel scale. The figure below is an abstraction of the waterways that comprise the Tualatin River Watershed. The city of Tigard is a part of this watershed and is indicated on the diagram by the location of Fanno Creek.

Fanno Creek is a celebrated small waterway that stems from Portland's West Hills and passes by downtown Tigard's west edge collecting water from each parcel on its way to the Tualatin River. Eventually, it travels to the Willamette River and the Pacific Ocean. Runoff from this area has an impact and is a part of many other adjacent ecologies. An image of Fanno Creek and its buffer zone can be seen below.



Figure 2: Fanno Creek (photo by Nate Carden)

Capital investment projects include street improvements that reflect practices seen in the Portland metro area. For instance, simple drainage trenches integrated within curb areas and around transformers exist at certain intersections such as SW Burnham Street and SW Main Street and are starting to help with infiltration back to groundwater (image below).



Figure 3: Passive drainage systems (photo by Nate Carden)

In addition, runoff is being mitigated to a degree by recently completed stormwater planters (Figure 4).



Figure 4: Stormwater planters (photo by Nate Carden)

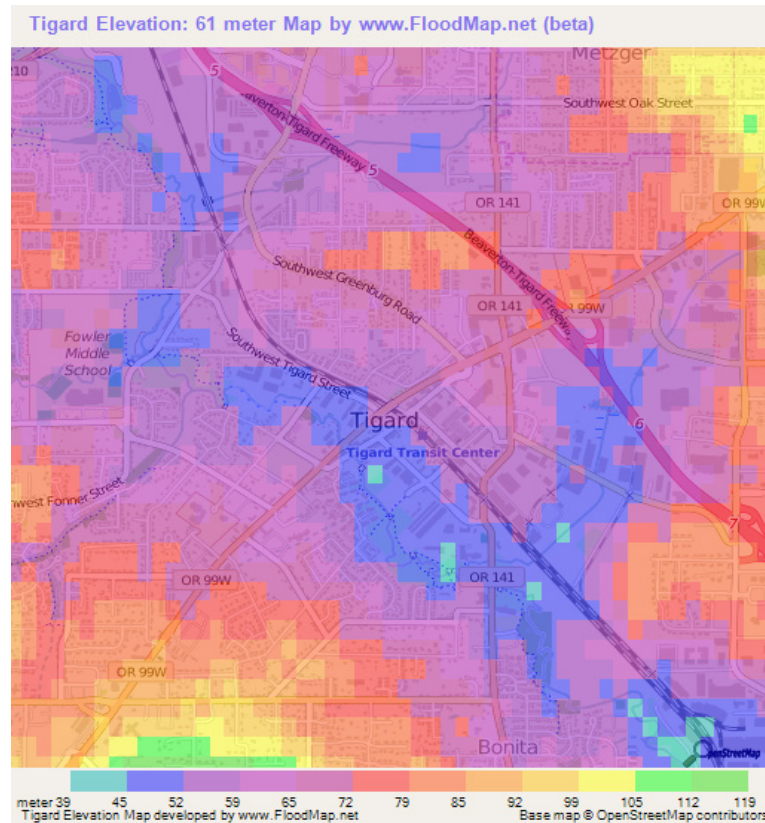
Despite these efforts, a significant portion of the city has not received these improvements, and permeability remains low due to vast areas of asphalt paving for roads and parking lots. Vegetated roof systems are also not a common element in the city. When conducting a stormwater sustainability assessment, Tigard has made strides, but has a distance to go before being a holistically sustainable place.

The Fanno Creek Trail is reasonably well-maintained with ecological buffers ranging from about 40-300ft. It could be argued that 40 ft is not nearly enough of a buffer distance to adequately increase water quality before reaching the creek ecosystem. On the east side of the downtown area runs another small creek called Red Rock Creek (also referred to as Rock Creek). In some places this creek has been reduced to a ditch through industrial yards with some light plantings and is forced through culverts under roads and railways. Water collects uncontrolled runoff from the surrounding paving and sends channels of polluted flows into the watershed, which can have serious implications on aquatic ecosystems over time. An example of this discontinuity can be seen in the bird's eye image at SW Hunziker Avenue.



Figure 5: Hydro-ecological discontinuity (image from Google Earth Pro™)

Some planting area is allocated to Red Rock Creek, but it is not enough to ensure the prevention of pollutants infiltrating large waterways.



The map above shows topographical conditions that relate to stormwater drainage in the Tigard area. The large V-shaped blue patch on the map represents Fanno Creek and a piece of Red Rock Creek, which both drain to the Tualatin River to the South.

Much of the area in downtown Tigard is impermeable asphalt or building coverage. Runoff often ends in city sewers and is then treated. Inevitably, some of the contaminated runoff collects in Red Rock Creek and enters the aquatic habitats from creek to river to ocean.

Stormwater runoff that is collected in city drainage systems is piped to the Durham Advanced Water Treatment Plant owned and operated by Clean Water Services.



Figure 6: Durham Treatment Plant – serving Beaverton, Durham, King City, Sherwood, Tigard, and Tualatin (image from Google Earth Pro™)

This plant is considered a world-class facility that utilizes advanced technologies in the wastewater treatment field at a scale that services up to eight different cities at a time, including portions of Portland and Lake Oswego. This massive facility, which represents investment of hundreds of millions of dollars, serves about 60% of its own energy needs from solar and cogeneration of renewable energies. Despite this investment, the plant remains a centralized machine that is reported in ecological studies to overflow raw sewage into the outfall in the Tualatin River during heavy storm surges (see DEQ Fact Sheet reference). In addition, cities like Tigard have entered trade agreements for industrial pretreatment and discharge into local waterways such as Rock Creek, the Tualatin River, the Willamette River, and the Columbia River. Clean Water Services has tried to clean up in cases like the Fanno Creek Spill of 2007 that happened during a wastewater pipe construction project and plant upgrades. In that event, raw sewage was temporarily discharged directly into Fanno Creek.



Figure 7: Recharging groundwater – natural vs. synthetic (Image by USGS)

Within downtown Tigard, certain areas require more attention than others. Figure 7 helps to illustrate flood zones during severe storm surges occurring every 10-50 years. The red dashed area on the right of the map has considerably less ecological buffer than the dashed area near Fanno Creek Park, which is preserved and maintained by the city. More attention must be allocated to the Red Rock Creek flood zone in order to increase permeability in the area and work symbiotically with natural systems.

Alternative approaches to stormwater and wastewater treatment to further enhance the city of Tigard’s ecological stewardship will be introduced in the next section of this site analysis to provide a set of GSI design rules moving forward.

Design Guides / Suggestions

The following framework provides support for sustainable urban stormwater and wastewater design strategies for the Tigard downtown area: Subtract; Slow / Cool; Treat; and Replenish

1. Subtract

The first part of this four-part foundational framework is about subtracting the maximum paving area possible from urban environments. In other words, a quantity of no more paving than is required should be assessed. This is sometimes referred to as a “road diet” or greening, but this tactic is something that is critical to minimizing runoff pollutants, maximizing urban habitats, and decreasing loads on the city wastewater.

Once a comprehensive assessment of a particular area has been done, there is conceivable room for landscape infill.

2. Slow / Cool

The second tool in this framework involves assessing runoff velocities and temperatures based on sources and concentrations. The area within the red circle in the diagram to the right shows an opportunity for landscape urbanism due to its more drastic grading. The grading in this area is approximately double the average of the rest of the city (about 6% compared to 3% respectively). Designers should target this area as an intervention site for open space to help decrease compounding flows to the existing industrial parcels to the south. In addition, this would help to reduce the temperature of the water before it causes problems in local aquatic ecosystems.

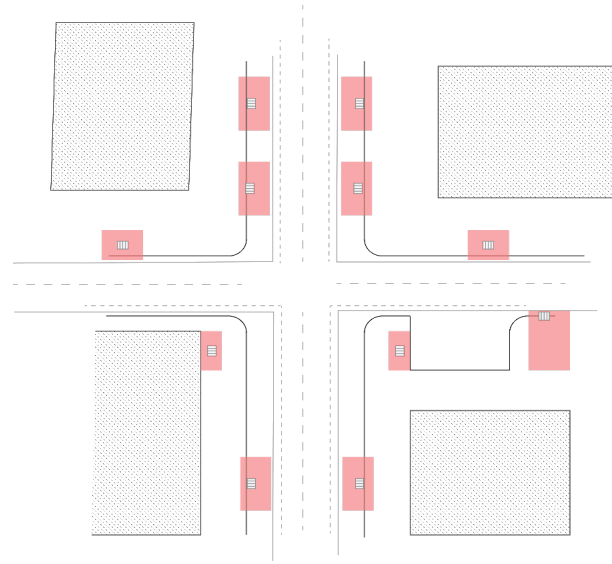


Figure 8: Subtracting tactics (diagram by Nate Carden)

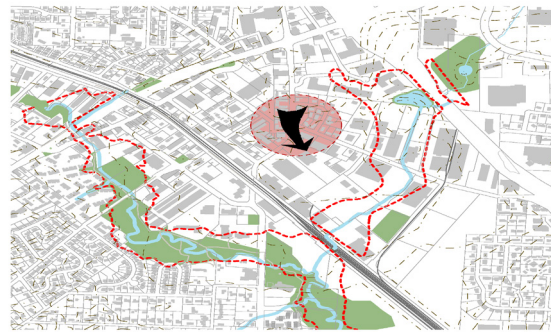


Figure 9: Higher velocity runoff (diagram by Nate Carden)

3. Treat

Combined with the previous two strategies, ecological buffer areas can act to treat considerable quantities of water before they enter waterways or hard pipes. The areas highlighted in the diagrams to the left indicate areas within downtown Tigard in need of further stormwater treatment. Planting shallow grasses or reeds can help provide pretreatment while varying combinations of native shrubs and trees can help provide the necessary ecosystems to remove pollutants from the flow to greater aquatic networks.



Figure 10: Larger scale treatment potentials (Diagram by Nate Carden)

4. Replenish

The final tool in this toolkit involves finding alternative ways to decentralize water treatment, reduce demand on existing systems, and employ natural vegetative sciences to clean water and reintroduce it into the environment as a replenished resource. The image to the left shows how synthetic groundwater recharge requires conveyance, pumps, valves, and injection pipes in order to recharge waterways and groundwater.

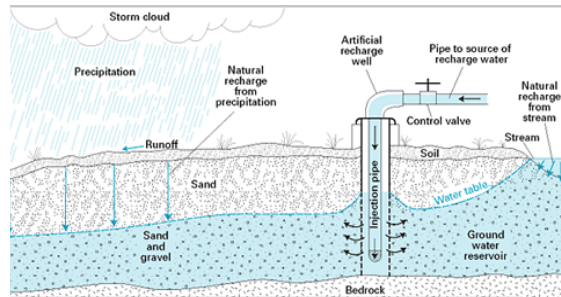


Figure 11: Recharging groundwater – natural vs. synthetic (Image by USGS)

The method described in rule 5 for recharging groundwater is similar to how Clean Water Services outfalls treated effluent into such waterways as the Tualatin River, Red Rock Creek, and the Clackamas River. If more natural filtration can occur, there are a number of spillover benefits.

Related Elements / Opportunities for Co-Benefits

There are a wide variety of related opportunities that are tangent to the topic of sustainable stormwater practices. For example, microhabitat creation (Sustainable Urban Design Framework - Draft, 2018) not only includes interspersed planting beds, but the existence of bacteria and other microbes that clean polluted runoff and wastewater. Ecological corridors and patches are natural results of repopulating existing hydrological areas with native vegetation. Areas of high ecological sensitivity and where less development is necessary for human networks result in ecological buffers. Sometimes these buffers must be designated as a remediation tactic as in the case of Red Rock Creek in Tigard.

Other tangent topics to stormwater include parking management and design, which must look for ways to mitigate runoff in order to be effective. Compact development provides the benefit of decreasing the overall surface area-to-watershed ratio, which has a large net impact. Wherever possible, is it critical to integrate permeable surfaces for paving. Lastly, maximizing the amount of urban tree canopies that occur has the potential to link benefits of stormwater management with habitat formation, reduce the urban heat island effect, and create enjoyable livable conditions. In coordination with resource flows of natural systems and other species, people and ecosystems may be able to thrive simultaneously.

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2.32 Extensive Urban Forest Canopy

Water / Block & Street

Rachel Lozeau

Topic Description

The urban forest canopy provides overhead coverage from the sun and precipitation. The canopy plays an important role in the process of stormwater management by capturing rainfall before it reaches the ground and impervious surfaces. The diverted water then undergoes a longer infiltration process into the groundwater system and can reenter the hydrologic cycle through evapotranspiration or through direct ground recharge. This process also delays the time of concentration—the time required for rain to travel from “the hydraulically most distant point in a watershed to the outlet,” (Woodward, 2010) with the outlet being a “major body of water or the aquifer” (Larco, O’Marah, & Trivisiono, 2016). Without the urban forest canopy, runoff would be more susceptible to collecting pollutants on impervious surfaces, which could then negatively affect waterways and the ecology of the area.

The urban forest canopy also provides microhabitats for a variety of species, enriching the biodiversity of the area. Additionally, the urban forest canopy and the introduction of street trees can help support a walkable community by creating buffer zones between pedestrians and traffic, which fosters a safe environment for pedestrians. The street tree canopy provides a sense of enclosure or shelter for the pedestrian, furthering the sense of safety and creating a comfortable, shaded experience. Street trees also provide an aesthetically pleasing experience for pedestrians and create interest to the streetscape.

Broadleaf deciduous trees are a beneficial choice in cities to mitigate runoff due to their large leaf structure and dense foliage; however, trees that provide coverage during the time of year with the most precipitation specific to the region are also favorable. For the city of Tigard, “an emphasis on planting evergreen trees for year-round benefits would create a more resilient sustainable urban forest” (DiSalvo, Fukuda, & Ramsey, 2017) due to the fact most rainfall occurs during the winter months. Additionally, trees that have vertical “branching limbs produce more stemflow, directing water into the soil at a reduced rate” (Larco et. al., 2016); this reduction in stormwater movement can also be attained with trees that have “rough or grainy” (Larco et. al, 2016) bark texture. Root structure also needs to be taken into consideration with the tree choice, as different species require different soil depths to promote healthy canopy growth.



Figure 1: Urban forest canopy of downtown Tigard; the city of Tigard’s tree canopy coverage is 25%, compared to Durham’s 49% coverage, Lake Oswego’s 47.6% coverage, Portland’s 27.7% coverage, and Beaverton’s 25.6% coverage (Tualatin River Keepers, 2015)

Current Conditions

The majority of the existing urban forest coverage in downtown Tigard is situated around the Fanno Creek Trail (see Figures 2 and 4). Fanno Creek includes tree species such as Ponderosa Pine, Oregon Oak, and Oregon Ash (Tree for All, 2017); the variety of deciduous and coniferous trees provides for yearlong tree canopy coverage adjacent to Fanno Creek and creates a rich ecosystem. This dense settlement then wraps downtown to the southeast with a patch of mature conifers that line an area open for development, which is also located upland from Red Rock Creek. The year-round life of the coniferous canopy (if the species are evergreen) can allow for effective runoff mitigation, potentially protecting Red Rock Creek. The wrap of trees is then completed with an urban forest canopy to the northeast of downtown, lining the Beaverton Tigard Highway. Overall, the use of trees densifies as one moves away from the commercial and industrial core of downtown and outward toward the residential areas. The dense canopy toward the edge of downtown creates a buffer for runoff before it reaches the two waterways, which can help mitigate the effects of pollutants.

Street trees are apparent and well-integrated into the downtown fabric on two newly redesigned streets, SW Burnham Street and SW Main Street. The street trees along SW Burnham Street are deciduous and roughly 20' in height, similar to the trees on SW Main Street. They are situated in bioswales, which collect runoff from the street, allowing the stormwater to infiltrate the ground slowly and in a controlled manner. The trees add an element of safety to the streets, creating a buffer from vehicular traffic and helping to delineate where crossings occur. Larger conifers and deciduous trees are set back from the streetscape, typically lining the parking lots that lie adjacent to SW Burnham Street. These larger trees provide coverage over the impervious surface of the parking lots with their extensive branch structures.

The lack of trees in certain areas more favorable to vehicular travel further deters pedestrians. Streets such as SW Hall Boulevard, with no street trees (see Figure 3), offer no element of safety and enclosure for pedestrians. The scarcity of trees on the site is also not beneficial due to the runoff that could be produced from the hardscapes in this area. With the amount of



Figure 2: Fanno Creek Trail



Figure 3: Looking southwest down SW Hall Boulevard

impervious surface in downtown Tigard, street trees, with extensive branching structures and canopy spread coverage, and a dense urban forest network, with a focus on evergreen trees, should be implemented in order to mitigate and control runoff and create a more pedestrian-friendly, walkable city.

Design Guides / Suggestions

(Figure 4 includes a map of downtown)

1. Create a continuous network of trees, “spaced at a maximum of 30” for optimal coverage (Larco et. al., 2016) and to re-stitch isolated areas into the overall urban fabric.

Use trees and green space to develop Fanno Creek Trail and to reconnect to Red Rock Creek.

Provide more green coverage for areas like SW Hall Boulevard and SW Commercial Street

(See Figure 5)

2. Consider the scale of the street or area that will be treated.

Smaller street trees (about 25’ tall at maturity) will not be suitable to treat stormwater for a parking lot.

Utilizing large conifers as street trees may present a risk to pedestrian safety.

(See Figure 6)

3. Utilize street trees where pedestrian accessibility is lacking to provide an element of safety and visual interest.

Area of concern: SW Hall Boulevard.

Line the trees on the road-facing side of pedestrian walkways.

(See Figure 5)

4. Use trees to buffer sensitive natural elements, such as waterways.

Provide protection for Fanno Creek and Red Rock Creek.

(See Figure 7)

5. Utilize the urban forest canopy where there are large areas of impervious surfaces and along streets.

Utilize trees along roads without canopy coverage and around parking lots.

The following list includes Tigard-approved broadleaf evergreens and evergreen conifers of various sizes (evergreens provide year-round coverage, ideal for mitigating runoff): Southern Magnolia, Strawberry Tree, Scotch Pine, Austrian Pine, Eastern White Pine, Oregon Myrtle, Edith Bogue Magnolia, Arnold Sentinel Austrian Pine, Fastigiata White Pine, and Giant Arborvitae Virescens (The City of Tigard, Oregon).

(See Figure 8)

6. Use different species of trees and different patterns to describe and define pathways, crossings, and ‘outdoor rooms.’

Utilize along long stretches of road (i.e. SW Hall Boulevard and SW Commercial Street)

(See Figure 9)



Figure 4: Downtown map noting key streets and waterways

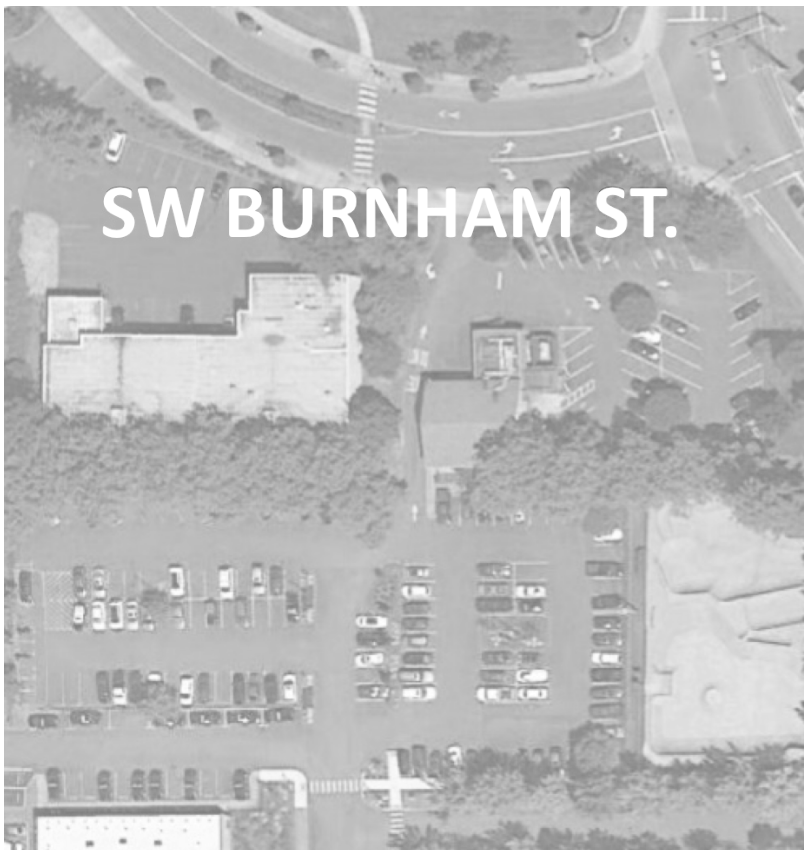


Figure 5: SW Hall Boulevard acts as a barrier to the connection of Fanno Creek and Red Rock Creek. Providing street trees helps to re-stitch these ecological areas as well as create a walkable environment for pedestrians



Figure 6: Small trees do not provide acceptable canopy coverage for large areas of impervious surfaces. Utilizing street trees with a larger canopy spread can collect more stormwater, mitigating runoff

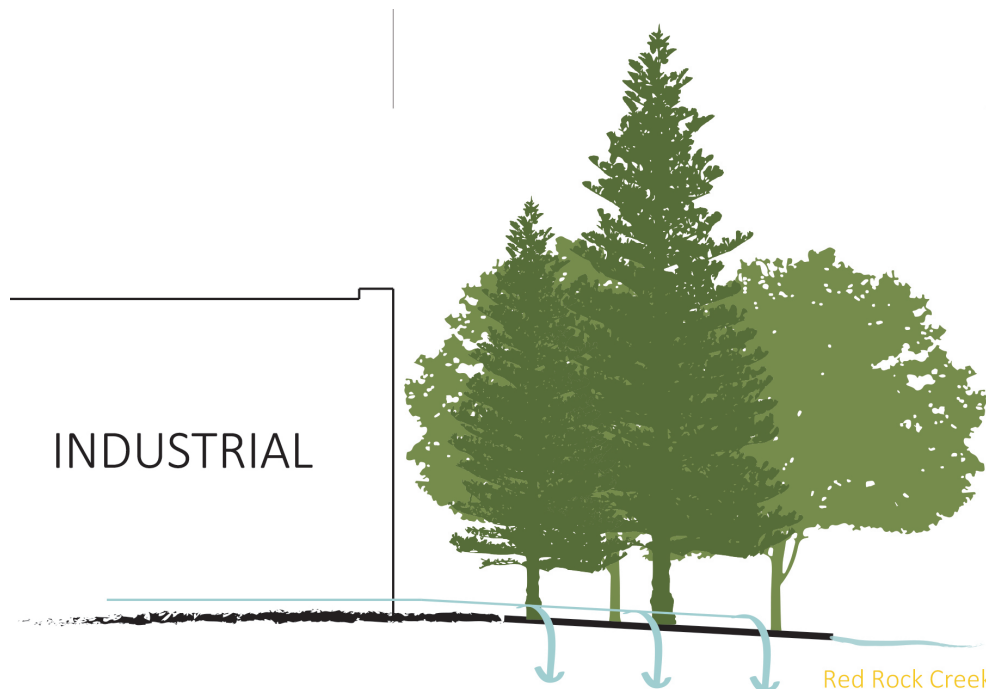


Figure 7: With industrial uses next to Red Rock Creek, trees with large canopy coverage should be utilized to act as buffers to help control contaminants from entering Red Rock Creek

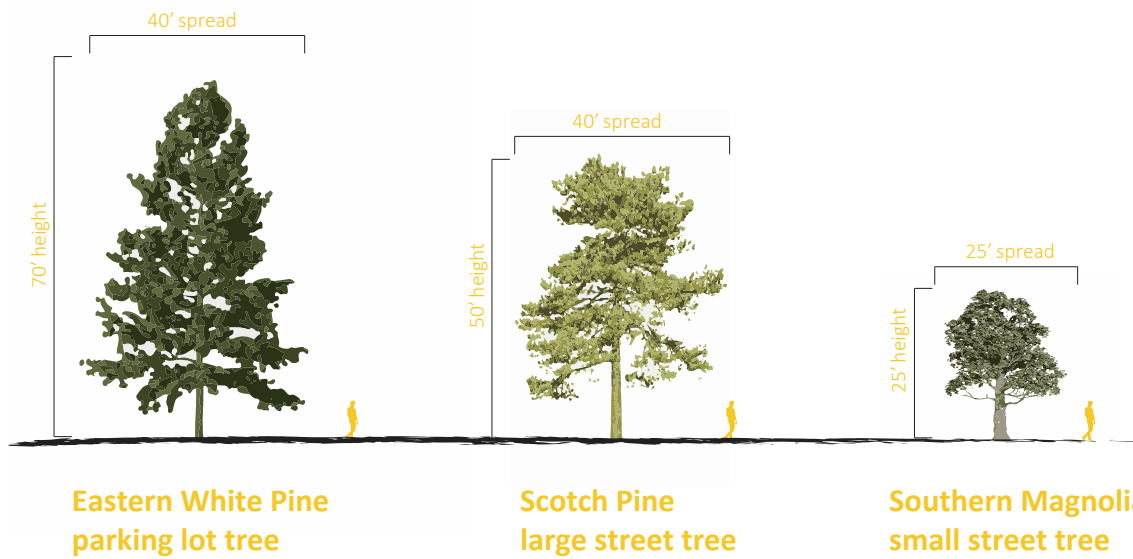


Figure 8: A variety of scales of evergreens are approved by the city of Tigard and are suitable for different interventions, such as coverage of impervious surfaces on parking lots, large streets, and small streets to help mitigate stormwater runoff



Figure 9: Adding trees to line SW Hall Boulevard provides a delineation of where crossings occur and where sidewalks lead, improving pedestrian wayfinding

Related Elements / Opportunities for Co-Benefits

1.301 Walkable Streets: Street trees enhance the experience of the pedestrian by creating shade, providing a sense of safety by buffering, and by being a source a visual interest.

1.32 Micro Parking Management & Design: Trees help reduce urban heat island effect, which is caused in part by parking lots and roadways. Trees can also help mitigate stormwater runoff that would normally reach the impervious surface of parking lots.

2.20 Robust Stormwater Management Network: “Urban tree canopies reduce the volume, velocity, temperature, and quantity of stormwater runoff” (Larco et.al., 2016).

2.31 Extensive Green Stormwater Infrastructure: Stormwater will reach the urban forest canopy before it has the ability to reach impervious surfaces. Canopies “provide the first point of mitigation” regarding the effects of stormwater (Larco et. al., 2016).

3.20 Ecological Corridors & Pockets: Dense urban forest canopies can provide extended areas to ecological corridors, acting as patches. Dispersed patches of urban forest canopies can provide a stepping-stone for ecological corridors.

3.21 High Urban Forest Continuity & Diversity: Urban forests can utilize a variety of different species that may, in turn, help to promote biodiversity for the area.

3.31 Micro-Habitat Creation: Tree canopies act as a habitat for a variety of small species including birds, small mammals, and a variety of insects.

3.32 Mitigating Habitat Disruption: Urban forest canopies can create patches of ecological corridors that may help to join broken areas of habitat.

3.33 Robust Ecological Buffers: Urban forest canopies can protect sensitive ecological areas, such as waterways, from harmful pollutants carried by runoff.

5.30 Active & Attractive Open Spaces: Street trees add an aesthetic sensibility to public spaces, create nodes for people to meet and linger, provide for comfortable shaded environments, and improve air quality.

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Figures created and photographed by Rachel Lozeau (2018)

2.40 Rainwater Capture & Re-Use

Water / Project & Parcel

Ellen Kume

Topic Description

Rainwater capture and reuse is an efficient way to repurpose natural resources to be reused later onsite. Rainwater is captured using a large surface and is then moved through coarse filters to remove debris. From there, rainwater is stored in a large cistern and is subsequently treated onsite for non-potable uses.

Rainwater can be captured using rooftops or ground surfaces. Rooftops that capture rain can be made from corrugated iron, aluminum, cement sheets, slates, and tiles. Tiled and metal-sheeted roofs are preferable because they are easy to construct and result in the cleanest water. Collecting rain from the ground surface is another option. However, this water is not as high quality as water captured on roof surfaces, and some water will be lost to ground infiltration.

There are many benefits to reusing rainwater:

- It lowers the pressure placed on existing water treatment facilities.
- Diverting rainwater from stormwater systems reduces wear and tear on existing infrastructure.
- Reusing rainwater means less demand on municipal water supplies.
- It reduces costs for residents.
- It reduces use of potable water for non-potable uses.
- It reduces demand on natural water sources, such as rivers and fresh underground aquifers.

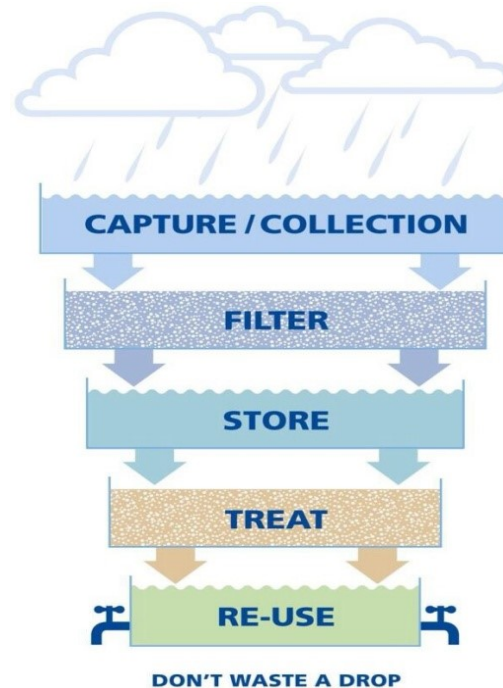


Figure 1: Sequence of rainwater capture for reuse



Figure 2: The Knoll at Tigard Apartments

Current Conditions

Tigard's proximity to Portland makes it a prime location to benefit from the city's leadership in green design and sustainability. There is a huge opportunity to implement rainwater capture in Tigard, especially due to its location in a region known for its abundant rainfall. One example of rainwater capture in the city of Tigard is The Knoll, an affordable senior facility and green building constructed in 2012. The building features a green wall, recycled building products, and a 15,000-gallon underground cistern that stores rainwater for flushing toilets. The city of Tigard also promotes rainwater capture and reuse in their Public Works Water Conservation Guide, which outlines the collection of rainwater for watering gardens.

There are many opportunities for the city of Tigard to promote sustainable water design to its residents and local businesses. It is Tigard's vision to "become the most walkable community in the Pacific Northwest where people of all ages and abilities enjoy healthy and interconnected lives." This idea can be extended to the environmental health of the community as well.

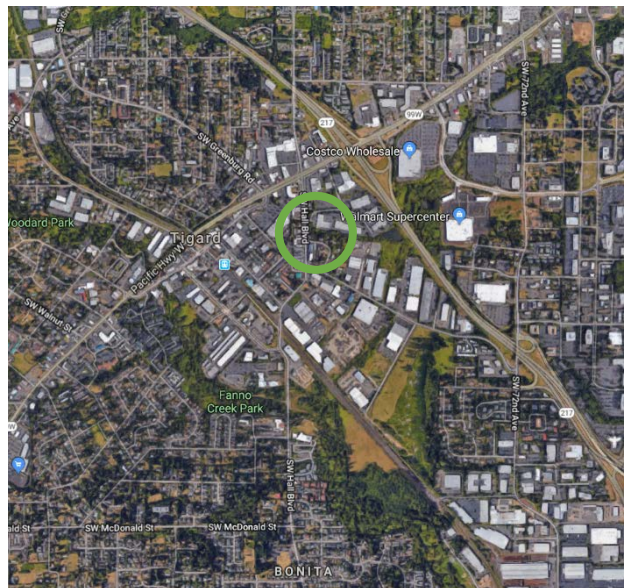


Figure 3: The Knoll at Tigard location

Some Suggestions for Tigard’s Healthy and Sustainable Future

1. Encourage local businesses in the heart of downtown to adopt water capture and reuse. This would reduce the amount of rainwater that is flushed into the city’s water treatment facilities. This is especially important in areas that have an abundance of hard surfaces and lack open green spaces where rainwater could otherwise be naturally filtered and allowed to infiltrate into the ground.



Figure 4: Downtown Tigard – prime spots for rainwater capture infrastructure

2. Make systems visible. Promotion and education should be implemented in order to inform and teach citizens that these systems exist and are viable options. Making systems visible normalizes a process that might be unfamiliar to the average citizen. A project that does an excellent job of promoting sustainability through visibility and interaction is Hassalo on 8th in Portland.



Figure 5: Hassalo on 8th, constructed wetlands

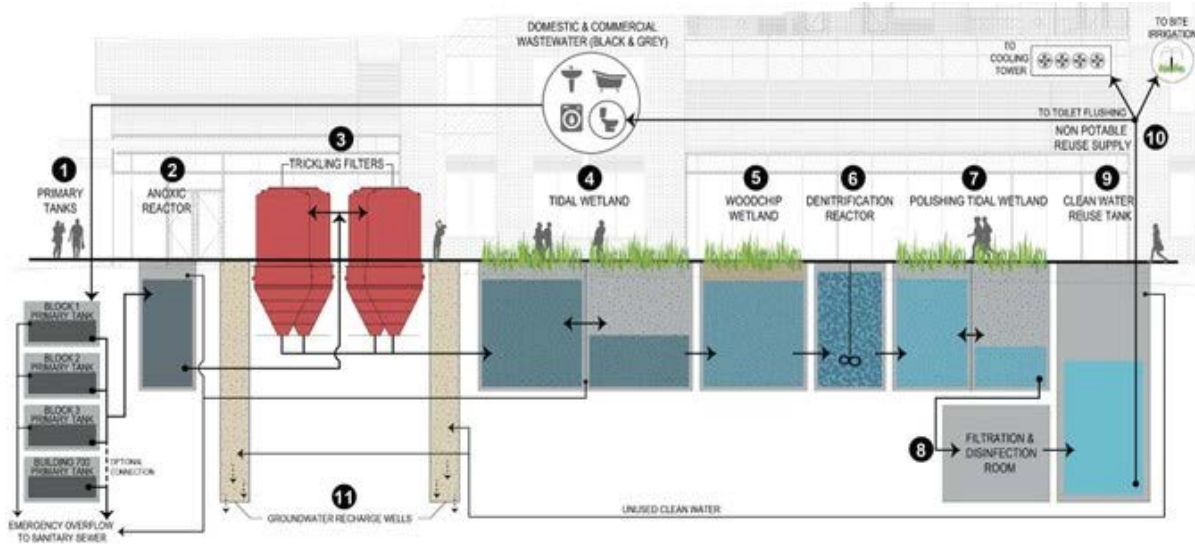


Figure 6: Hassalo on 8th, wastewater diagram

3. Create a city-wide, urban rainwater capture system. Traditional stormwater systems move water away from paved surfaces as fast as possible. This means that water that is re-released into rivers and streams come in large volumes and fast velocities. This can lead to flooding and deterioration on the river edges. The Los Angeles Stormwater Capture Master Plan is an example of an extensive, city-wide effort to manage stormwater responsibly. In the plan, water will be captured for reuse or will be allowed to slowly infiltrate the ground. The gradual infiltration reduces the risk of habitat deterioration. This plan also allows the city to reduce their reliance on imported water.



Figure 7: Urban rainwater strategies

4. The infrastructure at the new MAX stop could be the catalyst for a larger, city-wide rainwater capture strategy in Tigard.

Promotion of residential rainwater capture and re-use. Currently, rainwater capture promotion in Tigard focuses on reuse for watering gardens, but there are many potential uses for rainwater captured onsite, such as flushing toilets and washing clothing. Additionally, there are many benefits to residents, including reduced water bills, reduced stress on city infrastructure, and general sense of pride for doing something good for the environment.

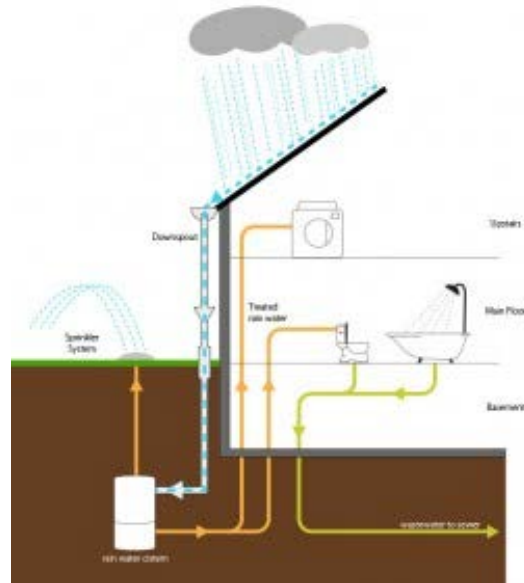


Figure 8: Residential rainwater capture and reuse

Related Elements /Opportunities for Co-Benefits

2.31 Extensive Green Stormwater Infrastructure: Green stormwater infrastructure is a way of managing surface runoff. These systems reduce the amount of water discharged from a site, reduce risk of flooding, and improve water quality. Some examples of these systems are green roofs, permeable pavement, rainwater capture, infiltration trenches / basins, filter drains / strips, swales, detention basins, retention ponds, and wetlands. Rainwater capture is a specific implementation of green stormwater infrastructure. Rainwater capture can and should be used with other green stormwater infrastructure to create a robust stormwater management system.

2.30 High Surface Permeability: Surface permeability in the context of the urban environment refers to any urban ground surface, streets, sidewalks, playfields, etc. It is important to understand and consider because the amount of impervious surface tends to increase as an area becomes more urbanized. More impervious surface means more runoff that is directed into streams and rivers and less ground infiltration. A way to deal with this runoff and reduce the stress placed on local stormwater systems and rivers is through rainwater capture and reuse.

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3.20 Ecological Corridors & Pockets

Ecology & Habitat / District & Neighborhood

Shannon Williams

Topic Description

Urban development causes habitat fragmentation and ecosystem disturbance. Ecological corridors and pockets are important elements to include in urban design because they help to mitigate some of the negative impacts of development. Ecological corridors are strips of vegetated land that connect two or more patches of habitat, and ecological pockets are small lobes of habitat that provide for more specialized habitat needs. Both play a key role in preserving and enhancing biological diversity as well as helping to reduce the heat island effect, mitigate stormwater runoff and pollution, provide flood resilience, and contribute to human well-being.

Current Conditions

The study site is mostly characterized by fairly dense urban development with patches of natural habitat and open space around the western and southern perimeter. Fanno Creek Park, a 30-plus acre park consisting of natural areas along part of Fanno Creek, forms the largest patch of habitat in the study area. A restoration project is currently planned to restore Fanno Creek closer to its historic location, create and improve the floodplain wetland, and re-establish native plant communities. In the northwest section of the study area, Fanno Creek flows under bridged sections of SW Main Street and Pacific Highway to connect with a vegetated riparian corridor that connects Woodard Park, Dirksen Nature Park, and Englewood Park. South of the site, the creek connects with the Brown Natural Area and the Colony Creek Greenway.



Figure 1: Fanno Creek Park corridor restoration project. Credit: Tualatin Park & Recreation district



Figure 2: Map of study site highlighting parks and vegetation. The vegetation layer contains vegetation patches that are larger than 1/2 acre

In addition to Fanno Creek flowing through the park, Rock Creek flows northeast into a wetland to the east of the site. This creek is funneled under a railroad track and through an industrial area. The wetland to which it flows is zoned light industrial on the most recent Tigard Zoning Map (effective 12/27/17). There is a vegetated buffer along the majority of the eastern branch of the creek, although it is very narrow (around 50 feet in most places). This area should be targeted for improvement to enhance riparian habitat and reduce pollution runoff from adjacent industrial areas.

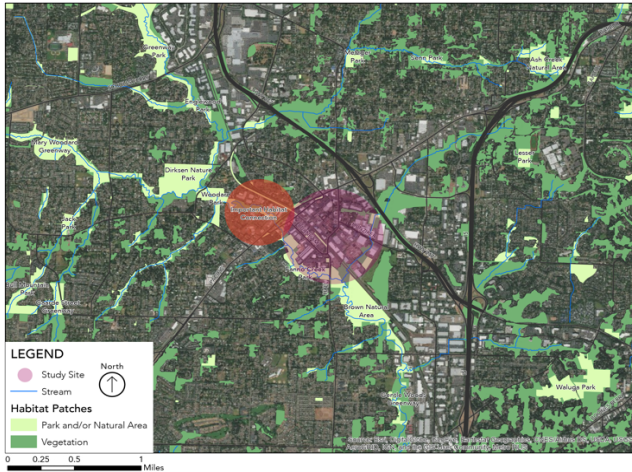


Figure 3: Regional habitat connectivity illustrating the importance of greenspace around the study site in maintaining the integrity of the system of natural areas

Apart from the creek buffers, the study site includes little open space or patches of vegetation that would provide habitat. The one area with decent vegetation cover is in the residential area northeast of the intersection of SW Hall Boulevard and SW Hunziker Street. This patch is connected to the wetland and the east branch of Fanno Creek with a narrow vegetated corridor. The habitat that does exist in the study area is very important to preserve in order to maintain habitat connectivity throughout the region (Figure 3). Of particular importance is the narrow corridor (shown in orange in Figure 3) connecting Fanno Creek Park with parks and greenways to the north and west of the study area.

Design Guides / Suggestions

This area is highly urbanized with remnant habitat corridors and lobes existing at the perimeter of the study site. The main goals of the recommended design elements below include protecting and enhancing what is already present. It is important to maintain greenfields where they are present, especially when they already link to other natural areas (Figure 3), because adding corridor connectivity or maintaining an existing corridor is much easier and less costly to do in a greenfield compared with a retrofit where there is existing development and poor soil quality.

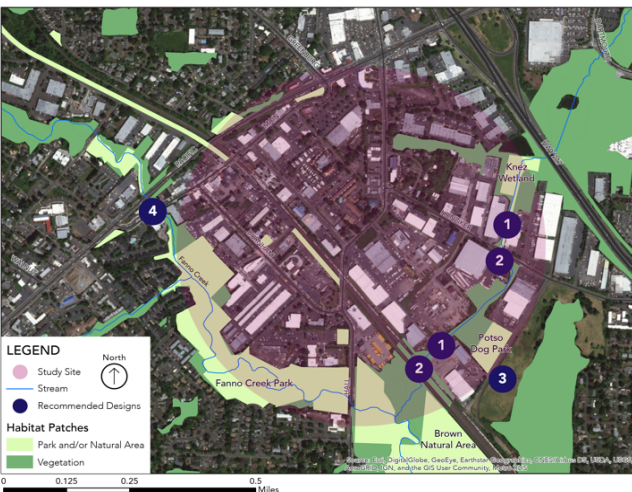


Figure 4: Map of recommended design elements in context of where in the study area they are located

Design recommendations below are illustrated on the corresponding maps in pink.

Enhance and widen corridor along Rock Creek. Riparian corridors are particularly important to protect. With this particular riparian corridor flowing through an industrial area, it is even more important to provide adequate buffer widths to help filter out some of the pollution contained in water runoff from these sites and offers suitable wildlife habitat. The three sections highlighted only have a corridor width of around 50 feet, so these sections would benefit from soil remediation and new vegetation to increase the width of these corridors. Remove barriers of movement across the railroad and SW Hunziker Street. Improving connectivity in this section would not only improve movement along a riparian corridor, but it would also allow movement of species between Knez Wetland and Fanno Creek Park. Building an overpass that wildlife could use to cross is likely not feasible in these areas, but increasing the density of vegetation right to the rail and roadway and installing signage along the roadway would likely reduce some of the risk for wildlife at these crossings. The culvert under SW Hunziker should also be improved and enlarged, if possible.

Improve habitat connectivity by connecting the vegetated area east of Potso Dog Park with the riparian corridor northwest of the park. Potso Dog Park is primarily covered in grass, so native tree and shrub plantings may be needed in order to facilitate movement of animals between the riparian corridor with this lobe. Connecting the vegetation patch to the existing corridor will allow for more specialized habitat needs away from the industrialized area. Making a second connection between this lobe and Brown Natural Area across the railroad tracks will improve connectivity and provide an alternate route that helps to reduce the negative effects of gaps, disturbances, and predators within corridors.

Protect habitat quality and facilitate species movement across two main roads, the Pacific Highway and Main Street. This recommendation focuses on critical riparian habitat that links Fanno Creek Park with natural areas to the northwest of the site (Woodard Park, Dirksen Nature Park, and Mary Woodard Greenway). Protecting and enhancing this section of corridor will not only help local species thrive and move within the space, but it will support the integrity of the regional network of natural areas. This section of corridor moves through a dense commercial area and under a very busy transportation corridor, so special care should be taken to make sure the habitat quality and corridor size in this section is not diminished. If the opportunity arises, it should be widened to further facilitate species movement and habitat quality.

Related Elements / Opportunities for Co-Benefits

Influences:

2.20 Robust Stormwater Management: Corridors provide vegetation and high surface permeability to reduce runoff.

3.21 High Urban Forest Continuity & Diversity

2.32 Extensive Urban Forest Canopy

4.31 Micro Climate Mitigation: Corridor vegetation can also help to reduce the heat island effect as well as provide residents a cooler microclimate during extreme heat events, which serves as an important public health benefit.

Influenced By:

3.10 Compact Development: Provides increased land / resources for corridors / habitat.

3.11 Avoid Ecologically Sensitive Areas

3.22 Daylight & Restore Waterways

3.31 Micro Habitat Creation

3.311 High Vertical Complexity: Developing without complex structure may lead to fragmentation

3.32 Mitigating Habitat Disruption: Increased disruption causes corridor fragmentation.

3.33 Robust Ecological Area Buffers

5.30 Active & Attractive Open Space

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3.31 Microhabitat Creation & 3.311 High Vertical Complexity

Ecology & Habitat / Block & Street

Gloria Morazan

Topic Description

A microhabitat is a small habitat or fragment of a larger ecosystem. The size, location, type, and origin of microhabitats can vary within the natural and built environment. Ranging from small trees to large parks, located in a city or in rural areas, all of these fragments are spaces where different species of flora and fauna develop. Microhabitats can originate as nurtured places created by humans through design or as fortuitous landscapes found in forgotten places within the city. In each case, they can provide biodiversity and opportunities for nature to develop.

The vertical structure of microhabitats is its arrangement in layers over a broad elevation gradient. This verticality within the environment (natural and built) is as important as the length and width dimensions. Based on this, there must be a high vertical complexity to increase the resilience of green spaces and species. This complexity can be achieved through spaces with high density and diversity of species, composed of three layers at different levels: tree or canopy structure, shrub layer, and ground floor. The layers can create connectivity between flora and fauna, facilitating biodiversity by providing more niches and microhabitats. Additionally, vertical complexity contributes to defining spaces, highlighting the edges and connections of the natural areas within cities.



Figure 1: Existing microhabitats in Tigard

Current Conditions

The city of Tigard is part of a network of green spaces that exist as independent patches and / or bigger areas, edges, and corridors located in different parts of the city. Even though there is a presence or existence of these green areas, there is not true connectivity between them. They lack strong links to the built environment and society. As part of the newly proposed Southwest Corridor Max line, the project's site is located in downtown Tigard within the area TriMet is considering for the transit stop. Inside this area the main green space is Fanno Creek Park, which extends from south to north on the west side of the site. Fanno Creek also extends to the northern side of Highway 99W through Woodard Park and Dirksen Nature Park. These parks contain different native habitat environments and wetlands like oak savannah, forested wetland, coniferous forest, mixed deciduous forest, ash forest, riparian forest, emergent wetland, scrub shrub wetland, and more. Red Rock Creek is another important waterway in the area. The creek requires many improvements due to its poor conditions associated with culverts, flooding, siltation, and erosion in various areas around Tigard.



Figure 2: Map of the existing microhabitats in Tigard

Other microhabitats identified on the site include dog parks, trees, stormwater catchment areas, and small patches in the sidewalks that are more abundant in the main streets. The vertical complexity in the sidewalks is moderately positive with two layers of vegetation. The microhabitats are also present in areas along the railway, yards, and vacant lots. The city envisions creating connectivity between the green spaces through corridors and pathways that are more pedestrian-oriented, but that goal has only been realized in some specific cases and works-in-progress.



Figure 3: Microhabitats at the sidewalks of the main streets



Figure 4: Microhabitats on the sides of the railroad



Figure 5: Fanno Creek Park



Figure 6: Dog park and streets from Tigard

Design Guides / Suggestions

The existence of some green spaces and the availability of locations to develop new ones provide opportunities to apply different urban design guidelines and approaches to create a healthier city where nature and the built environment create a unified system. The main objective must be to achieve true ecological connectivity within the city to minimize continued fragmentation and associated species extinctions. Connectivity can be created by weaving nature within the city, and this can be achieved by:

1. Creating and improving the network of pathways that connect the city;
2. Creating new green spaces of different scales;
3. Improving existing green areas;
4. Restoring microhabitats around the railroad and waterways; and
5. Defining edges, spaces, and connections of natural areas with the creation of buffers.

These guidelines can be applied throughout Tigard in different locations and scales. The first step to weave the natural and built environments is extending the greenery. Fanno Creek is the city's main green asset in the downtown, and its greenery could be extended into surrounding areas. New green spaces can be created in small areas on the streets with parklets, planting zones on the sidewalks, pocket parks, and bigger parks on larger sites. Parking lots also represent good opportunities; they can be transformed by introducing nature and giving it the same importance as cars without limiting the space required to accommodate the needed parking.

Green spaces can also be created in buildings through the technology of green roofs and walls. These technologies can similarly be used for rainwater retention and treatment at both the building scale and the urban scale. Rain gardens and bioswales prevent and reduce the effects of rainwater runoff. They can be created at the ground level, in the sidewalks, or even in the medians and islands on streets. Another technique to increase water filtration and control rainwater consists of replacing impervious surfaces with pavers. Improving the existing stormwater system in a sustainable way would ameliorate water quality.

Buffers and riparian vegetation are also beneficial to waterways. They provide stability, enabling the watercourse banks to resist erosion. They also function as corridors contributing to the movement of fauna. Increasing connectivity and reducing culverts will improve the overall conditions of microhabitats in the area.



These strategies not only contribute to the ecosystem, but they also improve street aesthetics, benefit pedestrian safety, and enhance people’s experience as they move through the city. Good connectivity from Fanno Creek could be done along streets such as Ash Avenue, Main Street, and Hall Boulevard. The park already contains entrances through these streets, and additional connections can be introduced with new trails, increasing planting areas along both existing and new. Creating vertical complexity is important in all the green areas, and all should include at least three layers of vegetation.

As Tigard develops, the objective of bringing nature into the city should be present in every project. The improvement and redevelopment of existing areas can be carried out with landscaping concepts. Similarly, new developments should start by preserving any significant tree or natural feature in the area, improving existing elements, and creating new green spaces.

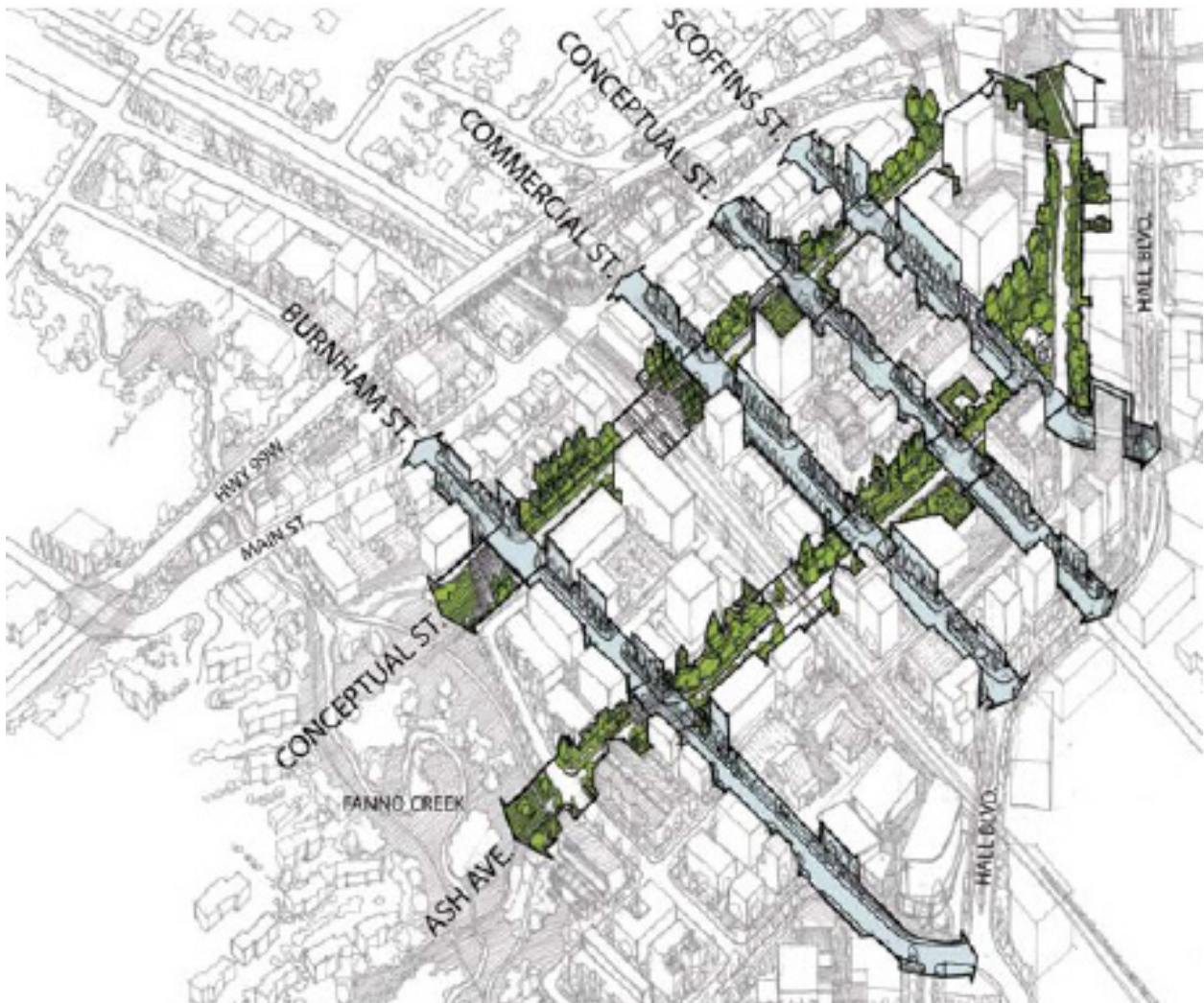


Figure 8: Network of green pathways (from Tigard future vision)



Figure 9: Before and after of Railroad Park, Birmingham, Alabama

Related Elements / Opportunities for Co-Benefits

Nature is a system that operates not just outside the city but within it. Integration of urbanism and ecology is required in order to make this system work. Based on this idea, the urban design element analyzed in this sections relates to different elements of the whole framework:

1.32 Micro Parking Management / Design: Parking lots should include nature within them, creating a balance between vegetation and cars. These spaces create opportunities to increase the connectivity of microhabitats.

2.30 High Surface Permeability: Surface permeability allows filtration, minimizing rainwater runoff that contributes to the urban hydrological cycle.

2.31 Green Stormwater Infrastructure: The control and treatment of rainwater can improve the quality of waterways and provide water for vegetation.

2.32 Extensive Urban Forest Canopy: Urban forests serve as microhabitats with diversity of fauna, creating vertical complexity and promoting connectivity.

3.20 Ecological Corridors & Pockets: Corridors and pockets such as parks and road edges create microhabitats within them and connectivity to surrounding habitats that can be reinforced with vertical complexity.

3.11 Avoid Ecologically Sensitive Areas: The undisturbed areas within cities are microhabitats that generally contain high diversity of species.

3.312 Native Vegetation: Native vegetation is a key element to create high vertical complexity, and it supports other native species.

3.33 Robust Ecological Area Buffers: Buffers improve air and water quality, protect soil resources, enhance microhabitats, and improve the aesthetic of the environment.

4.31 Microclimate Mitigation: Global warming and pollution have a negative impact on microhabitats.

5.30 Active / Attractive Open Space: Designed open spaces are areas of microhabitat that promote connectivity in cities' ecosystems.

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3.33 Robust Ecological Area Buffers

Ecology and Habitat / Block & Street, Project & Parcel

Joel Bohlmeier

Topic Description

A buffer zone is an insulating or “buffer” area that lies between important habitat or other natural features and the built or structured environment. For example, a dog park may be used to buffer a forest from residential development, or a riparian buffer strip can protect a stream from harmful runoff of a nearby industrial zone parking lot.

Benefits of Successful Buffers:

- Improved water quality
- Biodiversity
- Reduced soil erosion and increased soil productivity
- Economic opportunities
- Protection and safety from natural elements and natural disasters (i.e., floods, fires, strong winds, etc.)
- Enhanced aesthetics or visual quality
- Outdoor recreation



Figure 1: (Source: Google)

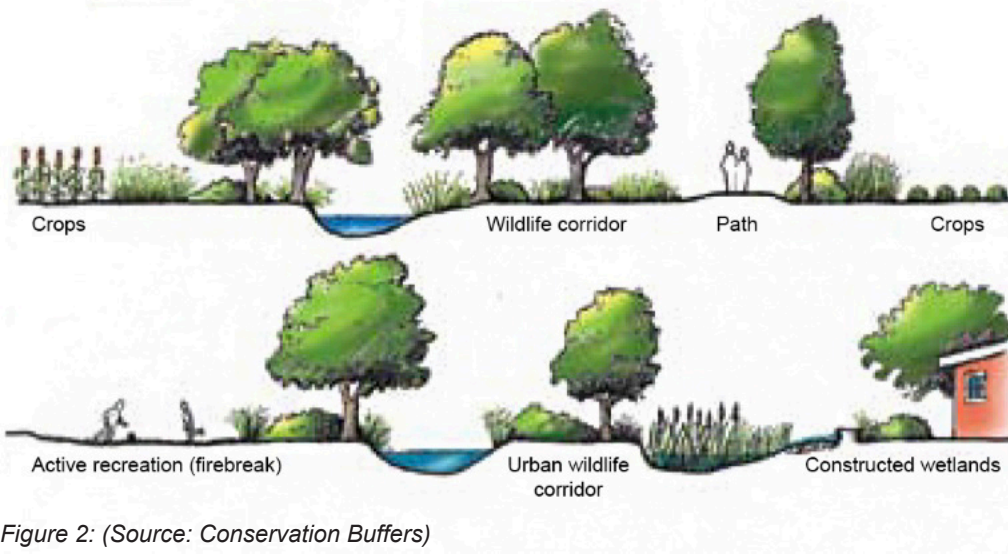


Figure 2: (Source: Conservation Buffers)

Current Conditions

Within the site, there are two primary zones of natural habitat that require a robust buffer: Fanno Creek and its surrounding natural habitat, and Red Rock Creek. The current design of the Fanno Creek area is relatively successful with the use of a few buffering elements. However, there are virtually no buffering elements between Red Rock Creek and the built environment.

The first method of buffering utilized near Fanno Creek is the park trail. The trail runs the length of Fanno Park and not only provides a wonderful opportunity for users to be engaged with the natural habitat, but it establishes a mild buffer between development and the creek. On the northwest end of the creek, the trail runs along the southern edge where development is closest (AREA 1, Figure 3). This ensures separation between houses and the creek. As the trail approaches the center of the site, it crosses the river and runs along the north, again where development is closest to the creek (AREA 2, Figure 3). However, at the southeast end of the creek, the trail establishes a buffer to the north side of the creek but fails to buffer the creek from the historic Fanno Creek House on the south edge (AREA 3, Figure 3). Unlike the Fanno Creek Park area, Red Rock Creek does not utilize a trail or any form of active or productive space as a buffering element.

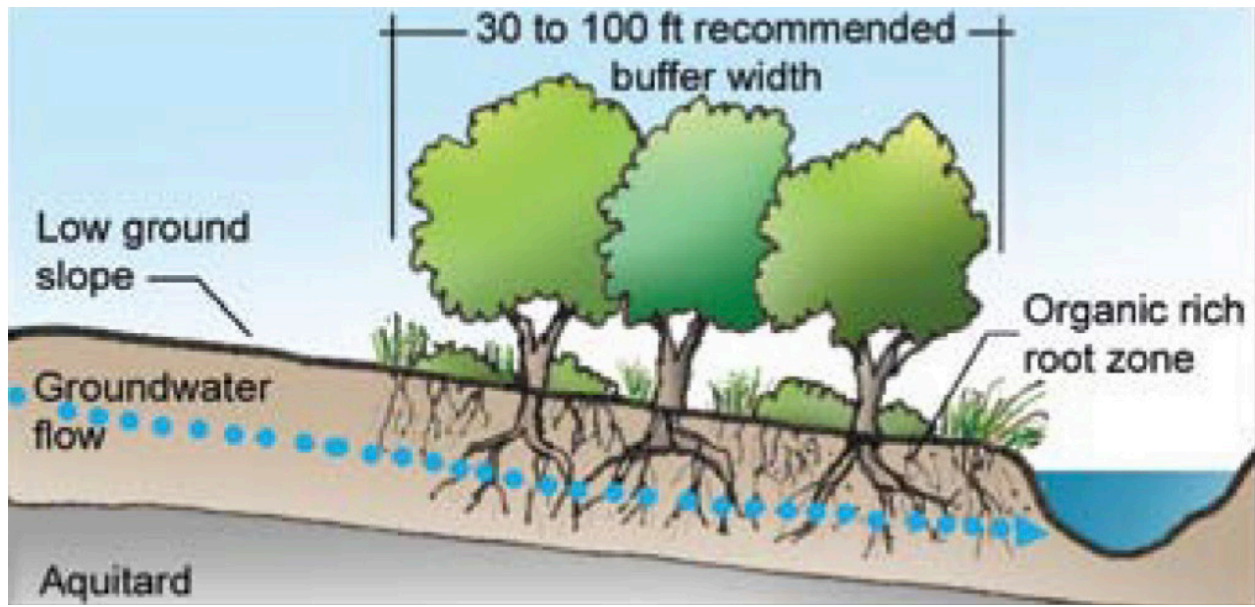


Figure 4

At area three, where Fanno Creek intersects with SW Hall Boulevard, continuity is adequate. Other than the road itself, development is stopped, and a vegetated riparian zone creates a buffer. The scale of the road is pinched, thus reducing the distance that animals must move to connect from one side to the other. However, at area four, where Fanno Creek passes under SW Main Street and Pacific Highway W, the vegetated riparian buffer is lost. The streets are wide, and development lies directly beside the creek, failing to buffer the natural habitat from the built environment. However, the primary issue that Fanno Creek faces is that it is eventually joined by Red Rock Creek. Red Rock Creek's buffering from the surrounding built environment is tremendously lacking. As indicated in Figure 3, the creek is bordered by numerous industrial sites and parking lots, all of which allow for runoff to enter directly into the stream. This runoff is then carried downstream, eventually entering Fanno Creek where the two streams merge.

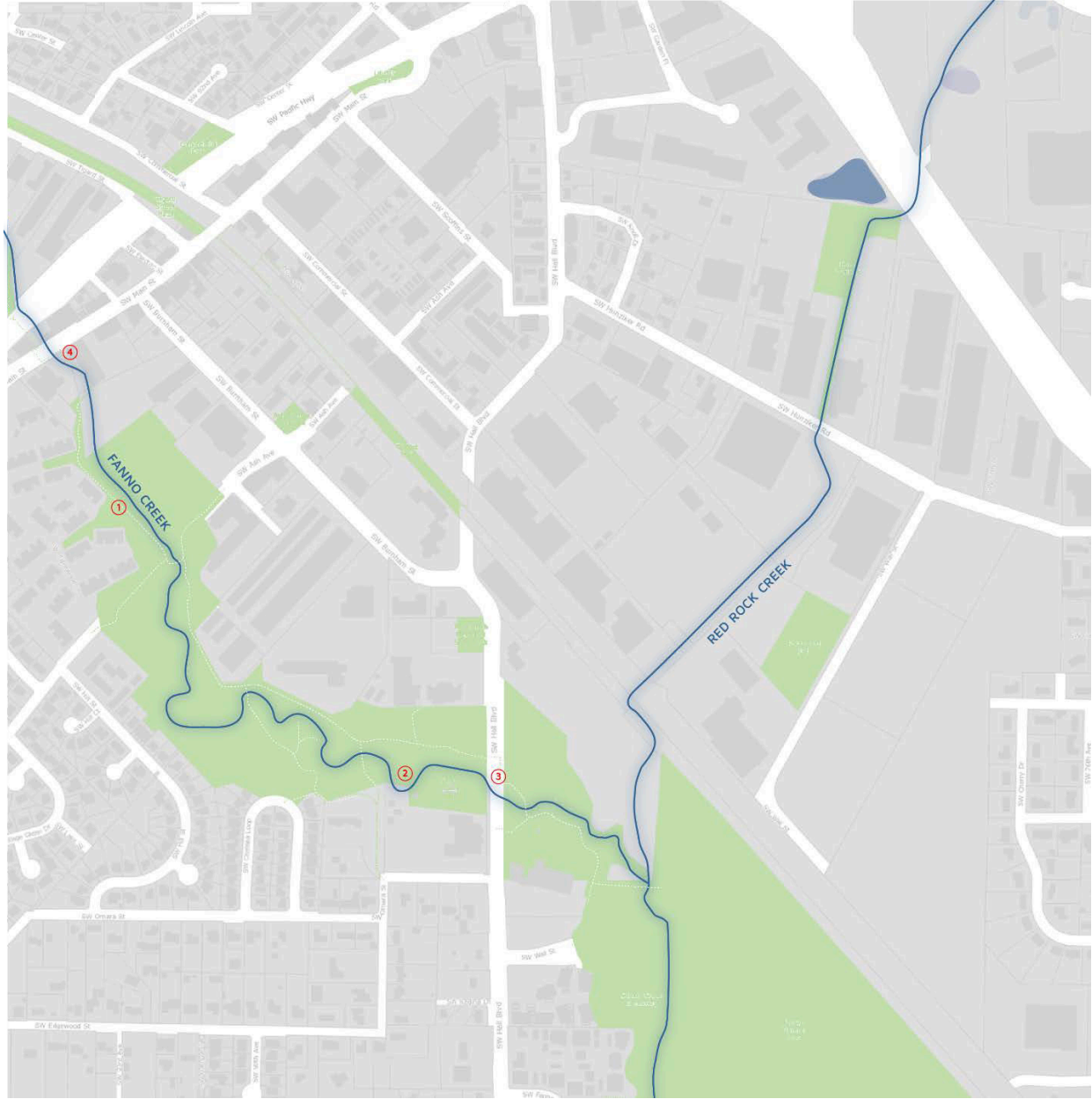


Figure 5

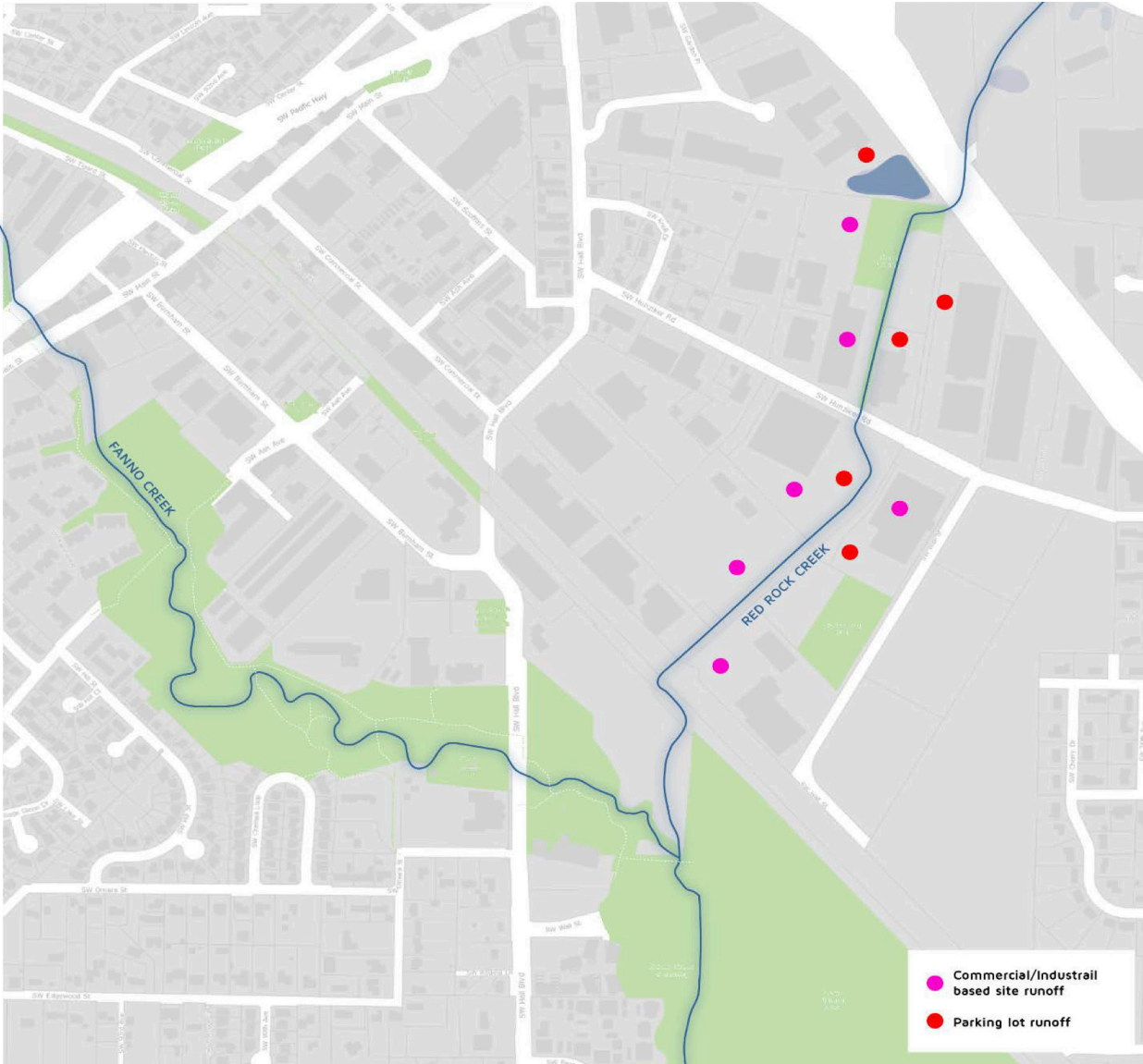


Figure 6

In the case of Fanno Creek and its surrounding park, the trail and vegetated riparian zone provide a relatively sufficient level of buffering in terms of sheer exposure of the creek. However, the proximity of development poses other issues. Distance is critical in establishing a proper buffer, hence the distinction of a robust ecological buffer. The creek lies within close proximity to many homes and commercial areas. Issues of noise, light, and constant exposure to humans may make it difficult for many animals to exist within the small area of Fanno Creek Park. Furthermore, Red Rock Creek’s lack of ecological buffers from surrounding industrial and commercial zones create substantial issues for Fanno Creek downstream.

Design Guides / Suggestions

1. Ensure that a riparian zone is maintained between the trail and creeks.

An essential piece of maintaining a healthy habitat is ensuring the protection of the health of the creek and its water. When locating the trail, ensure that a vegetated riparian buffer exists between the trail and the creek to filter runoff and keep the water of the creek clean for promotion of habitat.

2. Maintain a variety of vegetation types, scales, and densities.

Different species have different requirements for life. Furthermore, certain species work in harmony with other species and require close proximity to a diverse habitat. To ensure a healthy ecological diversity of species of animals and insects, vegetation should be diverse whenever possible.

3. Ensure proper tree canopy coverage along the creek.

To shade and protect the habitat of the creek, tree canopy should be maintained above the edges of the river. Create soft vegetation edges when two separate zones mesh.

Hard edges encourage movement while undulating or irregular edges encourage diversity of habitat. When meshing two separate zones, an attempt should be made to intersect with irregular edges to promote healthy diversity in habitat.

4. Create zone buffers as a gradient of diminishing intensity of use.

To optimize the space between development and ecological habitats, buffers should be zoned for uses. As a general guide, see Figure 7 below.

	HABITAT ZONE	RESTRICTED ZONE	ACTIVE ZONE
MINIMUM WIDTH	<i>Sloping river bank plus one tree width, plus any wetlands or steep slopes.</i>	<i>Cover the 100 yr flood plain.</i>	<i>At least an additional 25 feet before structures.</i>
FUNCTION	<i>Protect and assist in the functioning of stream ecosystem</i>	<i>Distance development from sensitive ecosystem</i>	<i>Prevent encroachment and detain/filter runoff</i>
RECOMMENDED VEGETATION	<i>Undisturbed mature forest or rehabilitated forest</i>	<i>Managed forest, selected clearing acceptable</i>	<i>Forest preferable, shrubs and tall grass is possible, turf grass acceptable</i>
RECREATIONAL USES	<ul style="list-style-type: none"> • Trail spurs to lookouts • Controlled access to water • Benches • Arboretum 	<ul style="list-style-type: none"> • Trails • Bike Paths • Picnic tables • Benches • Arboretum 	<ul style="list-style-type: none"> • Athletic fields • Playgrounds • Gardens • Picnic areas • Orchards • Lawns
FUNCTIONAL USES	<ul style="list-style-type: none"> • Flood control • Habitat restoration 	<ul style="list-style-type: none"> • Stormwater BMPs • Wildlife Corridor 	<ul style="list-style-type: none"> • Stormwater BMPs • Residential and recreational uses

Figure 7

Related Elements / Opportunities for Co-Benefits (if possible)

Influences

1.202 High Network Connectivity: Buffers can be great places for bike / pedestrian trails.

2.20 Robust Stormwater Management Network: Buffers help mitigate and distribute runoff into streams and waterways.

3.20 Ecological Corridors & Pockets: Buffers can protect habitat pockets and serve as eco-corridors.

3.31 Microhabitat Creation: Buffers can themselves be microhabitats.

Habitat Connectivity: Developing without buffers further isolates species.

Riparian Corridors: Healthy waterways require riparian buffers.

Influenced By

1.14 Macro Land Use Mix and Distribution: Proper zoning can designate buffer areas.

3.12 Macro Ecological Systems: Existing systems can help determine where buffers will be most effective.

3.21 High Urban Forest Continuity & Diversity: Buffers can be part of the urban forest.

3.30 High Surface Permeability: More impermeable areas generate more runoff and require larger riparian buffers. (Robust Ecological Area Buffers, WIP)

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5.30 Active & Attractive Open Space

Equity & Health / Block & Street, Project & Parcel

Amy Santimauro

Topic Description

Active and attractive open space is freely accessible outdoor space of any size connected to and within walking distance of the urban fabric. The goal is to promote active lifestyles while offering a diverse set of spaces used for physical activity. Connectivity to other spaces throughout the city is important in order to provide all demographics of people with a variety of accessible and safe outdoor space typologies.

Current Conditions

The location of the site sits within the city of Tigard and is bound by Fanno Creek Park to the west side. This is a huge advantage for creating successful active and attractive space. The park sits between Main Street in downtown Tigard to the east and a residential neighborhood to the west. Currently, it consists of four trail entrances from the downtown site. The park consists of mostly wooded floodplains with paved and unpaved trails weaving through the series of open green spaces. The city of Tigard is currently partnering with Clean Water Services in an attempt to restore Fanno Creek and provide more access and safe amenities to city residents. This will include the improvement of floodplain wetlands, replacement and installation of a series of bridges, a new trailhead, construction of a new pedestrian/bike trail, and the establishment of native plant communities along the new trail edges (Tigard-or.gov).



Figure 1: Woodberry Down, UK. (Source: BerkeleyGroup.co.uk)

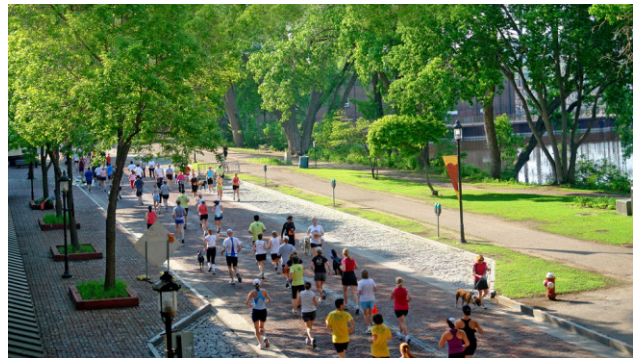


Figure 2: (Source: Best & Worst Cities for an Active Lifestyle. BroBible.com)



Figure 3: Fanno Creek Master Plan (Source: Tigard-or.gov)

This initiative will likely result in a larger variety of trails to make the park useable for a wider variety of pedestrians such as children, elderly, families, active adults, and bikers. While the city can only work with the natural habitat that currently exists, the floodplains may restrict the types of green spaces they can provide. Regardless, this is a great way to connect different parts of the city together such as downtown, the city library, and public skate park. The car-free trails and paths allow pedestrians to use the park to safely travel to restaurants, shops, and the city library by foot. Furthermore, there is a master plan in place to build a series of mixed-use buildings along the park that will include a public plaza and fountain. The introduction of a space like this would increase the diversity of activities that can exist and be successful in the area. Further analysis of the surrounding areas of downtown Tigard proved that although Fanno Creek Park is a great recreational resource, the city lacks any type of organized public activity such as basketball courts, volleyball courts, tennis courts, and soccer fields. With the exception of two dog parks and a skate park (marked on the map above), the city is lacking public amenities that promote a healthy lifestyle and interaction amongst city residents.

Design Guides / Suggestions

1. Locate more trailheads in order to encourage safe pedestrian engagement with the Fanno Creek Park from the site.
2. Use the city's master plan for the plaza and green space design in order to make decisions while designing. Consider the fact that the city has laid the groundwork for creating a centralized public space that will provide a variety public amenities. Development should support this new plan and help to aid these amenities to thrive and be a successful addition to the city.
3. Consider what needs are not being met by the current public space. Could the park benefit more people if the activities were expanded beyond biking, running, and walking? Consider including fields, sports courts, and/or covered gathering spaces within the open spaces of the existing park. These could also extend out into the edges toward the city to provide buffers into the park.
4. Incorporate the planned public space into future designs. This could mean extending "fingers" of the park into the city to create pocket parks or pulling other aspects of vegetated space into the downtown area from Fanno Creek Park.

Related Elements / Opportunities for Co-Benefits (if possible)

Robust Ecological Area Buffers: Active / Attractive open space is most accessible when connected to the urban fabric. This can be used to create buffers as well as serve the public with outdoor amenities.

Mitigating Habitat Disruption: Avoiding disruption and building of large infrastructure within the active / attractive spaces of a city ensures the safety of existing habitats. Also, large green space can promote habitat creation for new or struggling species in the area.

Urban Forest & Robust Vegetation: Going hand-in-hand with robust ecological area buffers, active / attractive open space can help to buffer sound and light pollution and create dynamic outdoor space for recreational activities.

Ecological Corridors & Pockets: Active / attractive open spaces can include ecological corridors and pockets within and along them. This can aid in creating connectivity.

Microhabitat Creation: Active / attractive open space can aid in the preservation of habitats as well as connect microhabitats to encourage the success of existing ecosystems.

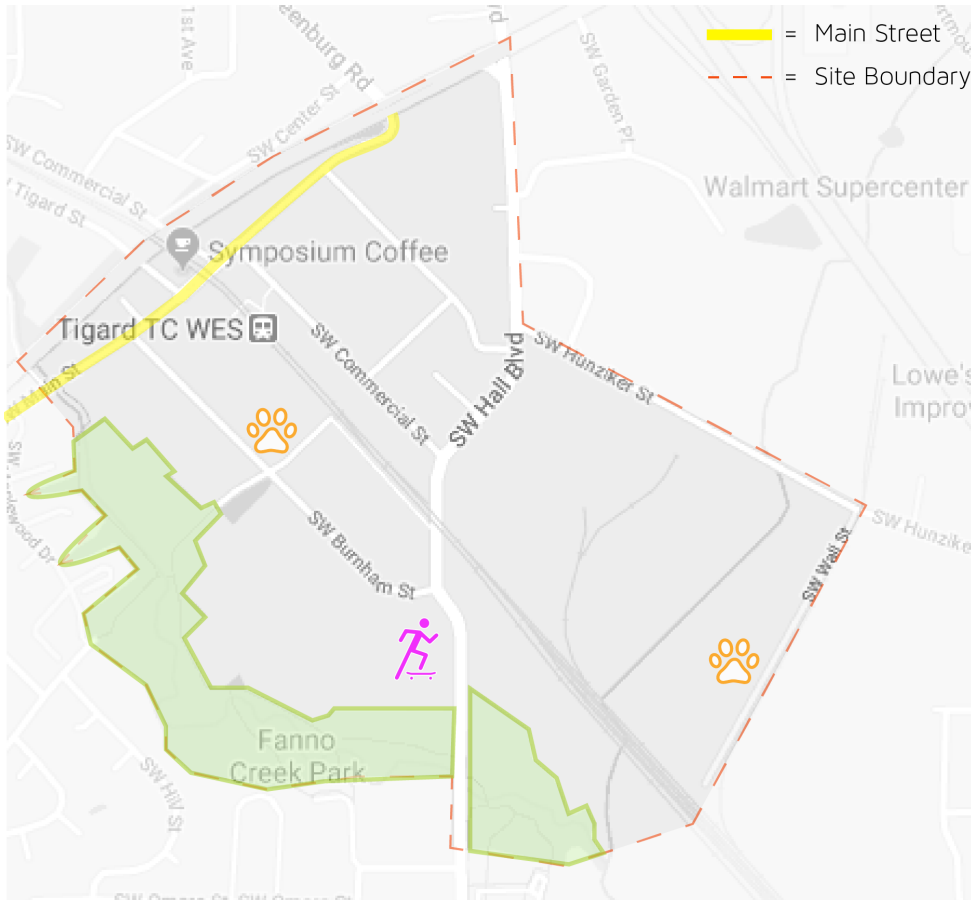


Figure 4: Fanno Creek Park (Source: outdoorproject.com)

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5.31 Site Design For Ownership & Surveillance

Equity & Health / Block/ Street & Project / Parcel

Luke Ralston

Topic Description

Design for ownership and surveillance includes aspects of site design that increase eyes on spaces and differentiates one area from another. Successful use of this principle will reduce crime in and around an area. This principle can be applied on the block scale as well as the parcel scale due to the repetitive nature of features such as balconies, windows, gates, and buffers. An overarching goal is to increase the exposure of crime.

A significant amount of research has gone into looking at what design approaches can do to increase surveillance and ownership within an area. One of the most notable is the CPTED, which stands for Crime Prevention Through Environmental Design. The field of study looks to reduce the incidence of crime and improve quality of life within a space through six main design concepts that work in tandem. These are territoriality, surveillance, access control, activity support, image / management, and target hardening (Cozens, 2005).

Current Conditions

Organizing observations around concepts of CPTED, Tigard features instances where some of the concepts are implemented, and others where they are not.

Territoriality is an umbrella concept that works in tandem with surveillance, access control, and activity support to instill a sense of ownership and safety to a space, discouraging trespassers (Cozens, 2005). A new housing development on Burnham Street and Ash Avenue achieves this through the use of balconies, purposeful vegetation and landscaping, and signage to delineate public from private space while also putting eyes on the open space.

However, the four above concepts must also work with the concept of image / management. The development on Burnham Street and Ash Avenue is very well-maintained with a positive image, decreasing the likelihood of crime.



Figure 1: New housing development at Burnham Street and Ash Avenue



Figure 2: Affordable housing development on Ash Avenue off Commercial Street



Figure 3: Affordable housing along Commercial Street

Affordable housing developments on Ash Avenue off of Commercial Street are an example of where territoriality, access control, activity support and surveillance are all evident to different degrees. However, the development is poorly maintained, and its image suffers, resulting in a less safe environment (Cozens, 2005).

Target hardening is the sixth CPTED concept, and its effectiveness is the most often disputed. The concept is to increase the readiness of a place through gates, locks, alarms, and other barriers that may or may not be visible

(Cozens, 2005). This concept was not very noticeable in downtown Tigard outside of banks or shops. Hardening of spaces can often hurt the other concepts by covering up windows, damaging a place’s image, or reducing eyes on the street.

Design Guides / Suggestions

- Below are a series of design guidelines for how to approach a site or parcel with the goal of implementing the elements of ownership and surveillance.
- Clear Boundaries:** Develop clear boundaries between one area and the next to clearly distinguish what is part of an “owned” property and what is not. This was visible in developments in Tigard that featured purposeful landscaping to define space. This also reinforces territoriality.
- Surveillance:** Orient buildings, windows, and entrances to public spaces. Additionally, slow traffic along roads in area to allow for surveillance of sidewalks. This was seen at the new development on Burnham Street and Ash Avenue through balconies and windows along the perimeter of the building.



Figure 4: Slowing traffic



Figure 5: Building oriented to public spaces



Figure 6: Controlled entrance



Figure 7: Barriers / buffers

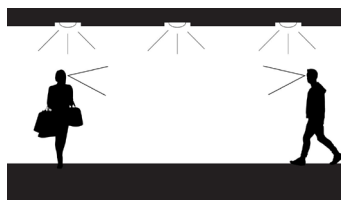


Figure 8: Well-lit

4. **Manage Entry:** Control who enters a space either passively with a gate or vegetation barriers, or use card-access systems. This aligns with the concept of access control and can be as simple as a key fob at the front door to an apartment building.
5. **Mixed Land-Use:** Utilize a mixture of land uses so that sites are occupied throughout the day and there are no dead moments where crime could occur when people are not present. There is currently little mixed-use in downtown Tigard.
6. **Lighting:** Light spaces well so that people are able to see throughout the space easily. Mitigate dark corners and poor sightlines. Consider lighting diversity so that all ethnicities are properly lit. Additionally, good lighting will help improve the image of a space while also increasing surveillance.
7. **A positive image:** A building that looks good and is inviting and open-looking to the public is less likely to play host to crime. The new development on Burnham Street and Ash Avenue is clean and well-maintained, reducing the likelihood of crime.

Related Elements / Opportunities for Co-Benefits

1.10 Compact Development: increases the density of a place, which increases the number of eyes on the street.

1.202 High networks Connectivity: helps increase the number of buffers and areas where bikes and pedestrians can travel.

5.11 Equitable Distribution of Uses and Services: increases quality of life and image of place.

5.21 High Density Zoning and Platting: promotes compact development.

5.30 Active and Attractive Open Space: increases the image of a place as well as the number of eyes on it.

References

Cozens, P. M., G. Saville and D. Hillier (2005). "Crime prevention through environmental design (CPTED): a review and modern bibliography." *Property management* 23(5): 328-356.

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5.32 Affordable Housing Strategies

Equity & Health / Project & Parcel

Hannah Hirzel

Topic Description

Housing costs are considered “affordable” at 30% or less of a resident’s gross income. When residents pay more than this, they run the risk of having financial difficulties that can lead to forced relocation. Affordable housing strategies fall under the category of Equity & Health in the Sustainable Urban Design Framework because so many factors having to do with quality of life stem from being able to afford housing. Housing costs are the largest financial burden for most people in the United States. If residents cannot afford their housing, other areas of their lives begin to suffer. People will move further away from city centers to be able to afford housing, but this puts more pressure on other costs. As they move further out, people lose access to important resources and require a longer commute. The cost of transportation becomes much higher. Ideally, affordable housing should include a community of diverse socio-economic statuses and be located close to jobs, resources and amenities, and transportation.

Affordable housing should aim to be beautiful, livable space. Housing designed for low income tenants can carry a stigma of being boring or cheap spaces to live. A development will not be a sustainable model if people do not enjoy where they live. Creating buildings with an pleasant aesthetic and a diverse array of units types appealing to all types of people will build a stronger and more diverse community. The development should be located close to transit and green spaces and be easily walkable (Larco).



Figure 1: Affordable Housing Case Study: Stephen’s Creek Crossing (2014) – Portland, OR (Source: MWA Architects, 2014. <http://www.mwaarchitects.com/our-work/housing/stephens-creek-crossing.php>)



Current Conditions

Affordable housing exists in one small area within our site. The city refers to the area as naturally occurring affordable housing (NOAH). It is considered naturally occurring because the development was not subsidized or specifically planned by the city. The location and building typology naturally makes it a more affordable place to live. The site contains a mobile home park and a few two-story “motel-like” residences. The diagram above illustrates the area of existing affordable housing in yellow.

This site becomes a bit of a challenge because it sits just south of Main Street and in the center of possible new development. Major roads that will most likely be involved with new development and street improvements are marked in blue. The patch of existing affordable housing rests in the center of these blocks.

With plans for a new light rail line coming to Tigard, there is no doubt this area of naturally occurring affordable housing will be affected. Though there is policy in place that does not allow the transit line to physically touch the site of existing affordable housing, there is little to be done to prevent the side effects of the new transit line. With new transit comes new transit-oriented development. Property values will rise and threaten the residents in the affordable housing community. The downside to new development is gentrification.

Design Guides / Suggestions

The area where the affordable housing exists is zoned for mixed use. This provides the opportunity to densify the area with both commercial and housing. There are ways to remove the mobile home park and create a better environment for people to live while still providing affordable housing on the site. The site is in an ideal location for transit access and has many amenities within walking distance.

The map below indicates possible opportunity sites for affordable housing. A 1993 study of the east side MAX line found that “properties in the East Burnside area within 500 meters of the transit were, on average, 10.6% greater in value than homes outside of 500 meters” (Al-Mosaind 3). According to the study, the closer the property was to the station, the higher the value. However, properties directly adjacent to the transit station were subject to more noise and congestion, which made them slightly less appealing and lowered the value. These areas have high potential for affordable housing. Property can be purchased at lower cost, which allows for lower rental costs. Starting with an existing structure rather than a new build can be a cost-effective way of creating affordable housing. An article in Wired Magazine talks about how to “reimagine public housing” by converting unused spaces into housing units (Rhodes). The map below also highlights potential buildings for conversion. The self-storage buildings south of the railroad tracks could create an interesting opportunity for reimagining housing.



These are some guidelines for a successful affordable housing community on the existing site:

1. Create a development of mixed unit types that appeal to residents of a diverse range of socio-economic status.
2. There is an opportunity to greatly increase the number of occupants on the current site. Right now, the mobile homes are not making good use of the site. Densifying the site with apartments or condos that share resources could cut down on utility costs and create a shared outdoor space.

3. To keep a similar community feel and housing typology of the existing mobile home park, a tiny-home community could be implemented where residents of lower economic status qualify to live.

Related Elements / Opportunities for Co-Benefits

1.30 Multimodal Street Design: Improvement of street design will be happening in tandem with new affordable housing, making it easier for people to get to where they need to go and reduce the need for owning individual cars. The site itself is a prime location for walking to amenities and transit.

5.10 Compact Development: Compact development reduces infrastructure cost, allows for more units per acre, and creates a close community of people.

5.30 Active & Attractive Open Space: When implementing a new affordable housing plan, the unappealing existing lots with little green space can be combined to make accessible shared open spaces.

5.31 Site Design for Ownership & Surveillance: When building new affordable housing, there should be attention to site design in that units have views to open space to increase safety and create a sense of community.

References

Al-Mosaind, Musaad A., and Kenneth J. Dueker, and James G. Strathman, "Light-Rail Transit Stations and Property Values: A Hedonic Price Approach," *Transportation Research Record* 1400, pp. 90 – 94, 1993.

Larco, Nico. *Sustainable Urban Design Framework*, Section 5.32

Rhodes, Margaret. "7 Smart Ways to Design Housing That's Actually Affordable." *Wired*, Conde Nast, 20 Nov. 2017, www.wired.com/2015/11/7-smart-ways-to-design-housing-thats-actually-affordable/.

5.40 Mix Of Unit Types

Equity & Health / Project & Parcel

Jorge Cabrera

Topic Description

Mix of unit types can be defined as the variety of housing unit types found in a specific area. Aurand defines mix of housing as “the presence of housing types that are in addition to the single-family home” (2010). According to the US Census Bureau, a housing unit is “a house, an apartment, a group of rooms, or a single room occupied or intended for occupancy as separate living quarters.”

Mix of units translates into varied economic and community benefits. It increases availability of mixed-income housing, providing more housing options for different social groups. This decreases housing prices as housing availability meets demand. In addition, it brings more affordable housing through new developments or renovations on existing unit types if regulations allow it. Mix of housing increases densities by encouraging more compact developments with smaller unit types, which improves safety, walkability, and street activation. It improves neighborhood escapes by merging more housing typologies into the urban fabric, and it brings social inclusiveness by mixing diverse social groups living within the same area.



Figure 1: Illustration of different type of housing units on a medium density residential neighborhood

Current Conditions

The site is located in downtown Tigard between SW Pacific Highway (north), Fanno Creek (west), SW Hall Boulevard (south), and SW Hunziker Street (east). Most of the housing on the site consists of single-family homes. This is particularly evident along SW Knoll Drive, where there is a cluster of single-family homes (roughly 20) compared with only two properties with townhomes and one apartment building along SW Hall Boulevard.

Figure 2 shows an aerial view of the site with a cluster of single-family homes (yellow), an apartment building (blue), and a row of townhouses (red) along SW Hall Boulevard.

The three unit types present on the site in addition to single-family homes are townhomes, apartment units, and two-story stacked duplex. As shown in images below, the mix of units are

widespread along SW Hall Boulevard, SW Ash Avenue, and SW Scoffins Street. The average building is two stories high. There are only two four-story buildings on the site, The Knoll at Tigard apartment building and the Attwell Off Main apartment building, both recently completed. The most prevalent typologies of residential buildings are long rectangular buildings with open gable roof and glass windows; groups of rectangular buildings forming a C-shape with semi-courtyards designated mostly for parking; and L-shaped buildings with parking spaces in the center. Blue and brick facades and siding are prevalent, as are shingle roofs.



Figure 2: Aerial view of the site showing a cluster of single-family homes (yellow), an apartment building (blue), and a row of townhouses (red) along SW Hall Boulevard

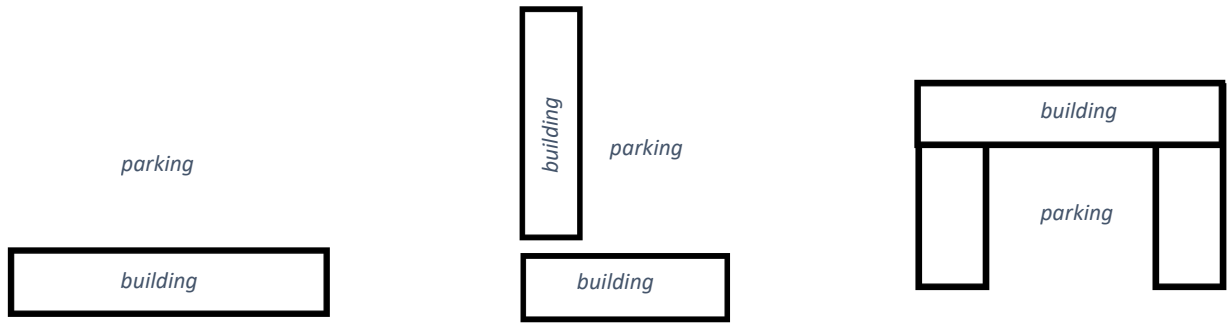


Figure 3: Three most common residential building typologies at the site: rectangular, C-shaped, and L-shaped

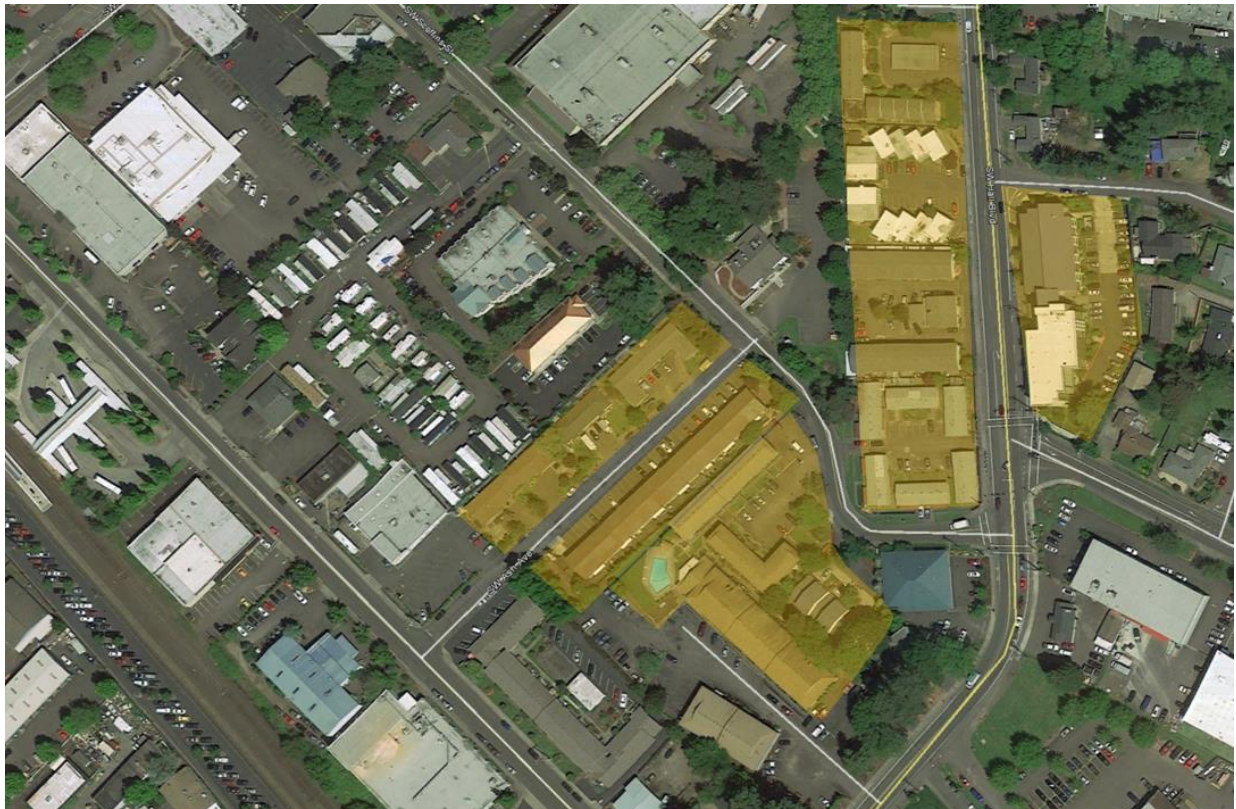


Figure 4: Aerial view showing mix of unit types on the site grouped along SW Hall Boulevard and SW Scoffins Street



Figure 5: Two story stacked duplexes along Scoffins Street



Figure 6: Townhouses along SW Hall Boulevard



Figure 7: The Knoll at Tigard apartment building

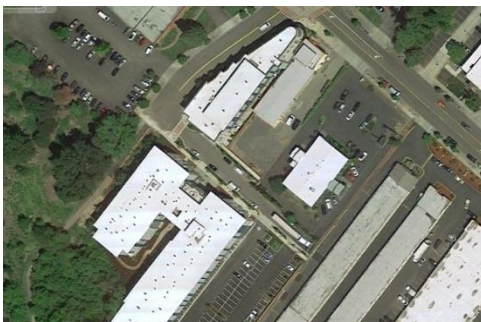
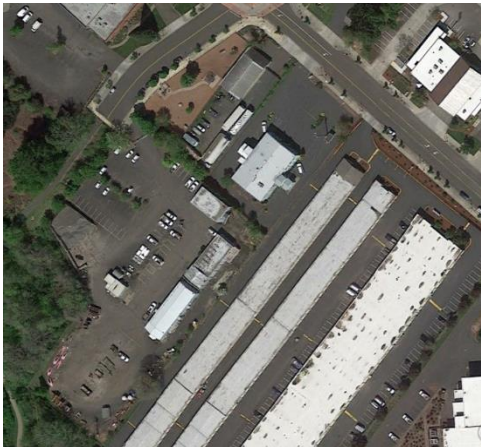


Figure 8: The Attwell Off Main apartment building. The Knoll and Attwell buildings are the only two four-story apartment buildings along SW Hall Boulevard.

Most residential buildings have excessive open spaces designated for parking, and most buildings have ornamental vegetation. Excessive parking is a disadvantage for buildings along SW Hall Boulevard because the street is a main artery in downtown Tigard. Land use allows for mixed use developments, and there is a need for ground floor activation to make this area more lively and walkable.



Figure 9: Tigard Terrace housing development on SW Hall Boulevard



Figures 10, 11: Site of the Attwell apartment building in 2015 before construction (top) and site after construction in 2017 (bottom).

In contrast, the Attwell apartment building represents a good example of suggested housing typology for future developments on the site. Completed in 2017, the new building infilled a wide and mostly underused parking lot. The property added 165 new apartment units in a very low-density area. The building's courtyard typology provides outdoor amenities that encourage community interactions. This typology offers balconies and windows to exterior spaces, providing a feeling of safety by having people looking to the streets. The building is mixed-use (commercial and residential), which means that there will be constant activity happening on the offices in the ground floor. The building also connects residents with Fanno Creek and offers access to another neighborhood through the trail along the creek. This building is next to a green open space that could potentially provide the same opportunities for future dense residential development on the site.

The site's density is relatively low due to current code regulations that only allow for low-density developments. This is problematic because it results in a lack of street activity and an increase in automobile use. There is an opportunity for future

apartment development on most properties along SW Knoll Road due to considerably large sites, concentration in a centralized area that would facilitate the combination of property sites to create a larger housing development, and proximity to SW Hall Boulevard, a major street on the site. However, these properties are located on a R.4.5 area, which the code intends for low-density residential development. Current regulations make it impossible to densify this portion of the site. If future housing is developed across SW Hall Boulevard where the code allows for mixed use development, this could result in abrupt changes in density.

Overall, the site presents primarily low-density housing with a shift to denser developments in recent years. Single-family homes are still the most prevalent typology in the site. Underused open spaces designated for parking presents issues for street activation and outdoor community spaces. Parking in existing building types should be discouraged and replaced with in-fill developments and more areas for community and outdoor activities.

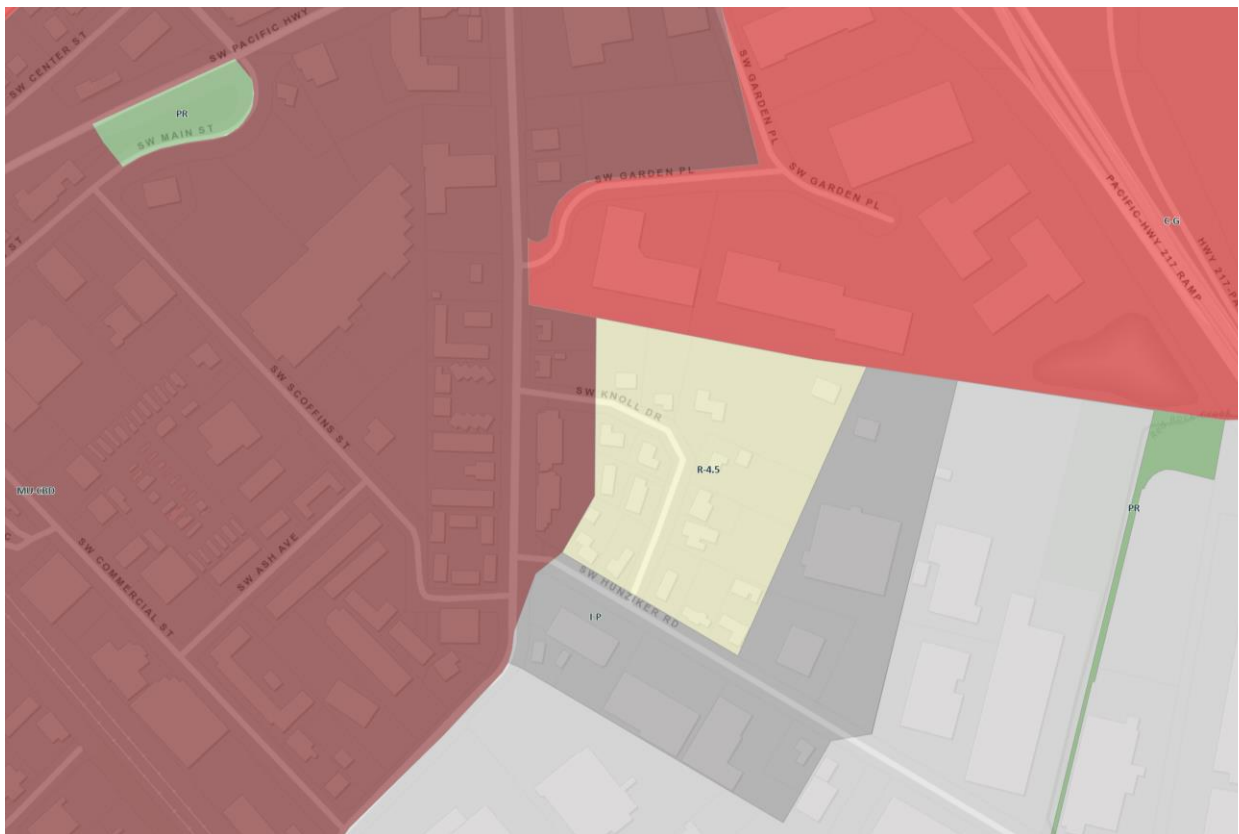


Figure 12: Zoning showing the only low-density residential zone (R-4.5 in yellow) in downtown Tigard next to the Mixed Use Central Business District zone (MU-CBD in dark red)

Design Guides / Suggestions

1. “Missing middle” development is encouraged along SW Hall Boulevard due to the character of the boulevard (more oriented to mixed development) to provide a harmonious transition from adjacent low-density areas. This type of development will reduce the possibility of backlash from the community to new housing developments in the area.

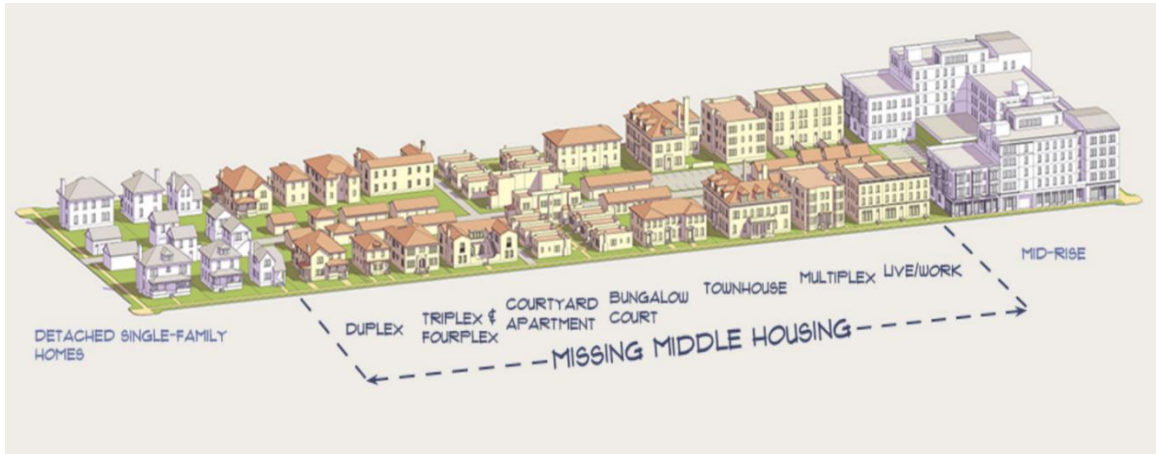


Figure 13: Illustration of missing middle housing (Source: missingmiddlehousing.com)

2. Unit types such as live / work housing units are suggested along the main artery streets on the site (SW Hall Boulevard and SW Burnham Street) due to opportunities for retail-oriented activities. This unit type would boost the local economy and facilitate the exchange of goods on main arteries of the site. In addition, live-work housing encourages street activation by promoting more commercial activity on the ground floor.



Figure 14: Illustration of live / work housing. Ideal for streets with mixed or commercial land use

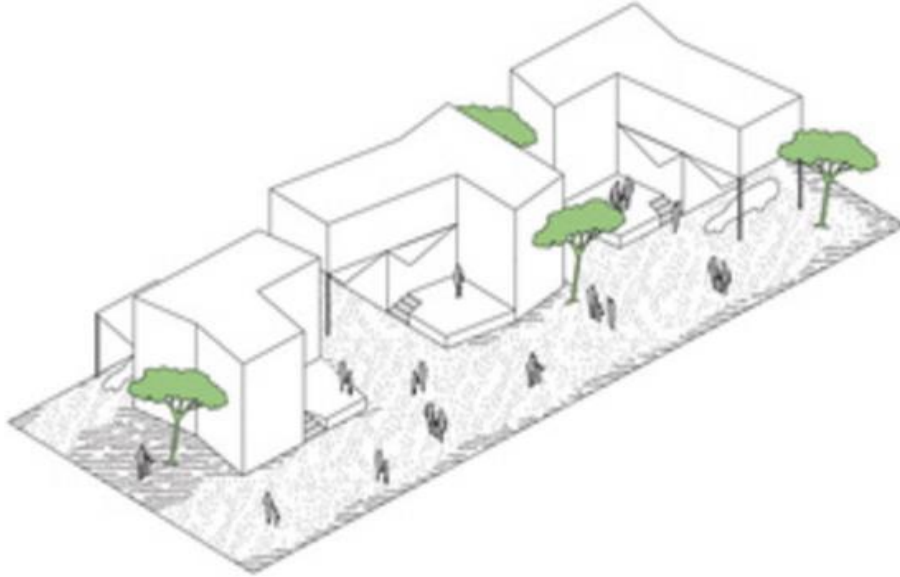


Figure 15: Illustration of townhomes and ground floor

3. Townhome unit types and community spaces are encouraged in inner roads of the site such as SW Ash Avenue and SW Scoffins Street. This unit type gives continuity to the character of the neighborhood. This type of housing development will provide a greater level of densification and improve the perception of safety in the area. In addition, townhomes encourage neighborhood activity by providing buildings with outdoor spaces that promote community activities.



Figure 16: Area of opportunity for denser housing development next to the ecological buffer

4. Encourage apartment building developments next to Fanno Creek Park. The park is an asset to attract developers and will increase the property value of any development happening next to it. Undeveloped open spaces exist next to the park. The area is also within a 10-minute walk of the shopping street, the Tigard public library, and the transit center. These areas are prime locations to promote high density apartment buildings. These buildings will increase the perception of safety along the park and will also encourage the use of existing trails by bringing more people to the area. This type of development usually includes community spaces that could be merged with the park to extend the ecological buffer while adding density to the site.

Related Elements / Opportunities for Co-Benefits

Opportunities for Co-benefits		
Element	Opportunity	Benefit
Land use	Densification	The character of downtown Tigard brings opportunities for new housing development and mix of unit types due to the central location of the site. Most of the site is in a MU-CBD zone which provides opportunity for densification and mix of land use activities that can bring more affordable housing and enhance the perception of safety in the neighborhood.
	Mixed-use development	The incorporation of mix of unit types next to commercial uses could create a trade-off in which households and retailers can benefit each other by bringing people closer to business and consequently more businesses to downtown. This trade-off could boost the economy and revitalize the area.
Natural habitats	Accessibility to natural ecosystems	The surrounding natural habitats represent opportunities for new community spaces and connections within neighborhoods. Natural spaces could provide amenities for future developments. Particularly, Fanno Creek can become a more central space in Tigard by connecting neighborhoods through natural trails.
Parking	In-fill development	Unused parking space represent an opportunity for in-fill developments. Parking must be reduced to encourage walkability and pedestrian activities in downtown. Existing housing buildings along SW Hall Boulevard present the biggest potential to create more dense developments and commercial in-fill.

References

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Sustainable Urban Design Framework

TOPIC AREAS IN URBAN DESIGN ORGANIZED BY SCALE	REGION & CITY	DISTRICT & NEIGHBORHOOD	BLOCK & STREET	PROJECT & PARCEL	
1 Energy Use & Greenhouse Gas (Transportation & Land Use)	1.10 Compact Development <i>(for Density & Proximity)</i> 1.11 Robust Transit Networks 1.12 Robust Bicycle Networks 1.13 Vehicular Networks 1.14 High Macro Scale Land Use Mix	1.20 Robust Pedestrian Networks 1.201 Small & Defined Blocks 1.202 High Network Connectivity 1.21 High Density Zoning & Platting 1.22 Macro Parking Management & Design 1.23 High Micro Scale Land Use Mix	1.30 Multimodal Street Design 1.301 Walkable Streets 1.302 Robust Bicycle Infrastructure 1.303 Design for Transit 1.304 Limiting Motor Vehicle Impact 1.31 Dense & Street Activating Building Typologies 1.32 Micro Parking Management & Design	1.40 Engaged Building & Street Relationship 1.41 High Internal & External Connectivity 1.31 Dense & Street Activating Building Typologies 1.32 Micro Parking Management & Design	
	2 Water	2.10 Compact Development <i>(for Limited Impact on Natural Systems)</i> 2.11 Avoid Flood Prone Areas	2.20 Robust Stormwater Management Network <i>(Distributed & On-Site Recharge)</i>	2.30 High Surface Permeability 2.31 Extensive Green Stormwater Infrastructure (GSI) 2.32 Extensive Urban Forest Canopy	2.40 Rainwater Capture & Re-use 2.30 High Surface Permeability 2.31 Extensive GSI 2.32 Extensive Urban Forest Canopy
		3 Ecology & Habitat	3.10 Compact Development <i>(for Limited Impact on Natural Systems)</i> 3.11 Avoid Ecologically Sensitive Areas 3.12 Robust & Connected Macro Ecological Networks	3.20 Ecological Corridors & Pockets 3.21 High Urban Forest Continuity & Diversity 3.22 Daylight & Restore Waterways 3.11 Avoid Ecologically Sensitive Areas	3.30 High Surface Permeability 3.31 Micro-Habitat Creation 3.311 High Vertical Complexity 3.312 Native Vegetation 3.32 Mitigating Habitat Disruption 3.33 Robust Ecological Area Buffers 3.34 Non-Polluting Lighting Design
	4 Energy Use & Production (Non-Transportation)	4.10 Compact Development <i>(for Limited Embodied Energy in Infrastructure)</i>	4.20 District Heating 4.21 Block Size & Street Orientation for Microclimate Mitigation 4.22 High Building & Housing Density	4.30 Dense & Energy Efficient Building Typology 4.31 Micro-Climate Mitigation 4.311 Low Albedo Surface Materials 4.312 Urban Forest & Robust Vegetation 4.313 High Street Height vs. Width Ratio 4.32 Efficient Street Lighting Design 4.33 Platting for Density & Solar Exposure	4.40 Infill Development 4.41 Increase Local Energy Production <i>(Solar & Wind)</i> 4.30 Dense & Energy Efficient Building Typology
5 Equity & Health		5.10 Compact Development <i>(for Proximity, Access, and Reduced Infrastructure Costs)</i> 5.11 Equitable Distribution of Uses & Services	5.20 Balanced Block Size 5.21 High Density Zoning & Platting 5.22 Limited Location of Point Source Pollution & Toxins 5.11 Equitable Distribution of Uses & Services	5.30 Active & Attractive Open Space 5.31 Site Design for Ownership & Surveillance 5.32 Affordable Housing Strategies 5.33 Urban Forest & Robust Vegetation	5.40 Mix of Unit Types 5.30 Active & Attractive Open Space 5.31 Site Design for Ownership & Surveillance 5.32 Affordable Housing Strategies