

# BELLINGHAM'S NEW WATERFRONT

## PROPOSALS FOR A MODEL CLIMATE DISTRICT

2022 ScanDesign Interdisciplinary Master Studio  
College of Built Environments, University of Washington



## LAND ACKNOWLEDGEMENT

We acknowledge the Coast Salish peoples on whose land we study and work, the land which touches the shared waters of all tribes and bands within the Puyallup, Duwamish, Suquamish, Tulalip, and Muckleshoot nations.

We are thankful to the Coast Salish Peoples whose lands and shared waters we studied. As future designers, we will strive to continue to learn about the Waterfront's cultural past and present and to support Coast Salish People to the best of our abilities. Additionally, we wish to express our thanks and deepest respect to Jewell James of the Lummi Nation who was generous to meet us on-site to share his insights regarding first nation political advocacy, culture and relationships with Bellingham's Waterfront and beyond.

PANORAMA SHOWING THE BELLINGHAM WATERFRONT AND TIDEFLATS CIRCA 1900  
Image courtesy of Whatcom Museum



BELLINGHAM WATERFRONT AND WAYPOINT PARK  
Image courtesy of Harcourt Developments

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2022 Scan Design Foundation Master Studio in Urban Design and Landscape Architecture  
College of the Built Environments, University of Washington

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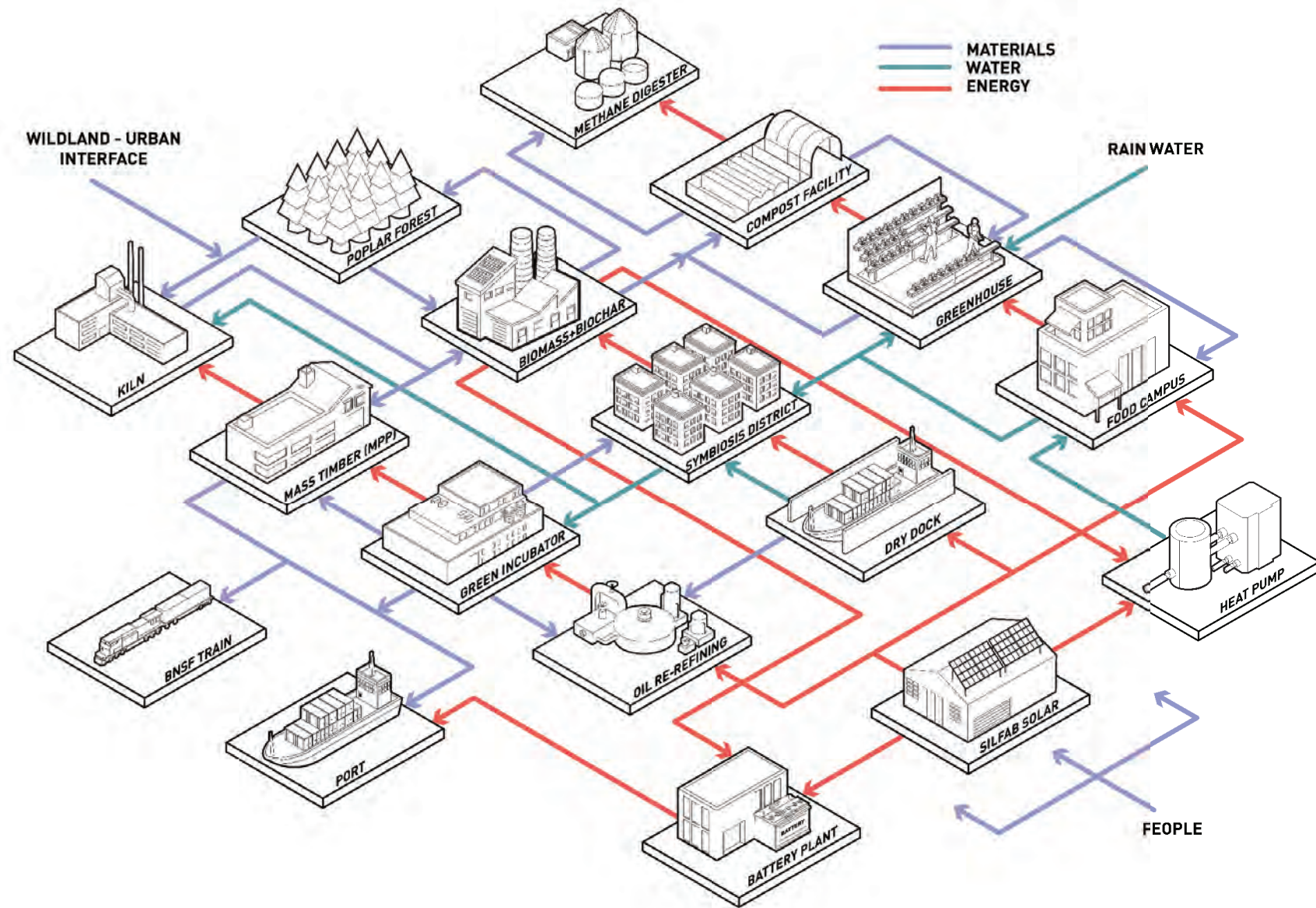
### ACKNOWLEDGMENTS

*This work could not have had the depth or relevance without the assistance of so many people and organizations whom we sincerely thank:*

Scan Design Foundation  
Andy Brown, Architect, Graham Baba  
Brian Gouran, Port of Bellingham  
Darby Galligan, City of Bellingham  
Gina Austin, City of Bellingham  
Jewell James, Scholar, Lummi Nation  
Joel Swisher, Western Washington University  
Kurt Baumgarten, Port of Bellingham  
Kurt Nabbefeld, City of Bellingham

Mauri Ingram, Whatcom Community Foundation  
Nicole Oliver, City of Bellingham, Parks  
Alexandra Spaulding, Whatcom Community Foundation  
Adrienne Hedgetus, Port of Bellingham  
Blake Lyon, City of Bellingham  
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BELLINGHAM WATERFRONT SITE  
Image courtesy of Constantine Chrisafis

# FOREWORD

In August 2021, and again in March 2023, the International Panel on Climate Change (IPCC) issued deeply-researched warnings that the globe is currently on a pathway to experience disastrous climate change impacts unless atmospheric greenhouse gases are drastically reduced within the next decade.

While adaptation to the many ill-effects of climate change will still be necessary, the IPCC indicated that actions can and must be taken to mitigate the severity of these impacts, through reduced greenhouse gas emissions by utilities and industry, capture of atmospheric carbon, and changes in built environment practices and the conservation behaviors that well-designed environments can inspire.

Within this context, we aspire to render our towns and cities those that encourage delightful, just and nourishing living for people, and are supportive of healthy environments upon which all organisms depend for survival.

Bellingham's former Georgia-Pacific industrial waterfront site presents an unparalleled opportunity to explore how cities can become part of the solution to the climate crisis. By designating this waterfront area a "Climate District," students in the 2022 Scan Design Interdisciplinary Studio were able to maintain focus on solutions for both accelerating climate protection (mitigation) as well for as adapting to the projected impacts by planning for inevitable, though variable,

future conditions. In conjunction with these challenges, the site is exceedingly complex, with legacy pollution and cultural amnesia, and rich opportunities for direct connections to the city's Downtown and a linked system of recreational and ecological open spaces.

Our dedicated students have done an exemplary job of embracing these complexities to consider what might be possible on this site, to address its many problems and potentials. Building upon the research and work of the 2021 Scan Design studio, three interdisciplinary teams have based their proposals on deep research to propose and explore solutions that consider existing conditions, community needs, interaction of systems, and temporal processes. They have incorporated "circular system" thinking: **How can the district work as a system within itself, and within its immediate contexts of city, county and region, for both local economic and environmental justice and global climate benefit?**

We hope that the thoughtful, illustrated proposals of this work may help to advance the thinking of Bellingham's citizens, Port and City government, and may inspire the imagination for how we may urgently plan, build and happily live to better protect our fragile climate and all whom it so dramatically affects.

*Nancy Rottle, Professor Emeritus  
University of Washington, College of Built Environments*



STUDENTS IN COPENHAGEN 2022  
Image courtesy of Nancy Rottle

# STUDIO OVERVIEW

*“In a world in which anthropogenic “natural” disasters run rampant, water stands at times as more foe than friend, viral pandemics await at the ready...it is time to try out new futures, new ways of movement...new ways of witness....We are standing at the edge of an Event Horizon, in more ways than one. Be it by flood or virus, the message from nature is clear – change is inevitable. What will our new normal be? Let it be harmonious, revolutionary. It is the only way we will survive.”*

– Thomas Saraceno, Event Horizons.

The 2022 Scan Design Foundation Master Studio in Urban Design and Landscape Architecture spent Fall 2022 imagining new futures for the Bellingham Waterfront, a post industrial brownfield site at the mouth of Whatcom Creek.

In September, studio participants traveled to Denmark and Sweden. The study tour focused on ecologically adaptive design, green stormwater management and the more ineffable elements of design that works for people — design for community and for a joyful and playful public realm. We analyzed how these elements work together to create vibrant public space that is both physically resilient and strengthens community resilience by fostering community connections, connection to the land and an understanding of waste, energy, water and other critical systems.

In our travels, students explored many sites by bike, foot and rail that share several of the key opportunities and constraints present on the Bellingham Waterfront. This formed a base of knowledge that informed site design back in Washington.

Once back in Seattle, the students completed precedent studies, visited the Bellingham waterfront, met with community members, and analyzed the underlying site context. This research created the foundation for the development of group site proposals. During the quarter students received a wealth of feedback and insight from our master teacher Louise Grasso, and countless community representatives, and design professionals both in Washington and Denmark. We are excited to share the work with you!

Studio Sequence:

- Study Tour to Copenhagen, Malmö and Samsø
- Precedent studies, including visiting the Kalundborg Industrial Symbiosis, Copenhill, and B001.
- Site visit to Bellingham Waterfront
- Site analysis and narratives
- Site concepts
- Schematic design
- Design development
- Reviews



# CHAPTER 1

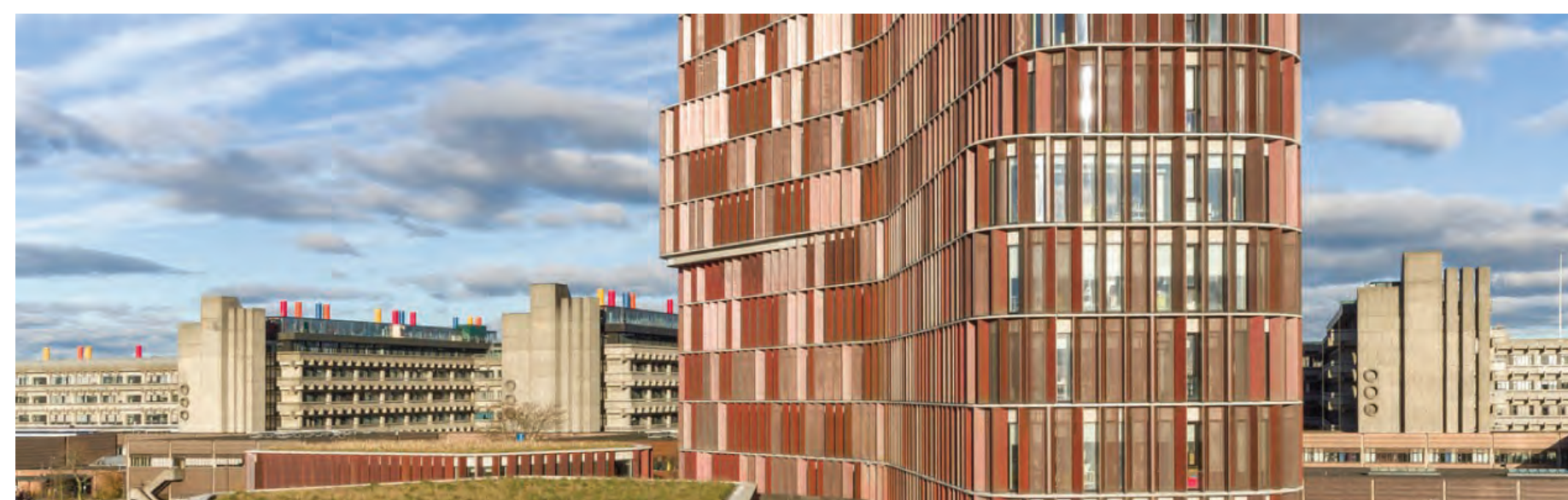
PRECEDENT STUDIES

During our study tour in Copenhagen, Malmö and Samsø students began the design process by visiting and analyzing projects with similar challenges and opportunities to the Bellingham Waterfront. Through these case studies they identified exemplary district planning strategies, ecological design approaches, funding mechanisms and governing principles.

## PRECEDENT PROJECTS

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MÆRSK TOWER  
Image Courtesy of Unsplash



# SUND NATURE PARK + MÆRSK TOWER

Dominique De Gracia + Kat Golladay

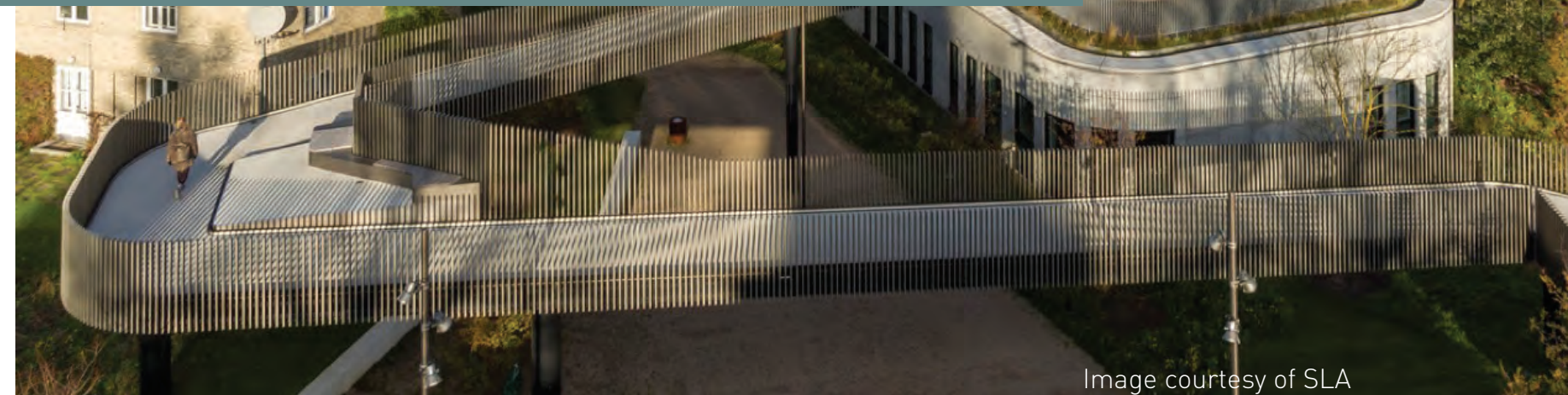
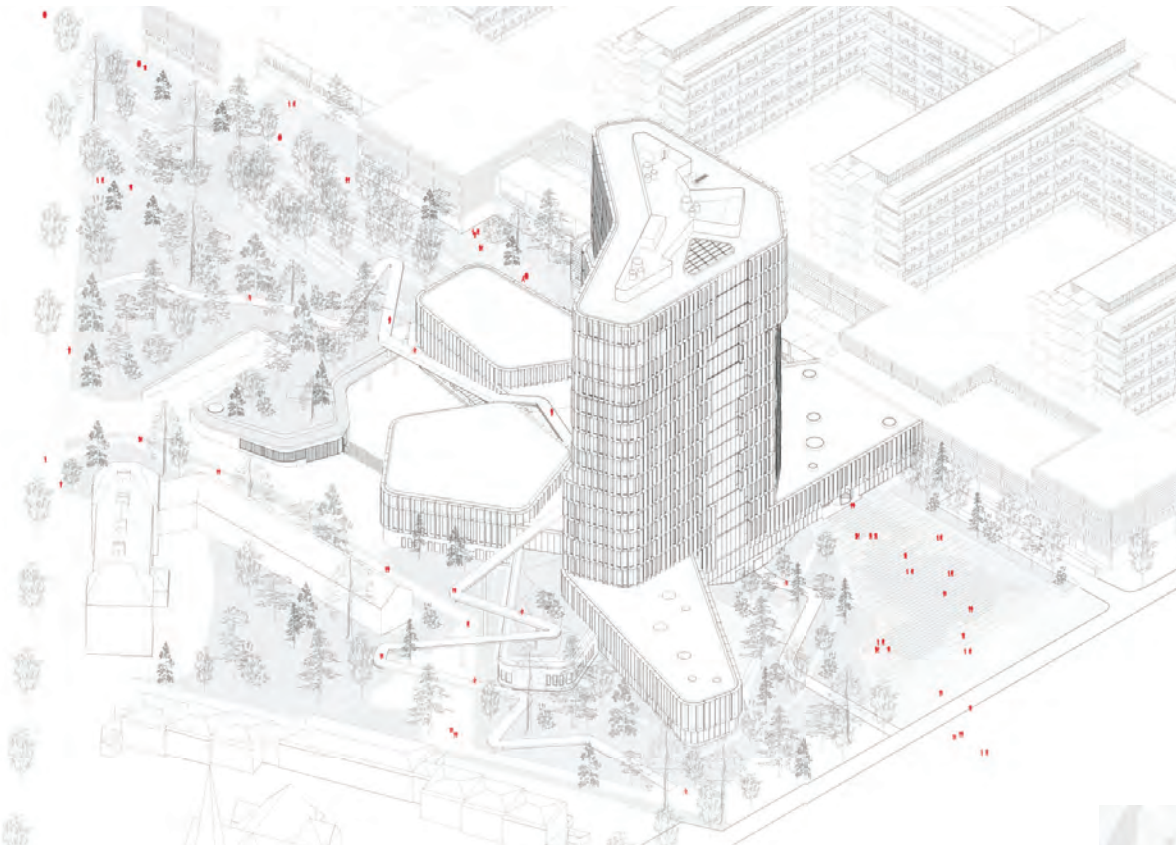


Image courtesy of SLA

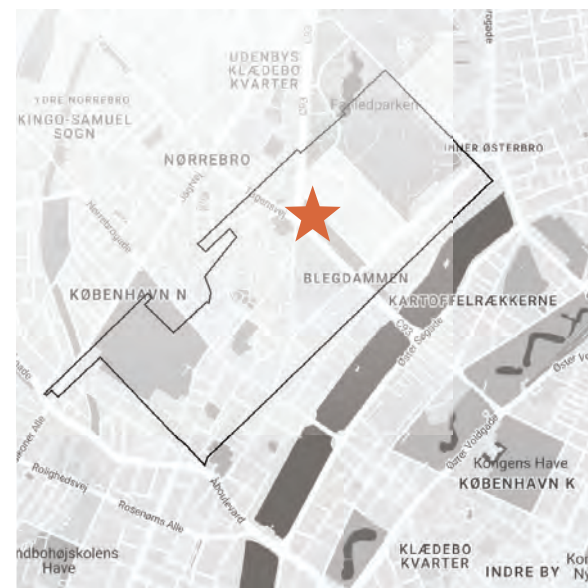


The Nature Park and Tower adds environmental value through its natural climate adaptation. The park can absorb a 100-year cloudburst event and prevent the local neighborhood from being flooded. Rainwater is collected on site and is recycled for irrigation or used as gray water inside of Mærsk Tower. The spaces of the modern campus park were designed with the lives of students, researchers, as well as Nørrebro residents in mind.

Located in the Nørrebro neighborhood, SUND Nature Park (designed by SLA) and Mærsk Tower (designed by C.F. Møller Architects) are part of the Health and Medical Sciences Research Complex for the University of Copenhagen.

The space was designed as an extension of the 1986 Panum Complex. The Panum complex was surrounded by lawns and parking lots, having low biodiversity and a perception of disconnection and harsh contrast to Nørrebro.

The lush biodiverse nature park aims to strengthen the neighborhood identity of Nørrebro by creating an open and inviting public space, with new connections through a 300 meter long pedestrian bridge.





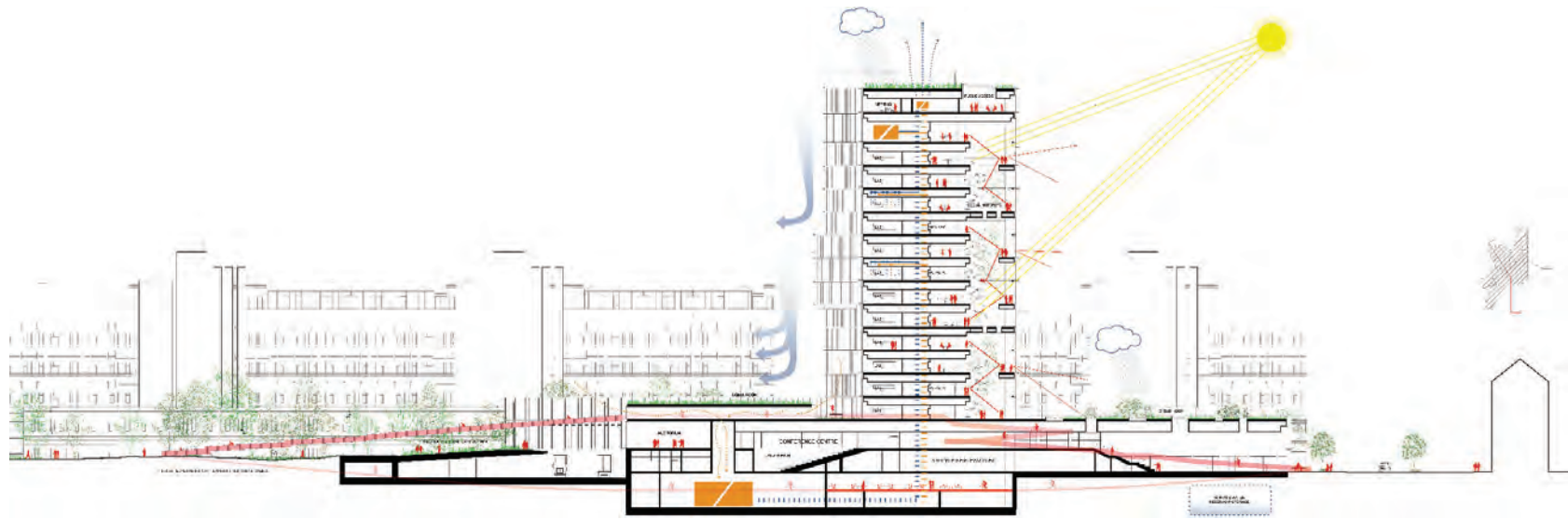


DIAGRAM SHOWING SUSTAINABLE STRATEGIES  
BY C.F. Møller Architects

## SUSTAINABLE STRATEGIES

Sustainability was at the forefront of the SUND Nature Park and Mærsk Tower designs. In addition to supporting native plant communities and pollinators for future generations, the naturalistic planting design and green roofs slow, capture, and store rainwater that is later used for watering plants and flushing toilets.

The Mærsk Tower itself has energy saving features such as storey-height copper-colored shutters that

automatically open or close depending on levels of direct sunlight. The shutters, in combination with both the automated LEED lighting and automated closing of fume hoods and laminar flow cabinets, reduce the overall energy demands of the building.

Together, the outdoor park and tower employ energy reduction and production strategies that ultimately lead to resource preservation.



PHOTOS OF BIODIVERSE NATURALISTIC PLANTING BY SLA

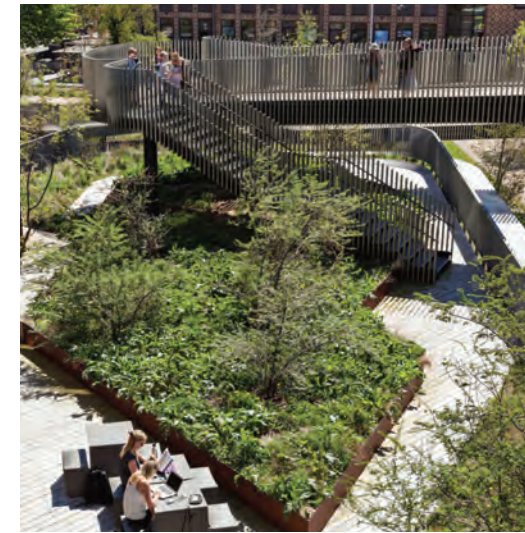


PHOTO BY SLA



PHOTO BY C.F. MØLLER ARCHITECTS



PHOTO BY SLA

## PUBLIC CONNECTIONS

A series of paths at different elevations guide human movement through the connected park and tower, create subspaces on the campus, and promote Denmark's Grass Commons and bike cultures. Traversers of the space are able to walk, bike, or rest at the terraced seating and picnic tables that are surrounded by biodiverse greenery. There are even spots along the zigzagging "floating path" for users to sit and relish in campus and neighborhood views. Inside Mærsk Tower, open yet modern laboratory spaces on each floor are connected in an efficient loop to encourage short travel distances for collaboration. The transparent facade at the base of the building, in conjunction with the indoor biophilic plantings, leads to a blending of indoor and outdoor boundaries, where researchers can enjoy the benefits of the outdoors from inside. C.F. Møller Architects aimed to create chambers for socialization and collaboration between users of the tower.

## RECOGNITION AND ACCOMPLISHMENTS

The inclusion of biophilic design, modern temperature controlling copper-covered shutters, and thoughtful design have brought these spaces success. Mærsk Tower has been recognized with the WAF Award - Higher Education & Research, Scandinavian Green Roof Award, and the Sustainable Campus Excellence Award, Winner 'Building and Innovative Infrastructure.'

SUND Nature Park's approach to a connected design has been awarded with the Landezine International Landscape Award, The Copenhagen City Award, The World Architecture Festival Award, and MIPIM Award.

The designer's goals to create a modern research space with environmental and cultural value have been realized. "But the fact is that you get your best ideas when having a cup of coffee out on the research plaza, or when you run into a colleague from one of the other levels," says Ole William Petersen, Professor of Tissue Morphology and Differentiation, DSc., at the University of Copenhagen and user of Mærsk Tower.



# NORDHAVN

Sophie Iannone + Yi-Lin Khor

Image courtesy of COBE



Master Plan

photo credit: COBE

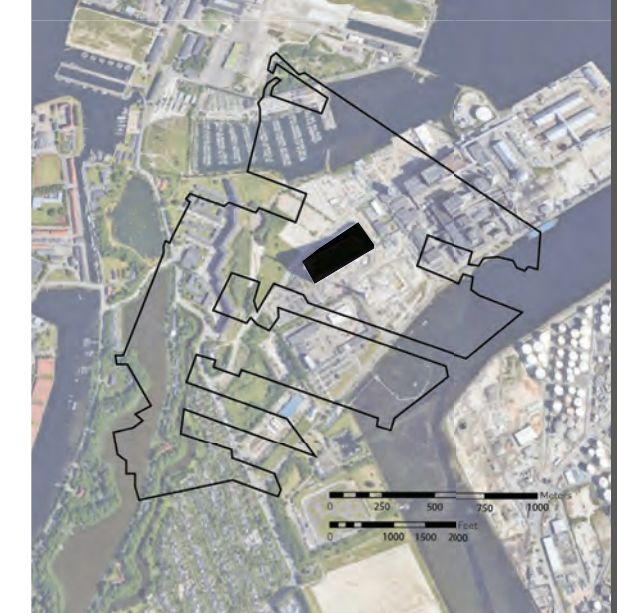


FIGURE 1: NORDHAVN WITH BELLINGHAM SITE OVERLAY.

## SUSTAINABLE CITY OF THE FUTURE

Scandinavia's largest metropolitan development project, Nordhavn (North Harbor) is a vibrant and eco-focused urban district rich in maritime and industrial history. Planning for the new development began in 2008 as an international design competition focusing on the new district as the 'Sustainable City of the Future'. The winning entry, 'Nordholmene - Urban Delta', put forth by Cobe Architects, was announced in 2009, and was further developed in partnership with CPH City & Port Development (CCPD) and the City of Copenhagen to create



THE VISION DIAGRAM OF NORDHAVN

an overall development strategy for the Nordhavnen area.

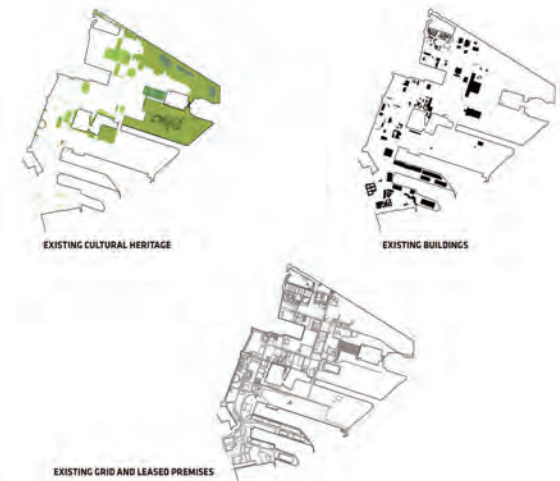
## STRATEGIC PLANNING

'Nordholmene - Urban Delta' proposed 6 goals for the sustainable city of the future: vibrancy, eco-friendliness, sustainable mobility, dynamic form, waterfront activation, and accessibility to all. These goals were further specified in the combined urban development strategy, which identified 6 themes for the new district: CO2 friendly city, five-minute city, blue and green city, intelligent grid, identity and history, and islets and canals. The idea was to create a robust yet flexible framework for planning, which would prioritize the district's existing assets and character.



### A CITY BY THE WATER

Nordhavn's development centers around its character and history as a free port area. The waterfront is its forefront community gathering space, intended for play, recreation and relaxation. Being developed as a series of islets and canals, water is asserted as both a navigable thoroughway, as well as a tool to isolate neighborhoods as they develop distinct character and community. Water has long stood as a valued natural resource for portside manufacturing and shipping industries. Sustaining water as Nordhavn's primary natural resource is key to its success and livelihood, which has prompted planners to exercise caution and consideration for the neighborhood's stormwater infrastructure, and creation of green space.



### IDENTITY AND HISTORY

Inner Nordhavn was excavated and extended multiple times through several land reclamation efforts over the past 150 years to accommodate its evolving use as a harbor, industrial area, and more recent urban redevelopment. The result is a district with a unique, peninsular shape. Nordhavn's history of continual change is evident through its mix of old architecture, including large monolithic silos and low-rise industrial buildings, with more contemporary styles. Development history has resulted in a unique urban form as well, characterized by narrow alleys and irregular squares. These spaces have not been lost in the development process, but instead modified to accommodate current needs, including spaces for play, work and housing.

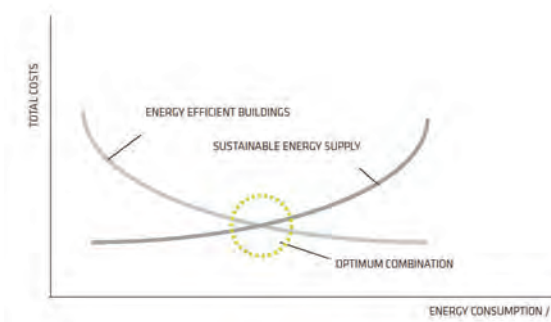


### A 5-MINUTE CITY

The site's circulation system utilizes several multimodal transit networks. In addition to an extensive network of bicycle infrastructure, Nordhavn is most directly accessible via Metro and bus, and walkable due to its dense form. Wide sidewalks are conducive to rolling and wheelchair access as well.



CONSTRUCTION PROCESS OF EXISTING LOW STRUCTURE AND ADD-ONS



### A CO2-FRIENDLY CITY

Strategic planning envisions tree-lined pocket parks planted with native species, green facades and roofing, solar thermal cooling, net-zero building construction, geothermal energy and infrastructure design that discourages the use of combustion engine vehicles, among other methods.



### A GREEN AND BLUE CITY

As a series of islets and canals, a focus of strategic planning in Nordhavn has been to connect segments of land through a robust network of greenways and waterways, in order to create a walkable and navigable district.

### STAGGERED BUILDING ZONES

Building zones follow an orthogonal structure. This diverse structure of buildings is conducive to flexibility, multi-functionality and comfortable climate within the urban form, and creates vibrant and imageable public space.



# MALMÖ WESTERN HARBOR

Alec Finewood + Akeo Maifeld-Carucci + Autumn Davis



Image courtesy of City of Malmö

## HISTORY AND BACKGROUND

Consisting entirely of reclaimed land, Malmö's Western Harbor is 187 hectares of prior industrial land that has been transformed into a sustainable eco-city with a focus on mixed-use development, public and active transit methods, and being entirely powered by renewable energy.

Once filled with some of the largest ship building yards in the world, the Western Harbor was scoured with

massive warehouses, hangers, and cranes and was the predominant industrial area in Malmö until the shipbuilding industry collapsed in the 1980's. With 6,000+ people without work, the area became derelict until the city began redevelopment in 2001 with ambitious goals of an equitable sustainable city complete with comprehensive circular energy, waste, heat, and stormwater management systems.



Image courtesy of NextGreen



MALMÖ HARBOR IN THE 1950s  
Image courtesy of City of Malmö



WESTERN HARBOR AND HIGHLIGHTED BIKE ROUTES  
Image courtesy of City of Malmö

### MOBILITY AND TRANSIT:

Pathways and arterial streets through the district are designed with the pedestrian and cyclist in mind, as grade-separated bike lanes, traffic calming paving, public transit, and narrow side streets form an extensive network throughout all of the Western Harbor. The city of Malmö hopes for 75% of journeys in the Western Harbor to be on foot, by bike, or via public transit by 2031.



Image courtesy of CultureTrip



Image courtesy of Google



Image courtesy of Reuters



Image courtesy of Living Nomads



Image courtesy of climateadapt.eu

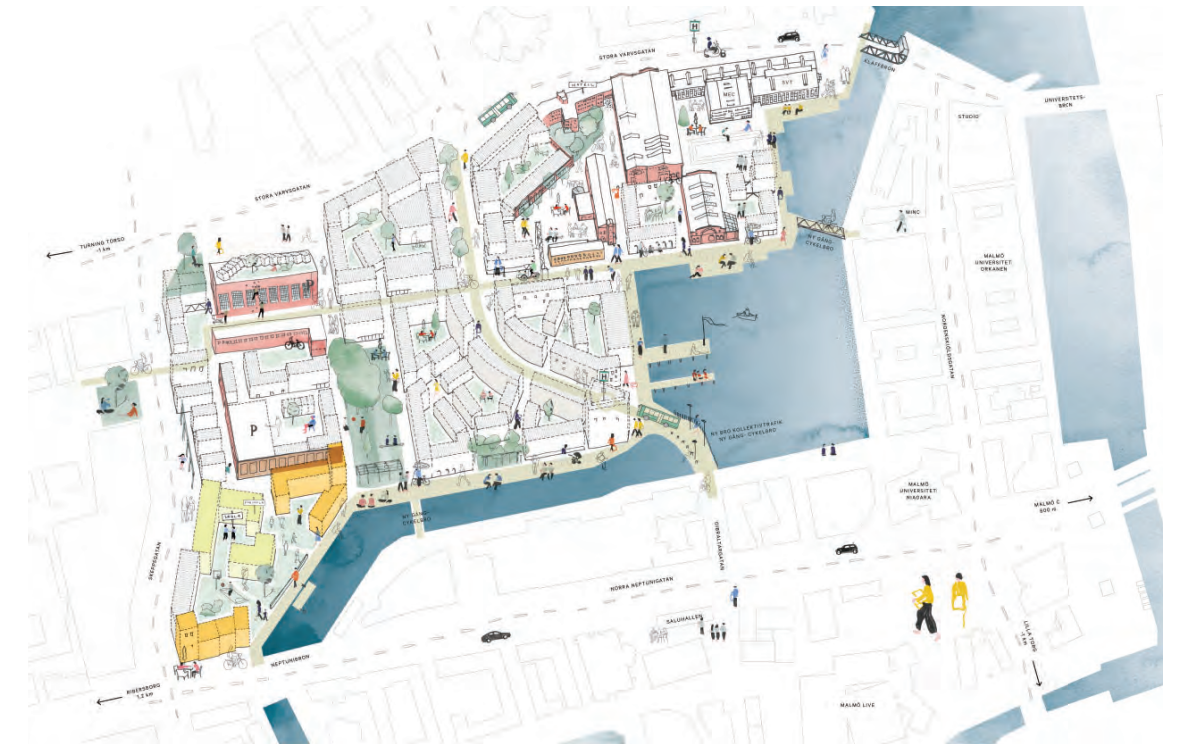


Image courtesy of Researchgate

### THE HUMAN SCALE

Architectural forms in the Western Harbor were designed to exist at a variety of scales, with a focus on walkable development of 3-6 story apartment and office buildings, and dense 2-3 story townhomes. The density and heights used reinforce human interaction and visual connection with the ground plane, heightening a sense of safety, connection with neighbors, and human scale facade modulation.

When finished in 2035 the Western Harbor will be home to **25,000 residents** and **400+ different companies**. Today the city contains a mix of housing, offices, retail and restaurant space, a 20,000 student university, expansive park space, and a variety of community institutions, all within a short walk or bike ride away.



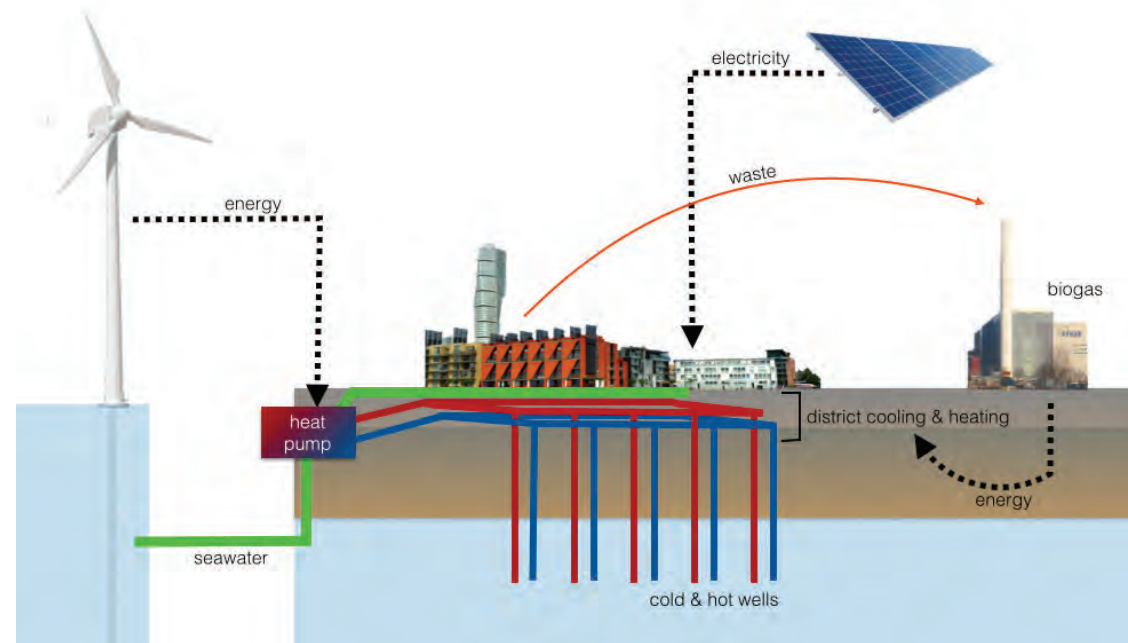
VARVSTADEN NEIGHBORHOOD IN WESTERN HARBOR  
Image courtesy of varvsstaden.se

## CLIMATE FUTURE CITY

Bio-swales, canals, passive-house regulations, vacuum trash disposal, solar collectors, thermal wells, heat pumps, and off-shore wind turbines all contribute to the Western Harbor being a climate future city. These implementations focus on solving issues of local energy production, carbon neutrality, and flood mitigation, all of which are immediate existential threats to the greater Malmö and Copenhagen region.



RAINWATER COLLECTION IN WESTERN HARBOR  
Image courtesy of climateadapt.eu



CIRCULAR SYSTEMS FOR HEATING AND COOLING IN THE DISTRICT

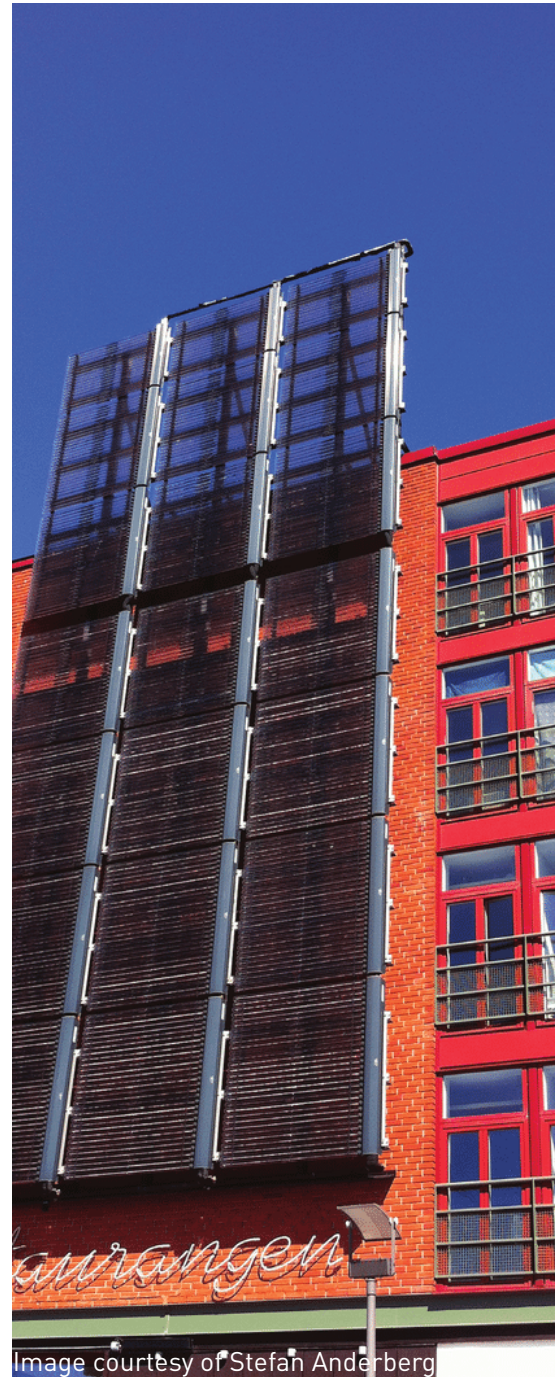


Image courtesy of Stefan Anderberg



WESTERN HARBOR WATERFRONT | Image courtesy of pinimg

## GREEN SPACE FACTOR AND ACCESS TO RECREATION

Green Space Factor was introduced into Malmö's Urban Development Guidelines with the construction of B001, the oldest neighborhood in Western Harbor. It ensures that biodiversity is considered in new developments and that residents have immediate access to some form of vegetation.

The program now requires neighborhoods to have "at least three bird and bat nesting boxes or other animal houses,

two natural biotopes and visible management of service water to achieve the highest level (of Green Points)".

Recreation opportunities proved necessary in Western Harbor to create vibrant public space and establish the district as a destination for neighborhood residents and the broader city.

Activities include an active waterfront, swimming opportunities, world-renowned skate parks, wake-boarding, public parks, playgrounds, and green spaces both big and small.



STAPELBÄDDSPARKEN | Image courtesy of Skatespot



COURTYARD GARDEN | Image courtesy of Blogspot



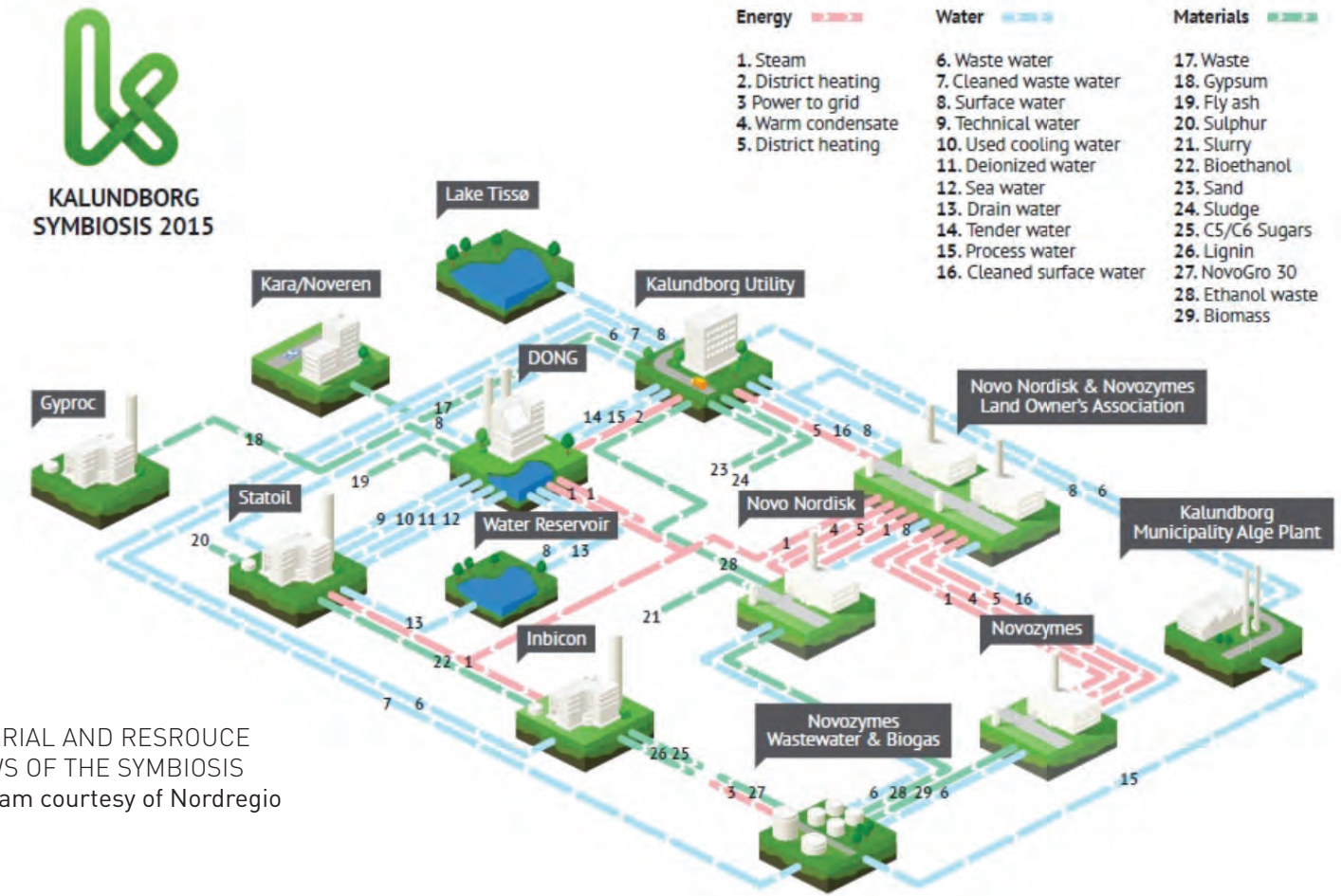
# KALUNDBORG INDUSTRIAL SYMBIOSIS

Akeo Maifeld-Carucci + Alec Finewood + Autumn Davis

Image courtesy of Symbiosis.dk



KALUNDBORG SYMBIOSIS 2015



MATERIAL AND RESOURCE FLOWS OF THE SYMBIOSIS  
Diagram courtesy of Nordregio

## History and Structure

From: nordregio.org, kl.dk

**1972:** Statoil entered into an agreement with Gyproc, a local gypsum production enterprise, for the supply of excess gas from Statoil's production to Gyproc. Gyproc used the gas to dry the plasterboard produced in their ovens.

**1973:** Dong Energy was connected to the Statoil water pipe.

**1989:** The term "industrial symbiosis" was used to describe the collaboration for the first time.

**1993:** Projects began using residual steam. Dong-Gyproc

**1996:** Partners forming the Symbiosis Center

**2011:** Kalundborg Symbiosis formed as an association

**2012:** Algea plant formed. Kalundborg Municipality- Novozymes

**2017:** Green Energy transformation of the energy supply. Dong- Kalundborg utilities- Novozymes- Novo Nordisk

# BAY OF PARTNERSHIP



Image courtesy of Symbiosis.dk



KALUNDBORG SYMBIOSIS

## MISSION

The Kalundborg Industrial Symbiosis is a collaborative industrial-corporate-commercial network, working to enable individual companies in transitioning from traditional linear production approaches of source-to-use-to-waste into a collective, circular form. Resources are shared and the waste from one company is reused by another.

## PERFORMANCE STATISTICS

- Through the use of surface water, the symbiosis saves 141 million ft<sup>3</sup> of groundwater
- 639,000 tons of CO<sub>2</sub> saved
- 68,000 tons of 'waste' materials recycled, made of over 20 different streams
- The energy used within the symbiosis has decreased its CO<sub>2</sub> emissions by 80% since 2015, by switching from coal to biomass (FSC certified woodchips) and through the use of solar and wind power.
- Bottom-line savings of 24 million euro

Kalundborg Symbiosis Center  
Helix Lab and Absalon University Centers



Image courtesy of Google

## COMMUNITY CONTRIBUTIONS

- 4500 people employed.
- 530 new jobs added in 2022.
- 5 new educational centers and college branches in Kalundborg.
- Development of a new commuter rail station.
- Landscape and biodiversity requirements for new developments.
- Knowledge sharing to other locations and municipalities across the world.



Kalundborg Industrial Symbiosis

Size: 4.56km<sup>2</sup>

Image courtesy of Google



Bellingham Waterfront

Size: 0.5km<sup>2</sup>

Image courtesy of Google



# REMISEPARKEN

LAUREN CORN + BRIANNA WEEKES



Image Courtesy of COAST STUDIO



PLAN VIEW OF REMISEPARKEN  
Image Courtesy of BOGL

Remiseparken provides a diversity of activities for users while addressing social and climate needs. The 2020 redesign creates a safe and desirable space for residents.

Remiseparken's winding, interactive, path connects unique programming and provides a stimulating experience. Here users can interact with farm animals, practice a green thumb in the allotment gardens, launch themselves down the bowl of the skatepark, climb, and find respite in nature. Remiseparken provides both active space, places of calm, and climatic response through stormwater management design.



HORSES THAT CHILDREN RODE  
Image Courtesy of Lauren Corn



THE BUILDER  
Image Courtesy of COAST STUDIO



STORMWATER INFRASTRUCTURE  
Image Courtesy of COAST STUDIO

# PATHWAY + PLACES

**Size:** 20,000 sqm

**Location:** Urbanplannen, Copenhagen

**Year Completed:** 2020

**Landscape Architect:** BOGL

**Competition:** Winner of the 2021 Danish Landscape Prize

**Status:** Completed

**Client:** Copenhagen Municipality

**THE PATHWAY:** BOGL wanted to keep existing successful elements of the park, add additional experiences, and create a unified park experience. The carefully designed activity path became the common language that strings together the different park experiences.

In the redesign, BOGL created an activities path to create a coherent connection between the different activities of the park.

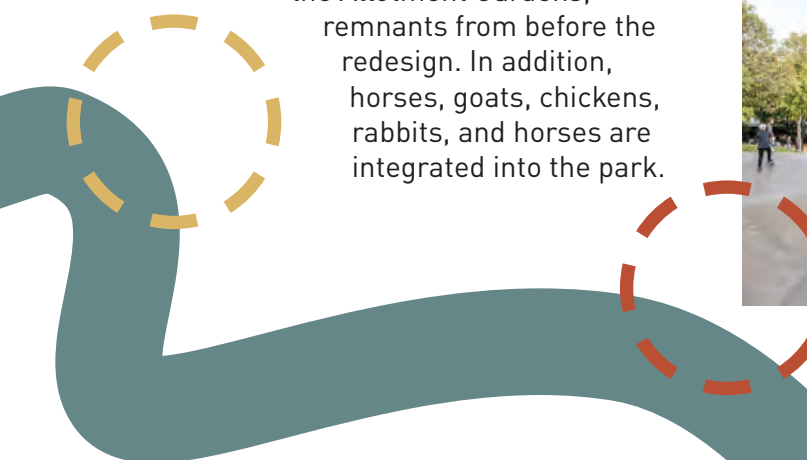


**ACTIVITY PATH AND SKATE PARK**  
Image Courtesy of BOGL

The pathway is made from dyed concrete, but the surface has been treated to create three different texture types. The border around the path is highly textured signifying the edge. At places that invite viewers to sit the path widens and the concrete is smoothed and polished. Walking paths are a more traditional type of concrete.

**THE PLACES:** Small rooms open along the unraveling path. These rooms integrate existing successful aspects of the park along with new experiences. BOGL focused on spaces of cultural significance, locations to inspire movement, and hidden corners to enjoy nature.

The cultural landscapes include an agricultural focus, food-based programming, open space, and water design. Small rooms include the Farm, a new addition to the park, and the Allotment Gardens, remnants from before the redesign. In addition, horses, goats, chickens, rabbits, and horses are integrated into the park.



The nature area in the southwest section promotes biodiversity and manages stormwater. Users travel through the alder grove where more than twenty different alder species are present. BOGL provides resilient outdoor spaces even through cloudburst events where users can feel a sense of intimacy with the natural environment.

A movement-based activity park called The Builder is designed specifically for children six years and older. This area of the park includes ball courts, a skatepark that is uniquely nested into a steep hillside, a sculptural obstacle course, slides, monkey bars, and large swings.



**ALLOTMENT GARDENS**  
Image Courtesy of Lauren Corn



**REMISEPARKEN TROLL**  
Image Courtesy of Lauren Corn



**SKATE PARK**  
Image Courtesy of Coast Studios



**CLOUDBURST DETENTION AREA**  
Image Courtesy of Lauren Corn



# CHAPTER 2

## ANALYSIS + FLOWS: BELLINGHAM'S WATERFRONT CONTEXT

In this chapter we analyze the Bellingham waterfront site, and surrounding environment to understand historical context, existing environmental conditions, connections to Bellingham, and ties to the broader county and region.

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# CULTURE, HERITAGE & WELL-BEING

Seyyada Burney, Brianna Weekes, Akeo Maifeld-Carucci



BOARDMILL BUILDING MURAL: Mural by indigenous artist Jason LaClair (Source: Phu Ngoc Hnin, 2022)

## INDIGENOUS CULTURES

### THE SALMON PEOPLE

The Lummi Nation's territory traditionally included much of the San Juan islands and spread from Seattle north to the Fraser River. According to the Treaty of Point Elliot in 1855 this land was greatly diminished to the current 13,500 upland acres on the Lummi Peninsula but access to much of their traditional fishing grounds was maintained. Currently, there are 4650 registered tribal members and the Lummi Indian Business Council is the third largest employer in the Whatcom County area (Lummi Indian Business Council).

While these tribes are culturally distinct, both the Lummi and Nooksack recognize themselves as coming from the land and being integrated pieces of the natural world in which they live. They place significant value on connections to salmon and other species including the western red cedar that are central to their livelihood and spiritual well-being.

These cultures practice sophisticated traditional patterns of overlapping individual and collective responsibility. By requiring sharing of surplus and caring for all in the community within their use and stewardship of personal areas of land, these practices offer rich lessons for all communities as the climate crisis mandates we do more with less in flexible, cooperative ways (Lummi Indian Business Council).



COAST SALISH REGION INDIGENOUS GROUPS: shown by language area (UW Burke Museum)



CEDAR: Traditional Lummi oars and hats (Sharon Eva Grainger)

### THE NOOKSACK TRIBE

Native to the river that continues to hold their name, the Nooksack have about 2000 registered members and reside 15 miles east of Bellingham in Deming, WA. While the Nooksack were not granted a reservation in 1855, they have continued to make their home in this small part of their original lands and also have been allowed to maintain their traditional fishing rights and areas. (Nooksack Indian Tribe)

## TRADITIONS OF PROTEST

The Lummi and Nooksak people have long-standing traditions of protest. In the 1960-70s, indigenous fishermen began non-violent protests to reclaim their commercial fishing rights that had been periodically removed by Washington State. The aggression and violence

against indigenous fishermen because of these “fish-ins” that followed became known as the Fish Wars. In 1974, this resulted in the Boldt decision, a landmark ruling for tribal rights quantifying and re-validating their rights (Bellingham Racial History Timeline). This activism is also seen in their advocacy for environmental protection in the face of climate change. This is seen in their participation in the 2015 Paris climate talks and a yearly environmental awareness raising totem pole carving and journey from the Lummi House of Tears carvers (dos-polacos.com).



CHERRY POINT VICTORY: Totem Pole celebrating fossil-fuel terminal rejection (Seattle Globalist, 8/26/2016)

X'WÖTQWEM: "SOUND OF WATER DRIPPING HARD AND FAST"

## SALMON WOMAN TOTEM POLE

The story of Salmon Woman tells how she gifted her children, the salmon, to Raven in his time of dire need when he was lost and his people were starving. Yet at the bottom we see Bear, Raven's brother, who disobeyed salmon woman's agreement and stole spawning fish up-river causing all the salmon he touched to die and no longer return to the ocean. (Salmon Woman)

SALMON WOMAN TOTEM POLE (Washington State Library)



## NORTHWEST INDIAN COLLEGE

The main campus for the Northwest Indian College (NWIC) is located on the Lummi peninsula but the college has 6 additional campuses. In 2020 NWIC served about 600 students with the average student being a 29 year-old female. Additionally, 75 percent of students are indigenous tribal members representing over 90 different tribal nations. They confer mostly associates degree certifications but also have 4 bachelor degree programs (Northwest Indian College).



CAMPUS LOCATIONS: the main and satellite campuses of NWIC serving greater PNW region. (Northwest Indian College)

## INDIGENOUS ART

Artistic expression is an important way for indigenous people to share their cultures and values whether through more traditional forms like carving, dance, and weaving or more modern forms of murals, photography, and other digital media. Recent efforts sharing this art through community installations and work with local schools have been quite valuable for the Bellingham area (Bellingham Public Schools).



REEF NETTING TODAY: still low by-catch and now solar-powered (NW Treaty Tribes, 2016)

## FISHING AND INDUSTRY

Salmon and shellfish provide ceremonial, subsistence and economic value traditionally and today. In addition to pioneering sustainable fishing techniques like reefnetting, the Lummi also contribute to current practices including a shellfish hatchery and a salmon population enhancement hatchery (Lummi Nation Atlas).

## 9000BC | BELLINGHAM BAY IS INHABITED BY COAST SALISH GROUPS

The area in and around Bellingham Bay, and adjacent territories, is home to a number of groups including the Lummi, Nooksack, Saanich, Samish, Semiahmoo, and Songish.

## 1855 | TREATY OF PT. ELLIOT

Lummi, along with other northwest coastal tribes were paid a total of \$150,000 for their lands and paid an additional \$15,000 in relocation costs and expenses.

## 1880 | RESIDENTIAL SCHOOLS

Indigenous children in the region were sent to Catholic residential schools with the goal of stripping the indigenous people of their language and culture, and imposing Euro-American culture on them. These schools included Stickney Home Mission School for Indians (Lynden, WA), and Chemawa Boarding School (Salem, OR) - pictured.

## 1893 | NEW WHATCOM SCHOOL

New Whatcom School is established, which would eventually become Western Washington University.

## 1925 | WHITE SUPREMACY

Bellingham hosted the strongest KKK chapter in WA state throughout the 1920s and 30s. In September of 1925, an organized rally draws a crowd between 12,000 and 25,000 people.

## 1974 | BOLDT DECISION

Following the 'Fish Wars' (1960s and 70s), where native peoples were engaged in non-violent protest, the case re-affirmed the rights of American Indian tribes in the state of Washington to co-manage and continue to harvest salmon and other fish under the terms of various treaties with the U.S. government.



## 2020 | RACISM DECLARED A PUBLIC HEALTH CRISIS

The Whatcom County Board of Health adopted a resolution recognizing racism as a public health crisis.

## 1852 | LUMBER AND COAL MINING INDUSTRY BOOM

The Roeder-Peabody lumber mill is established on Whatcom Creek, housing one of the leading industries in the region. By 1853, coal mining had begun in the new city of Sehome, and alongside the Fraser River gold rush, brought over 75,000 people through the growing area.

## 1885 | CHINESE EXPULSION

Chinese residents are expelled from Bellingham in a campaign led by a local newspaper. Civic leaders campaigned to drive Chinese workers away from the area. When they succeeded, the towns celebrated with a torchlight parade.

## 1900 | SALMON INDUSTRY

From 1900 until about 1945, canneries were the area's largest employers. The Pacific-American Fisheries cannery was the largest structure in Washington and the largest Pacific salmon processing-plant in the world. The Lummi (and other native tribes) were excluded by the state of Washington from the commercial fishery.

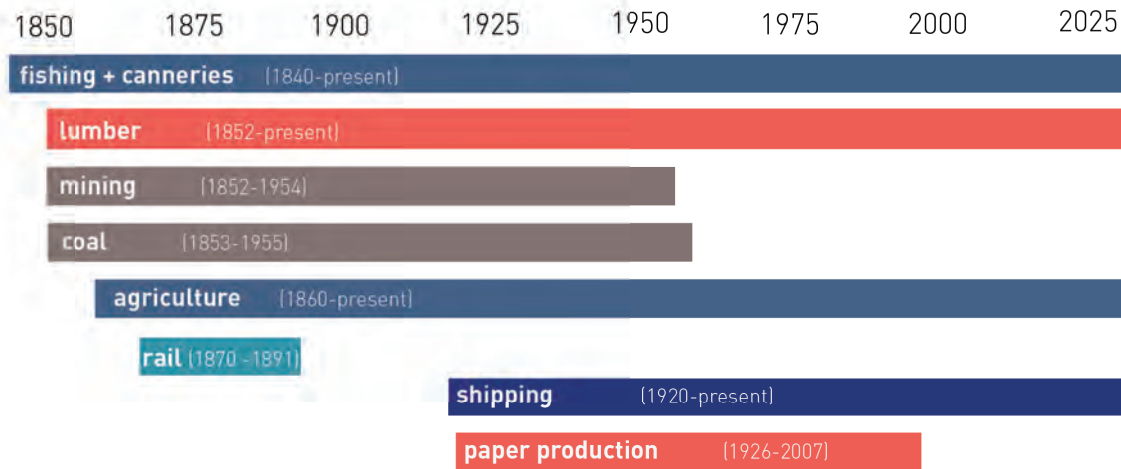
## 1907 | SOUTH ASIANS EXPELLED

East Indian lumber mill workers, predominantly Sikh, are violently attacked and driven out of Bellingham.

## 1990S -2000S | HATE SPEECH + ISLAMOPHOBIA

Bellingham communities struggle to contain repeated incidents of hate speech, hate crimes, antisemitism, and Islamophobia against communities of color.

# HISTORY OF INDUSTRY



PEOPLE MAKE INDUSTRY: A collage of industry including canning, mill, and railway. Accompanied by a timeline of industry. (Photo Sources: Western Library)

## HERITAGE

The prominence of industry has developed a working class history and culture in Bellingham. This building of economy was dependent upon the loss of land of the local tribes and the contributions of immigrant populations to the work force.

# A SITE OF PAST AND PRESENT INDUSTRY

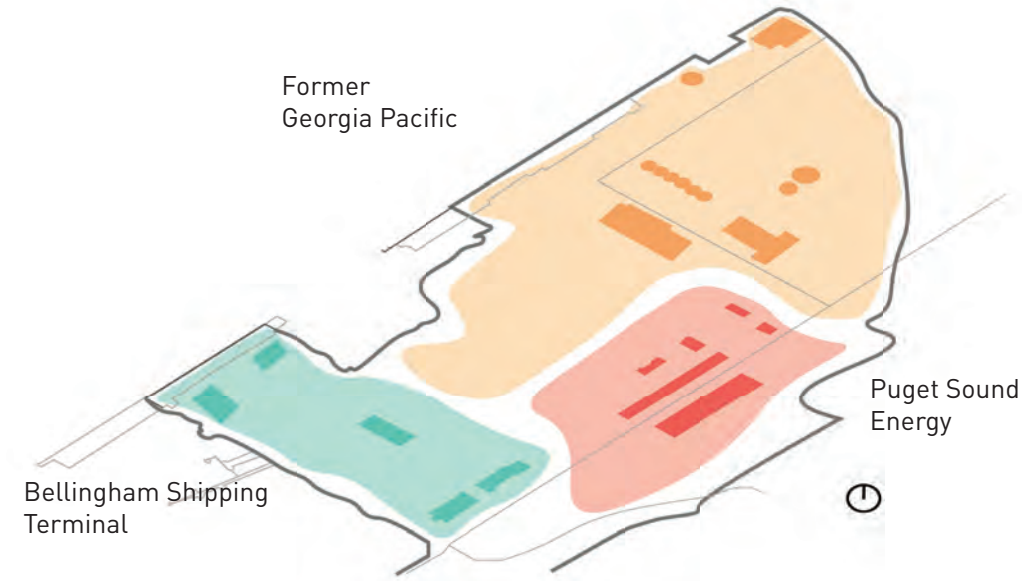
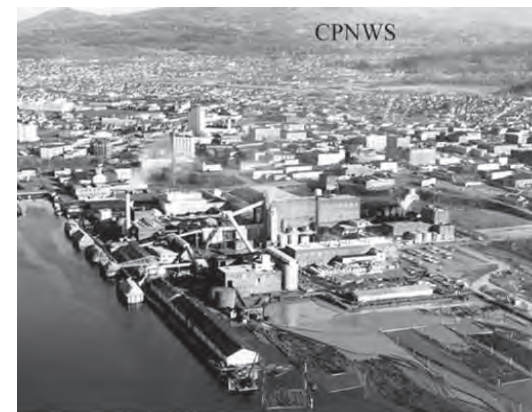
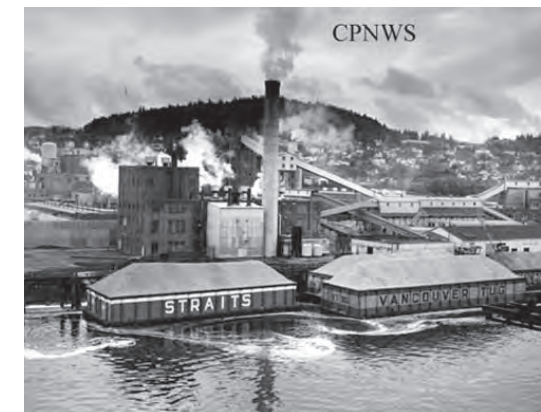


Figure: A diagram depicting industrial use on the site



GEORGIA PACIFIC SITE 1960-1980. [CPNWS-WWU Archives]



SAWDUST BARGES ARRIVING AT MILL, 1960-1980 [CPNWS-WWU Archives]

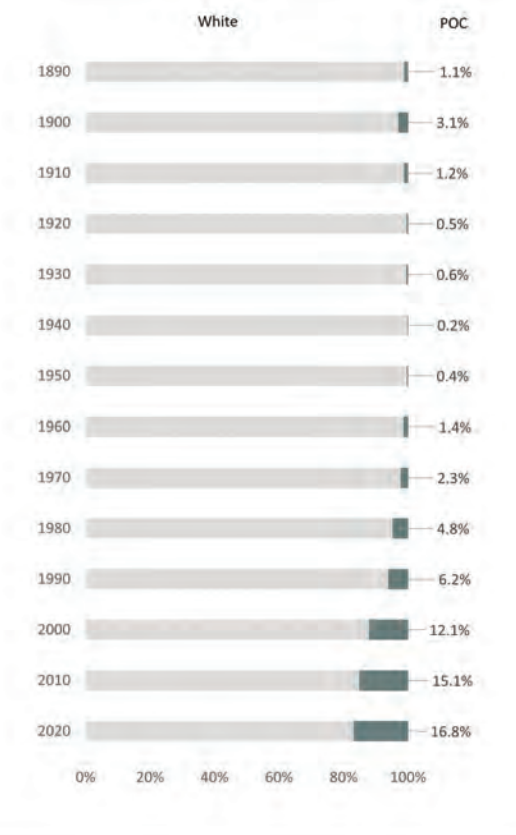
# TIDES OF INDUSTRY

- 1906**  
On Whatcom Creek Waterway, the mud flats were platted with fill to create the site
- 1918**  
Bellingham Port Authority is formed
- 1924**  
Bellingham Port Authority purchased the Municipal Shipping Terminal
- 1929**  
Puget Sound Pulp & Timber was formed
- 1938**  
Production began with the first mill on the site
- 1963**  
Puget Sound Pulp & Timber was acquired by Georgia Pacific
- 2001**  
Georgia Pacific closed the pulp mill
- 2003**  
Georgia Pacific closed tissue production
- 2005**  
Bellingham Port Authority acquired the former Georgia Pacific Site
- 2005**  
Puget Sound Energy began operating Ecogen Generating Station

# BELLINGHAM TODAY

The Bellingham community has steadily diversified along with its economy since the 2000s. Increasing ethnic diversity is, unsurprisingly, changing both this community's strengths and needs: today, 9.4% of Bellingham residents are foreign born. This trend that reflects the influx of migrant farm workers and recent geographic shifts following COVID-19 and transitions to remote working. However, this community is yet to be served by municipal infrastructure, community services, or cultural anchor organizations.

Recent advocacy efforts by immigrant communities in Bellingham have led to proposals for a dedicated Immigrant Resource Center. This was submitted to the City of Bellingham in September and is due for decision in October 2023. (Washington News Service).



ETHNIC DIVERSITY OVER TIME (WWU)

Bellingham is home to an active and growing community of mountain bikers- as well as a thriving landscape of breweries. The Northwest Tune Up Festival brings bikes, beers, and music together for a three-day celebration of Pacific Northwest Culture. In June 2022, the inaugural festival was held at the Waterfront District, and attracted several thousand people from around the U.S.

## DEMOGRAPHICS

**90,821**  
Population

**82.1%**  
White

**9.4%**  
Foreign-born

**32.9 years**  
Average Age

**\$28,480**  
Median Income  
(Aug. 2022)

**4.8%**  
Unemployment Rate  
(Aug. 2022)

**20%**  
Persons in Poverty

Sources: American Community Survey, US Bureau of Labor Statistics.



ARTIST AND DIGITAL RENDERINGS OF THE MILLWORKS: Image description/caption [Whatcom Community Foundation]

## THE MILLWORKS

The Millworks is a two-phase 'community benefit development' led by the Whatcom Community Foundation.

Phase 1 is a \$37 million family housing and early learning center being developed in partnership with Mercy Housing Northwest. This project will bring **83 permanently affordable housing** units to the Waterfront District. 10% of the units will serve families experiencing homelessness, 20% will serve differently abled individuals, and the remainder will serve individuals making 30%, 50%, and 60% of Area Median Income - a critical 'missing middle' for urban housing. A **six-classroom Early Learning and Childcare Center (ELC)** is also part of the development. With the additional support of a state subsidy and a YMCA scholarship, as many as 1/3 ELC slots could serve low-income families.

Phase 2 of the project focuses on food resilience and economic resilience. Planning and fundraising are in progress. Envisioned as a **'regional food hub'**, this second building will bring an additional **150 new jobs**, co-op housing, workforce training, technical assistance, and a business incubator.



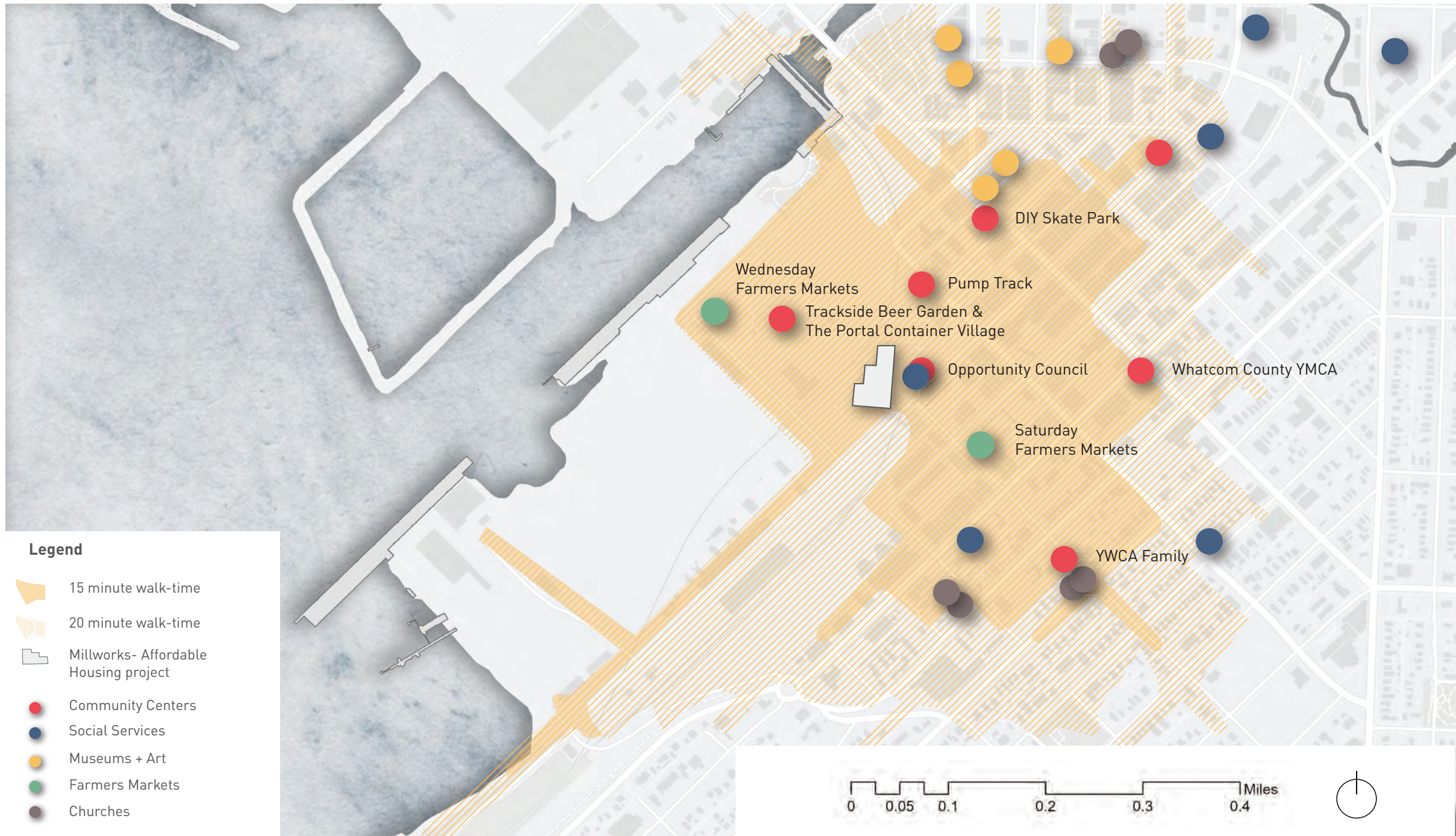
# NEW COMMUNITIES

Active and concerted development efforts are bringing new communities to the waterfront district. Trackside beer garden, Pump Track, DIY Skate Park, and The Portal are already attracting Bellingham residents and visitors to the waterfront for a variety of recreational opportunities. However, it is unclear how many of these temporary activations will be made permanent - despite their clear popularity. This raises questions about which services will be available for future residents of the Waterfront District. The City of Bellingham has promised to build connective infrastructure between the waterfront district and existing downtown core, but these investments are tied to square foot development goals - which may not be met (at all or equitably) within critical infrastructure.

## WALKSHED ANALYSES

Network analysis of the waterfront district reveals that there are relatively limited services within 15 and 20-minute walk times of the slated housing developments. While market-rate condo residents will be able to travel further and more regularly, Millworks residents will depend on these walksheds for vital needs: affordable food, schools, cultural centers, and a sense of community.

Will urban development keep pace with *community* development?



### COMMUNITY ANCHORS ORGANIZATIONS WITHIN WALKING DISTANCE OF THE MILLWORKS

Opportunity Council program members will enjoy relative proximity to continued services, but other Millworks residents may need to travel far to access basic needs, such as schools or libraries - neither of which fall within 15 or 20 minute walksheds of the development.

# PUBLIC ART AND ACTIVATION ON SITE

As the site has been in a state of flux, community members and partnerships have worked to program and activate the site.



Image: Pump track by Bellingham Herald



Image: Jason LaClair Mural by Phu Ngon Hnin



Image: Container Village by Briana Weekes



Image: Public Art Wall by Seyyada Burney



Image: Community Initiated Skate Park by Jack Finley



Image : Adaptive Reuse as Art by Briana Weekes

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# ECONOMY AND SUSTENANCE

Alec Finewood + Constantine Chrisafis

IMAGE 1: Aerial view of the Bellingham waterfront (2014)

## THE ECONOMY OF WHATCOM COUNTY

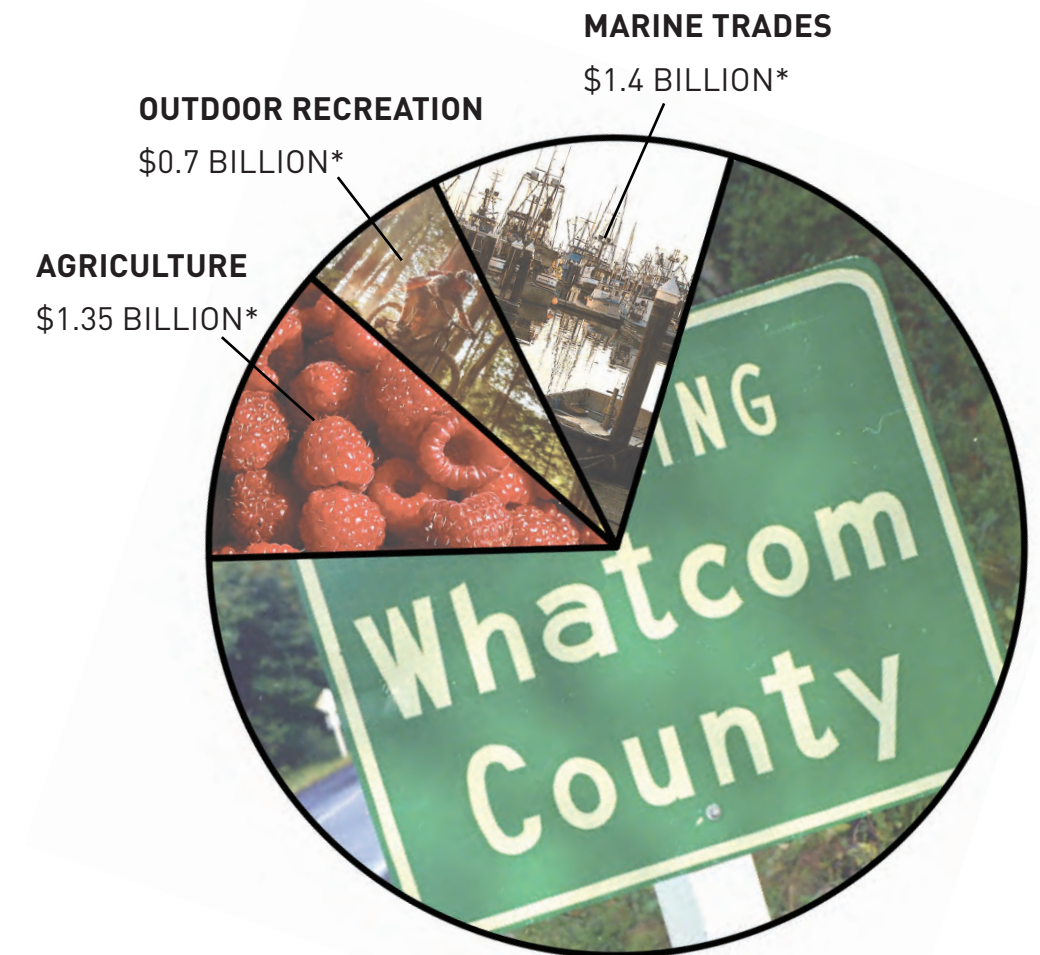
### WHAT MAKES BELLINGHAM'S ECONOMY UNIQUE?

Marine trades, outdoor recreation/tourism and agriculture comprise 30.1% of Whatcom County's annual GDP and are intricately tied to the region's history and local culture. Furthermore they sustain a vibrant trade economy, with stable blue-collar jobs. Preserving these economic sectors has been a vital mission for the City and the Port of Bellingham.

### OTHER ECONOMIC SECTORS

In 2019 retail trade comprised 12.8% of gdp output and educational services, health care and social services contributed 22.9% (Census 2020).

**\$11.45 BILLION** TOTAL YEARLY GDP\*



\*GDP AVERAGE ACCROSS WHATCOM COUNTY (2013-2019): these average gdp figures reflect the major economic drivers in Bellingham and greater Whatcom County.

# MARINE TRADES

## BELLINGHAM'S WORKING WATERFRONT

Marine Trades brought in \$1.4 billion in revenue in Whatcom County (Port of Bellingham, 2013). The waterfront has historically been a major site for maritime and extractive industries. Figure 1 looks at current marine trade businesses on the waterfront, and reflects a present shift from heavier extractive uses towards more service-oriented light industrial uses.

Major activities on the Bellingham Waterfront could be categorized by use-type:

- Seafood processing/storage
- Boat Manufacture & Repair
- Charter boat excursions
- Shipping terminal
- Yacht sales
- Technology center/technical school training
- Fish market



## PORT OF BELLINGHAM

Port of Bellingham is currently the owner of the waterfront site. As well as an important factor in the local and extended economy of Whacom County. The Port's mission is to "promote sustainable economic development, optimize transportation gateways, and manage publicly owned land and facilities to benefit Whatcom County".

## PORT OF BELLINGHAM'S ECONOMIC CONTRIBUTION

8,780 total jobs\*

\$42,120 average yearly wage

\$406.3 million total payroll

\$1.4 billion in business revenue

\$37.7 million in state/local taxes

11% of local economic output

50% of the Port's impact is associated with maritime trades

*\* Total jobs include direct employers on port property, jobs produced by wage expenditures by these direct employees, and jobs created when port businesses make local purchases with suppliers.*



BELLINGHAM WATERFRONT: A diagram looking at the relationship between the Bellingham Waterfront Site and major marine trades businesses currently inhabiting the greater waterfront area.

# OUTDOOR RECREATION

## NATURAL LANDSCAPES AND TOURISM

A 2015 State of Washington study revealed that each year, **residents and visitors spend \$705 million on outdoor recreation in Whatcom County**, ranking it eighth-highest in the state for such expenditures. **This spending supports a total of 6,502 jobs.** “Whatcom County boasts a total of 14 million participant days in outdoor recreation, with residents averaging 71.8 participant days well above the state average of 59 days per year” (Recreation and Conservation Office, 2019)

“Recreation is critical to Bellingham and Whatcom County,”  
 - Former Bellingham Mayor (2011-2020) Kelli Linville

## ECONOMIC VALUE OF TOURISM

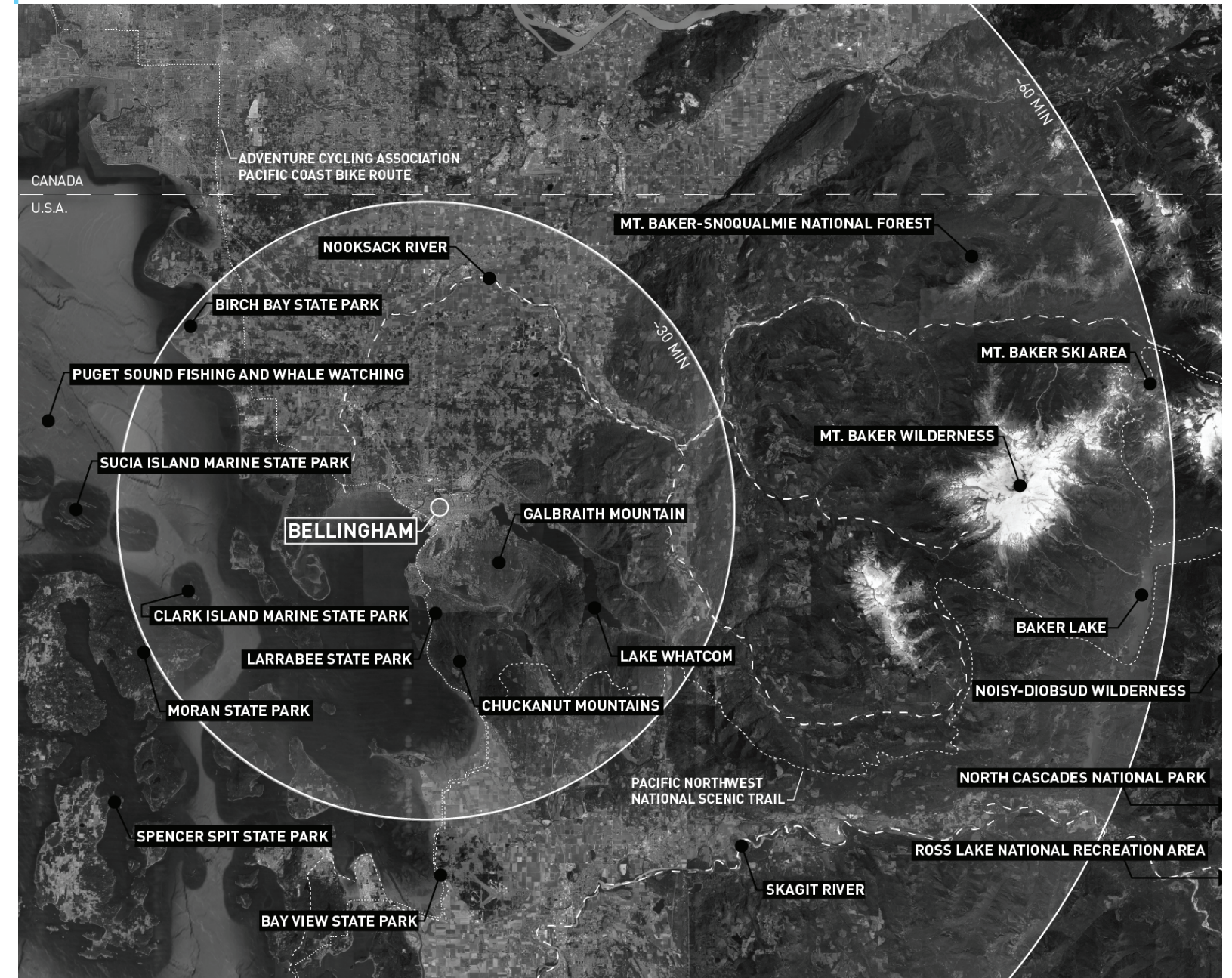
On average a tourist visiting for the day brings \$58 worth of economic value and \$278 when spending a night in Bellingham. The Whatcom County Tourism Board recently reported that “total travel spending in Whatcom County generated \$70.7 million in state and local taxes in 2019” (Economic Analysis, 2019).



IMAGE 2: Bikers on Galbraith Mountain

## ECONOMIC VALUE OF ECOSYSTEM SERVICES

“Trees, water and animals provide ecosystem goods and services such as swimmable water, habitat, and aesthetic beauty. Whatcom County’s 755,000 acres of public land provide many of these benefits. The combined total estimated value of these nonmarket benefits is between \$6 billion and \$10 billion a year” (Earth Economics, 2015).



WHATCOM COUNTY: A map looking at the landscape of outdoor recreation/natural amenities around Bellingham that are identified by the Washington State Recreation and Conservation Office as having considerable impact on local economy.

# FARMING AND FOOD SYSTEMS



IMAGE 3: agriculture in Whatcom County.

## THE IMPACT OF LOCAL AGRICULTURE ON BELLINGHAM

- \$380 million in market value of products in 2017
- \$900 million to \$1.8 billion in economic impact using a three to six multiplier (USDA Economic Research Service uses a multiplier of six at the national level)

The greater agricultural landscape of Whatcom County is a key piece of state and national agricultural markets, specialising in berry production and ranking 6th among all WA counties for total agricultural production (whatcomcd.org). In the last decade, the number of small farms (less than 10 acres) in the country that grow for the regional market rather than for export has grown by 2% (Gallagher). The proposed Millworks Project on the waterfront site includes a Food Campus that could draw together these threads and build on the growth of local agriculture to connect the site to its local and regional context through food.

## WHATCOM COUNTY AGRICULTURE AT A GLANCE

Over 100K acres of productive farmland

2% organic farms

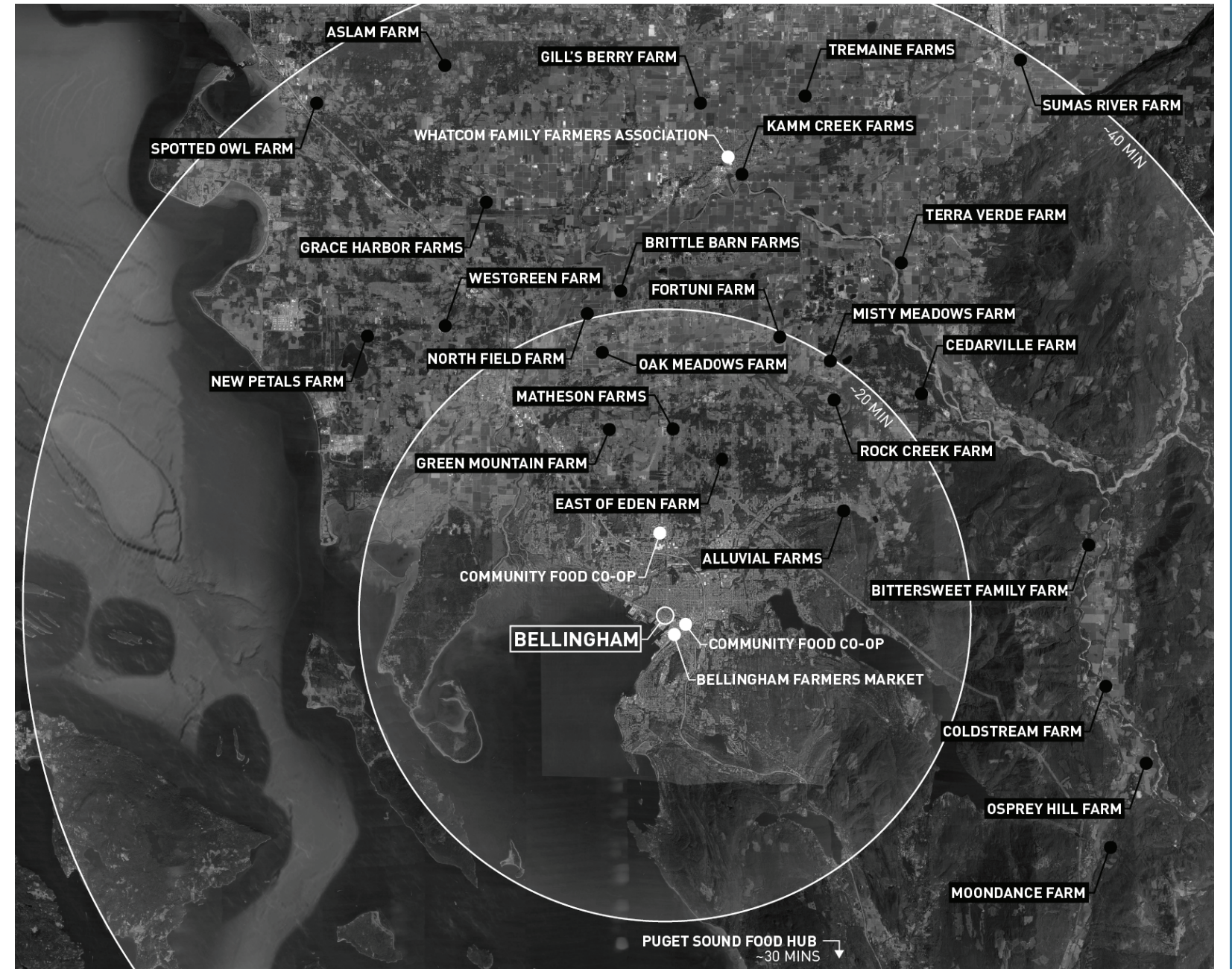
15% sell directly to consumers

1,712 farms

97% family farms

\$372M in annual agricultural production

65% of red raspberries grown in USA



BELLINGHAM ENVIRONS: The system of major farms and agricultural businesses around Bellingham that contribute to a vibrant local agricultural economy.

# HOUSING AND ECONOMY IN BELLINGHAM



## BELLINGHAM HOUSING AT A GLANCE

Bellingham was the 9th-least affordable mid-sized city in the US in 2020

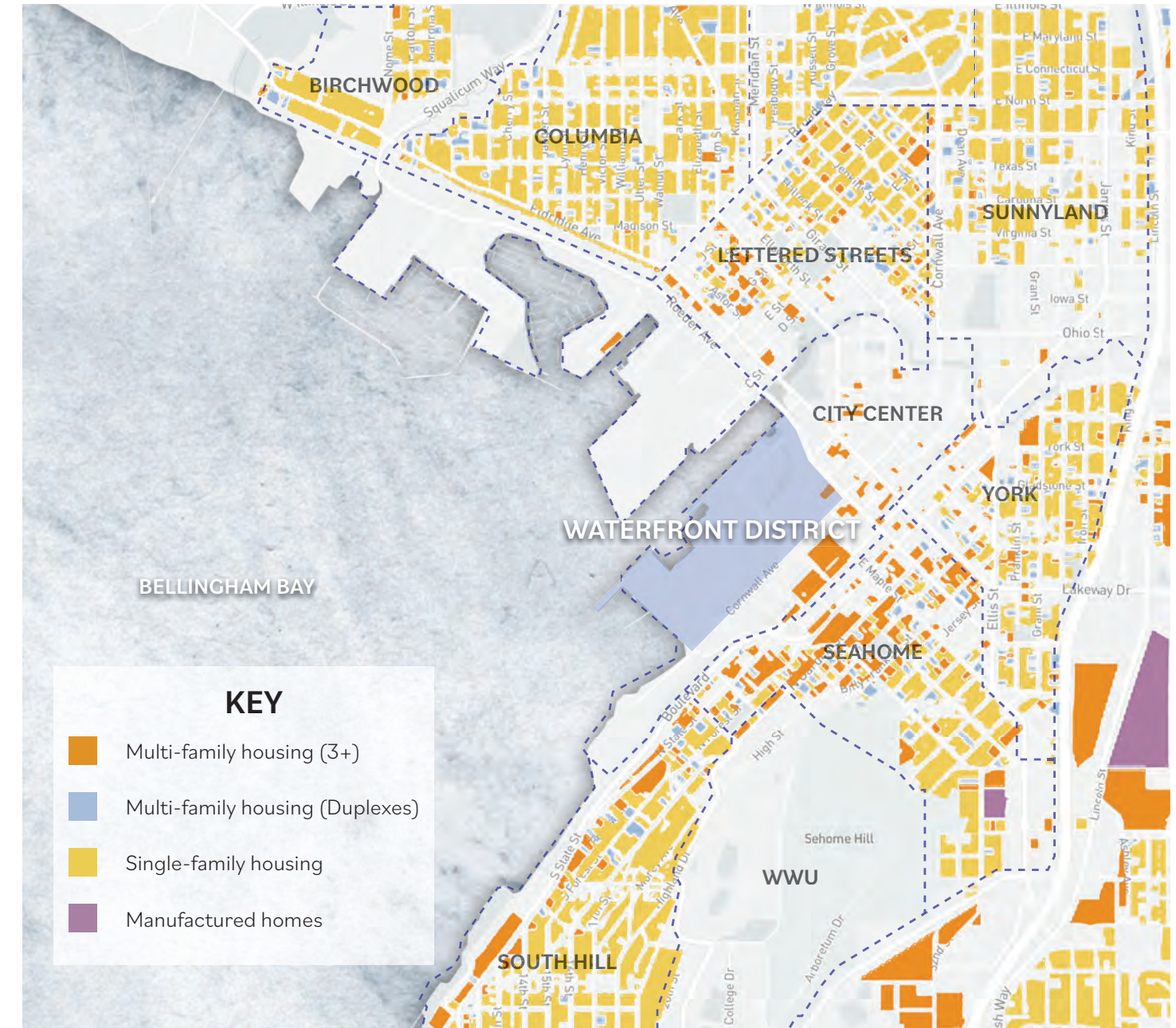
Median home price in 2021: \$625K (up 28.3% over 2020)

54% of homes renter occupied / 46% owner occupied

30% of renters are severely cost-burdened

## THE HOUSING CRISIS AND BELLINGHAM'S ISSUE WITH AFFORDABILITY

One of the key issues in Bellingham that a redeveloped Waterfront District could help to address is housing affordability. Like many cities in the US, Bellingham is experiencing an historic housing shortage that has led to skyrocketing home prices and rents. A preponderance (46.7%) of Bellingham's total housing stock are single-family homes, which serve to further limit the availability of affordable housing. Despite this need, it is important to carefully consider where housing could be placed given the health and safety challenges in the Waterfront District and considering the impacts that climate change will have on the area.



HOUSING TYPE: Housing type distribution around the city shows a dominance of single-family homes and a lack of housing in the city center, contributing to Bellingham's housing affordability issues.

# OPPORTUNITIES FOR SYMBIOSIS ON THE WATERFRONT

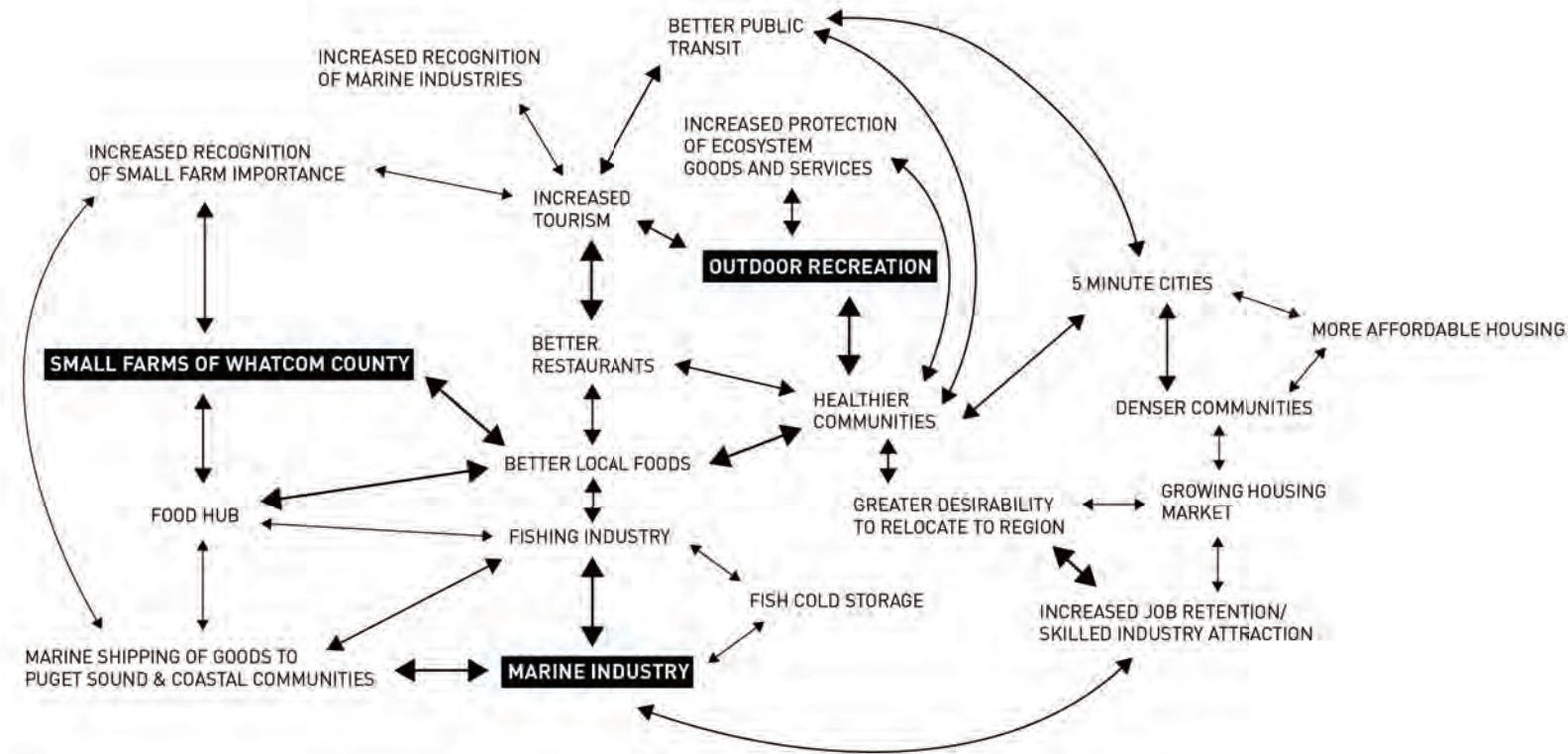


FIGURE 5: The system of major farms and agricultural businesses around Bellingham that contribute to a vibrant local agricultural economy.

## AN ECONOMIC WEB

Accross economic sectors from marine trades, recreation/tourism and agriculture there is the potential for “symbiosis”. Leaning on the precedent mentioneds earlier in the book (Kalundborg Symbiosis) the waterfront represents a web of material and resoruce flows that could build a more robust and durable local economy (both on the waterfront and accross greater Whatcom County).

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## FIGURES

FIGURE 1: Map by Alec Finewood (2022)  
 FIGURE 2: Map by Alec Finewood (2022)  
 FIGURE 3: Map by Alec Finewood (2022)

## IMAGES

IMAGE 1: Photo by wikipedia (2022)  
 IMAGE 2: Photo by Eric Ashley (2018)  
 IMAGE 3: Photo by Brett Baunton (2022)

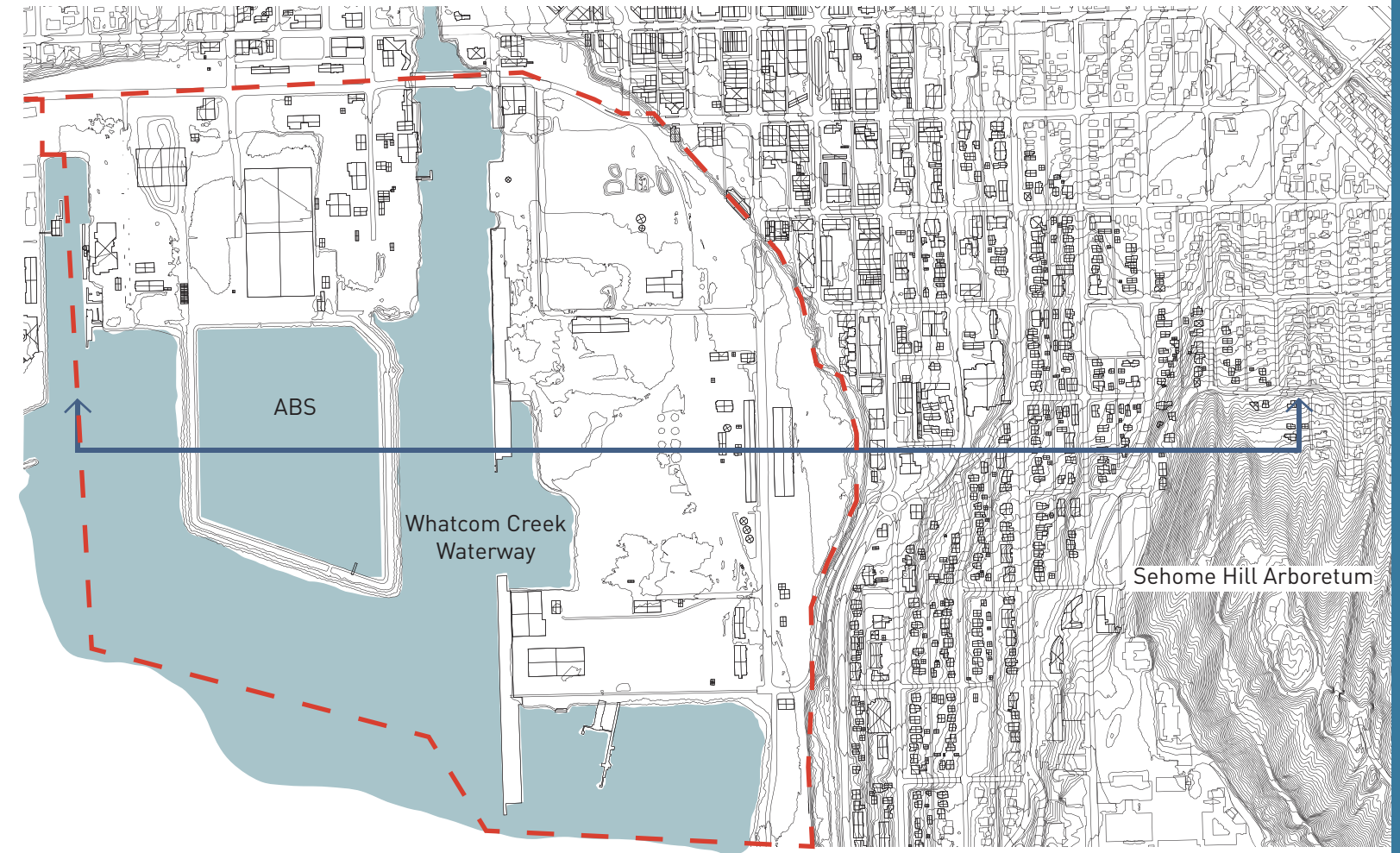


# ENVIRONMENT, TOPOGRAPHY, PARKS

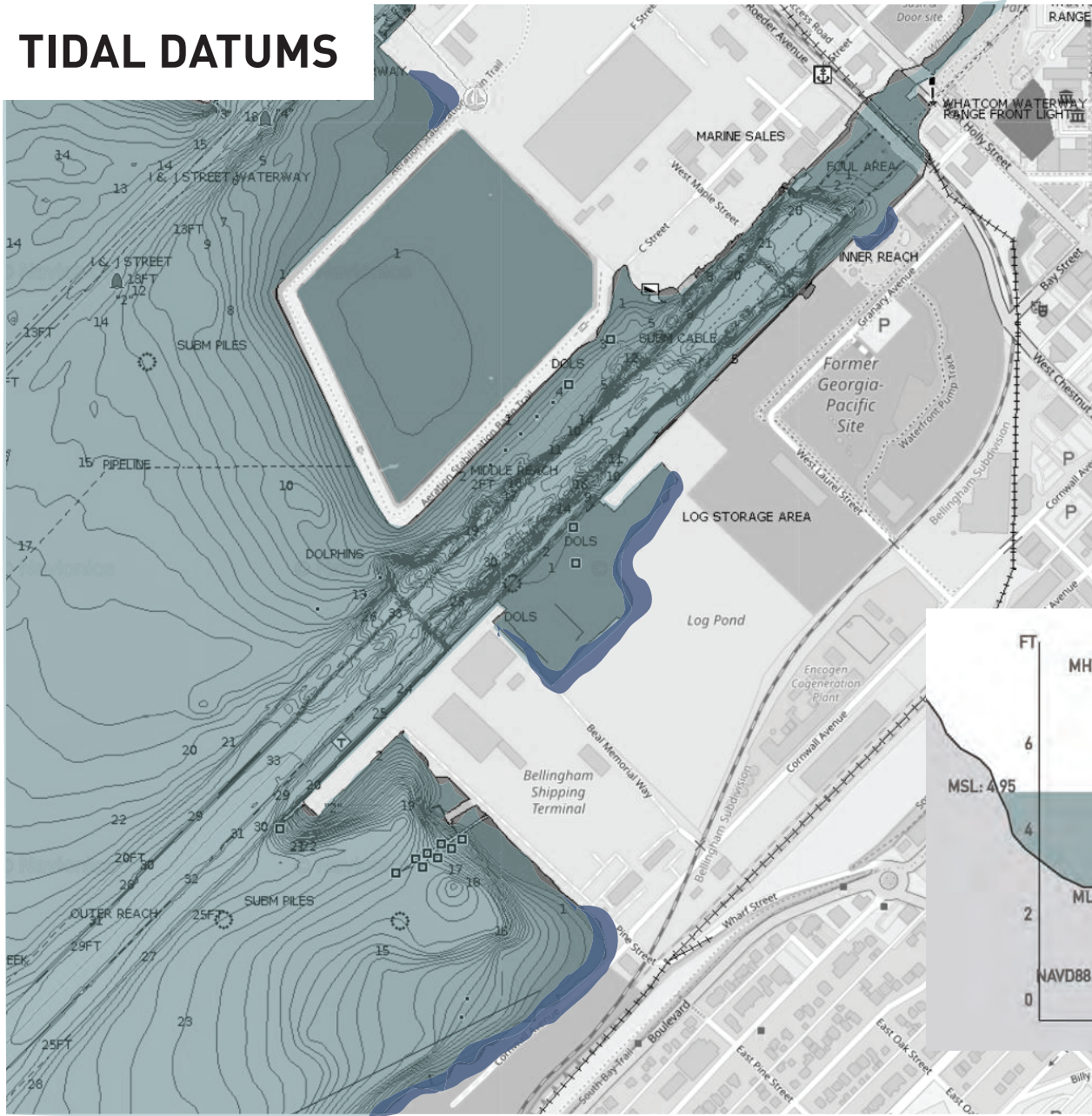
Autumn Davis + Kat Golladay + Phu Ngon Hnin

BELLINGHAM BAY

## SITE TOPOGRAPHY



# TIDAL DATUMS

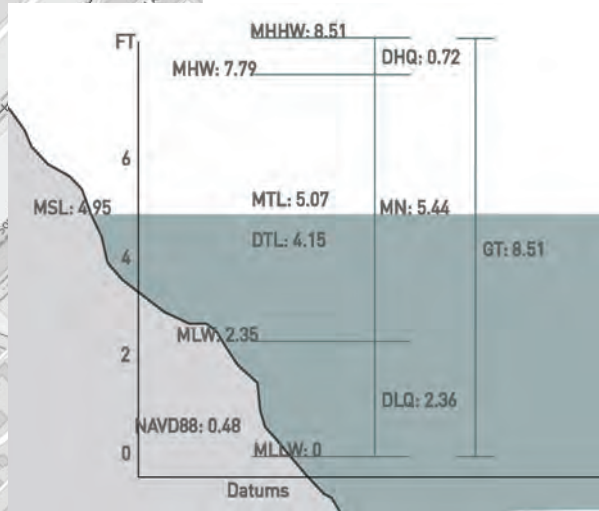


edges that experience tidal change

Mean High Water 7.79ft

Mean Tide Level 5.07ft

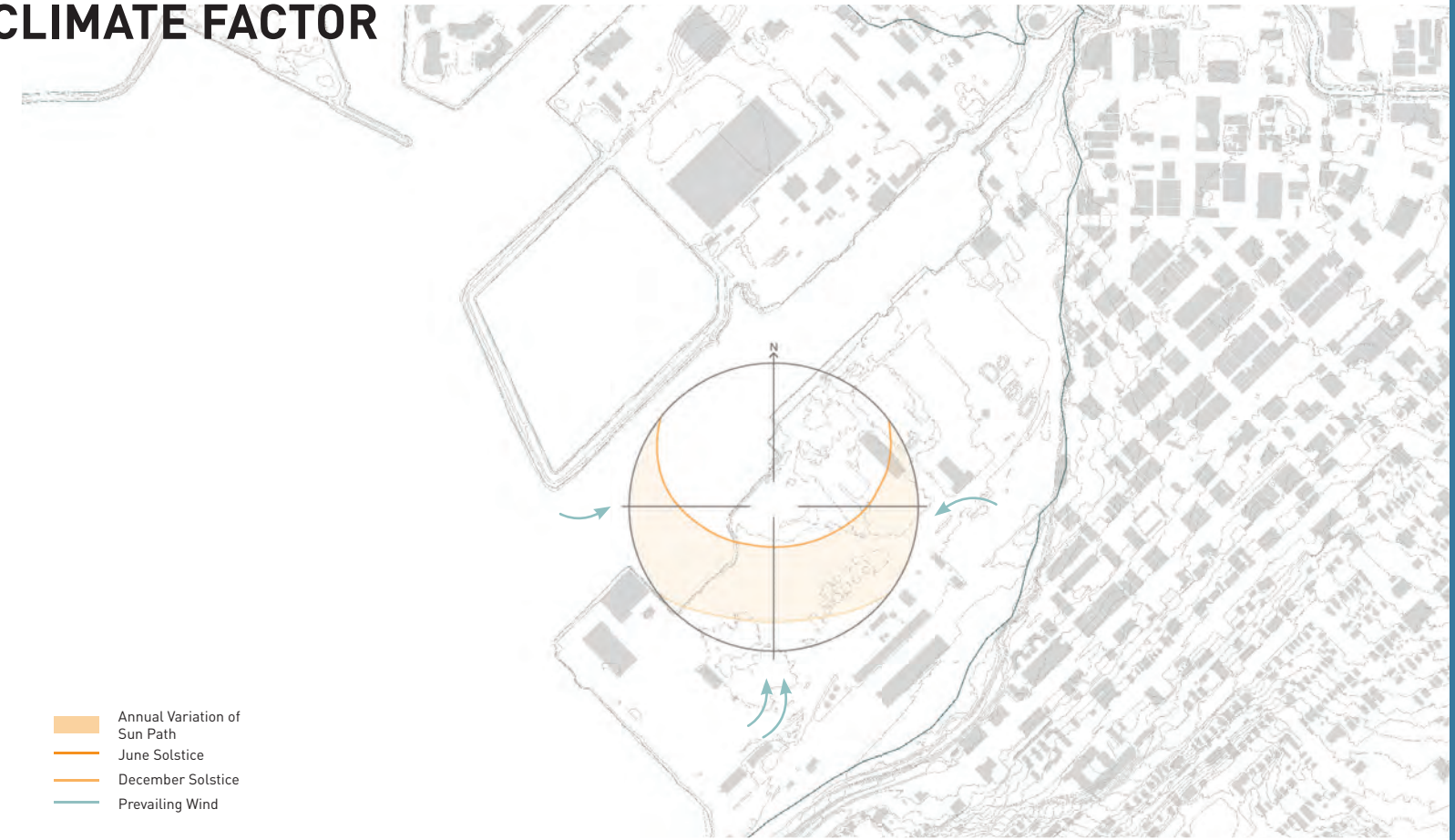
Great Diurnal Range 8.51ft



TIDAL DATUMS: Average tidal datums for Bellingham (National Oceanic and Atmospheric Administration)

BATHYMETRY MAP: Bathymetry map for Waterfont (fishermap.org)

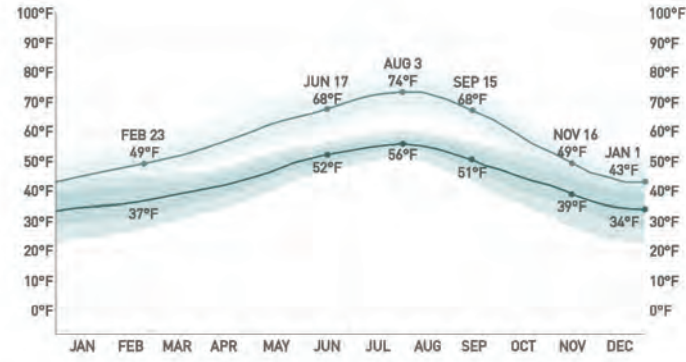
# CLIMATE FACTOR



Bellingham has fairly comfortable and partly cloudy summers and very cold, wet and mostly cloudy winters. The temperature typically varies from 34°F to 74°F and rarely below 23°F or above 82°F. The average hourly wind speed experiences significant seasonal variation over the course of the year. The windiest month of the year in Bellingham is December with an average hourly wind speed of 5.9 miles per hour. The calmest month of the year in Bellingham is August, with an average hourly wind speed of 2.9 miles per hour. The prevailing wind is often from the south from March to April and from August to October. The wind is most often from the west from April to August with a peak percentage of 46% in July. The wind is most often from the east from October to March with a peak percentage of 54%. It is also important to note tidal datums of Bellingham. Based on the number of high and low tides and their relative heights each tidal day, tides are described as semi-diurnal, mixed, or diurnal. The heights of tides are expressed in feet referenced to Mean Lower-Low Water. In average, Bellingham has great diurnal range of 8.51ft, mean tide level of 5.07ft and mean high water of 7.79ft. Increase in tidal movement causes an associated increase in the activity of various marine organisms.

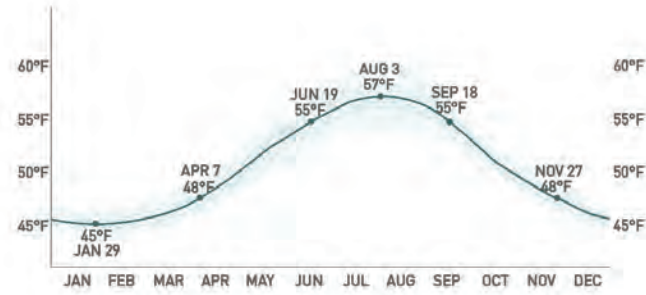
SUN PATH: Sunpath and Wind Direction (Weather Spark, National Oceanic and Atmospheric Administration, GAISMA)

# MICROCLIMATE



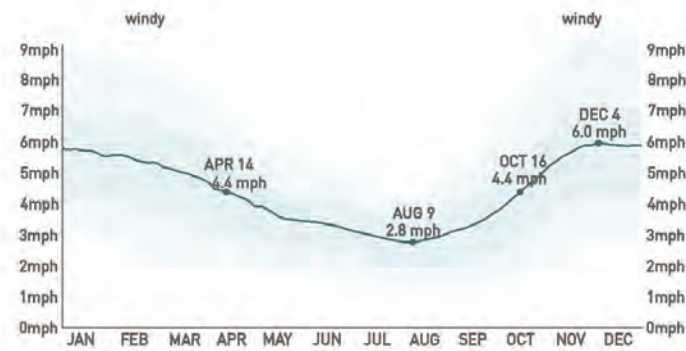
SURFACE TEMPERATURE

Average Highest Temperature: 73°F  
 Average Lowest Temperature: 49°F  
 Average Temperature: 55°F



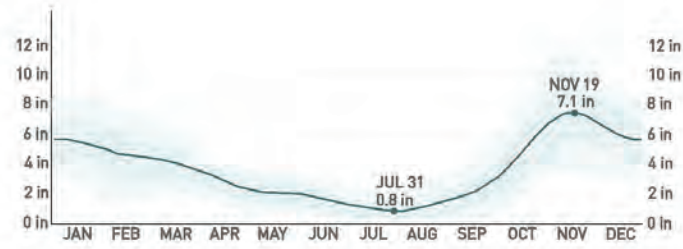
WATER TEMPERATURE

Average Highest Temperature: 55°F  
 Average Lowest Temperature: 45°F  
 Average Temperature: 48°F



WIND SPEED

Maximum Wind Speed: 5.9mph  
 Minimum Wind Speed: 2.9mph  
 Average Wind Speed: 4.4mph

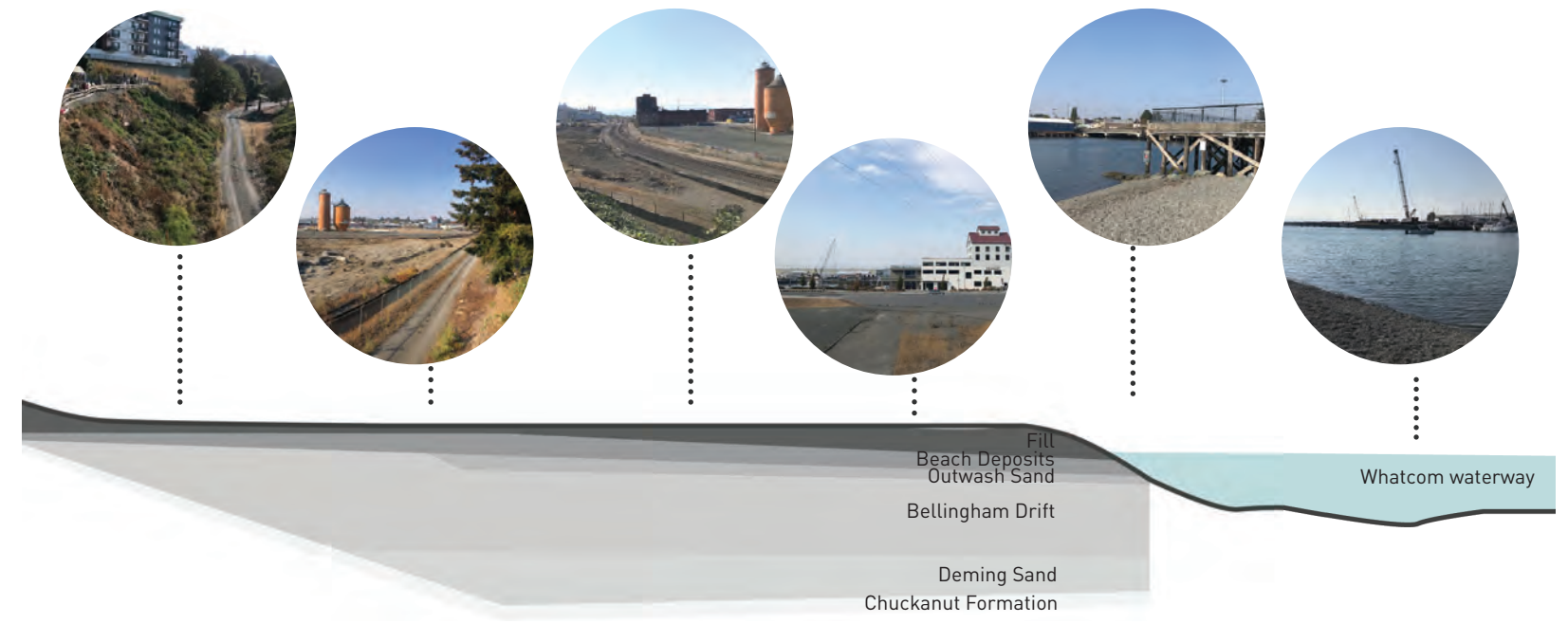


RAINFALL

Maximum Rainfall: 7.3in  
 Minimum Rainfall: 0.9in

WEATHER MAP: Climate and Weather Year Round in Bellingham (Weather Spark)

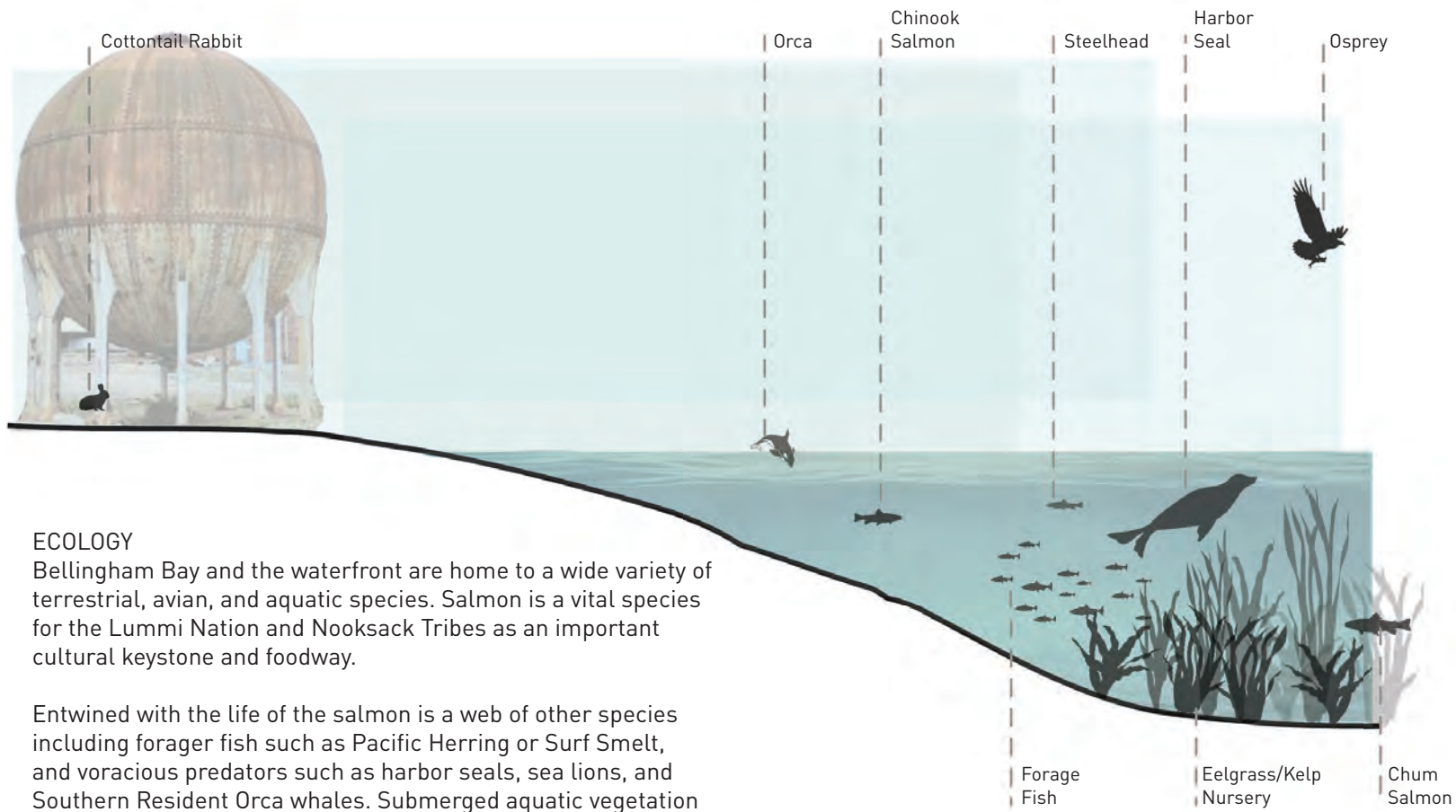
# SOIL CONDITIONS AND NOTABLE GRADE CHANGE



Bellingham's current waterfront, log pond and shipping terminal areas are made up of landforms created by filling tidal flat areas up to elevation of 15 feet over the past century. Filling was accomplished by a variety of methods including silt dredged from the adjacent waterway and conventional land-based filling closer to shore. Before this filling occurred, these tide flats provided food and protection to young salmon as they left nearby rivers and adjusted to salt water in preparation for a journey out to sea.

SOIL CONDITIONS: Waterfront Soil Conditions (Port of Bellingham Geotechnical Survey)

# BIODIVERSITY



## ECOLOGY

Bellingham Bay and the waterfront are home to a wide variety of terrestrial, avian, and aquatic species. Salmon is a vital species for the Lummi Nation and Nooksack Tribes as an important cultural keystone and foodway.

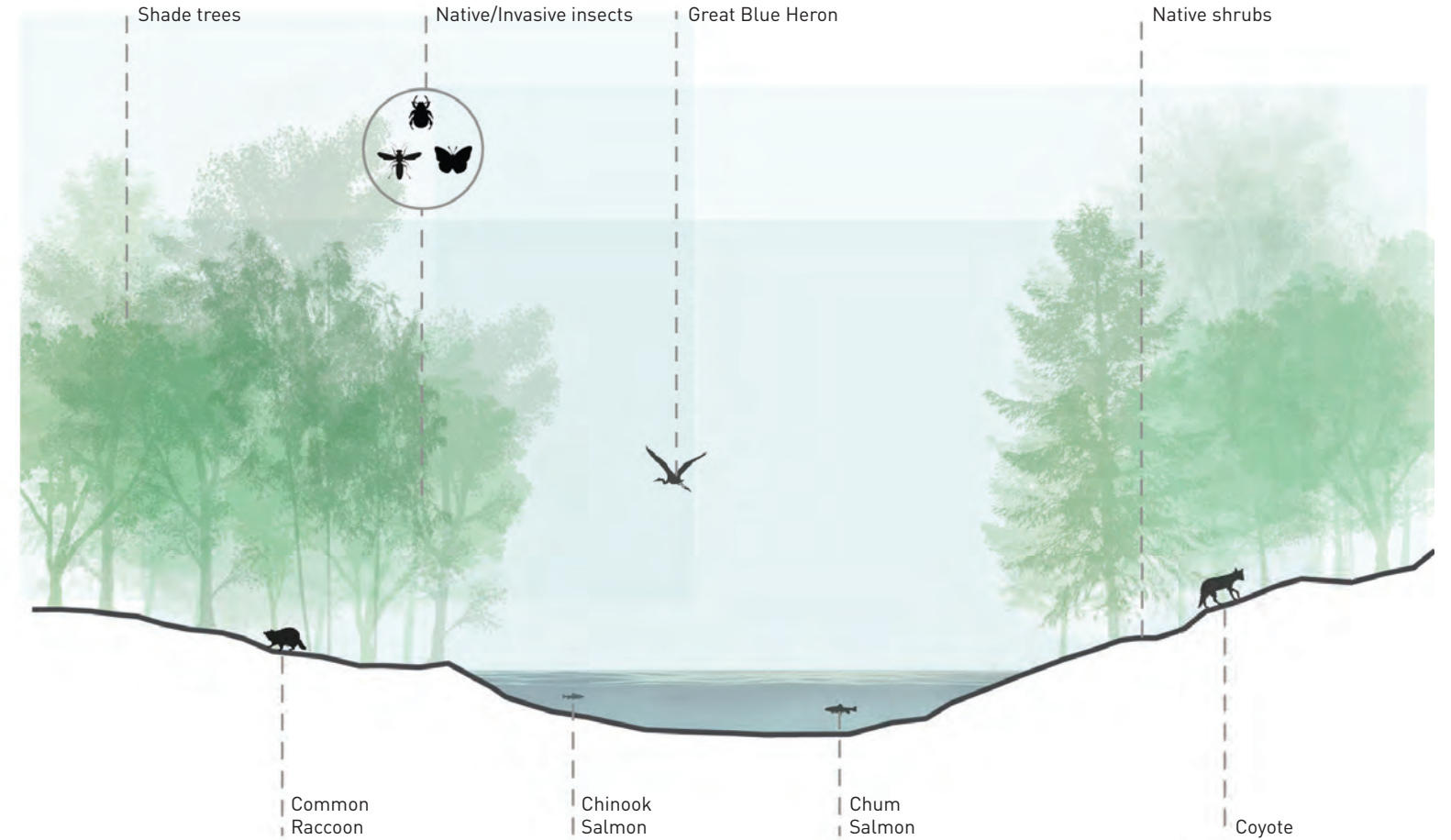
Entwined with the life of the salmon is a web of other species including forager fish such as Pacific Herring or Surf Smelt, and voracious predators such as harbor seals, sea lions, and Southern Resident Orca whales. Submerged aquatic vegetation (SAV), such as eelgrass and kelp, support forager fish and salmon by providing habitat and protection from predators, as well as food for waterfowl.

## TIDE IMPACTS

The waterfront site is a tidal system with high seasonal fluctuation. Typically, in the Pacific Northwest, eelgrass needs water that is at least 3-5m deep to establish. It is a great option for farming because of its ability to osmoregulate against the highly variable conditions of air exposure and salt levels that

occur in the shallow estuarine waters of Bellingham Bay. Additionally, it is a high nutrient flowering plant that can be eaten by humans or used as mulch or fertilizer.

In general, SAV are important components of a healthy and resilient waterfront ecosystem. Low and high tides can both impact the success of these plantings by exposing them to air or limiting light levels, respectively. Therefore, extensive consideration is needed if/when planting these species.



## WHATCOM CREEK: RIPARIAN HABITAT

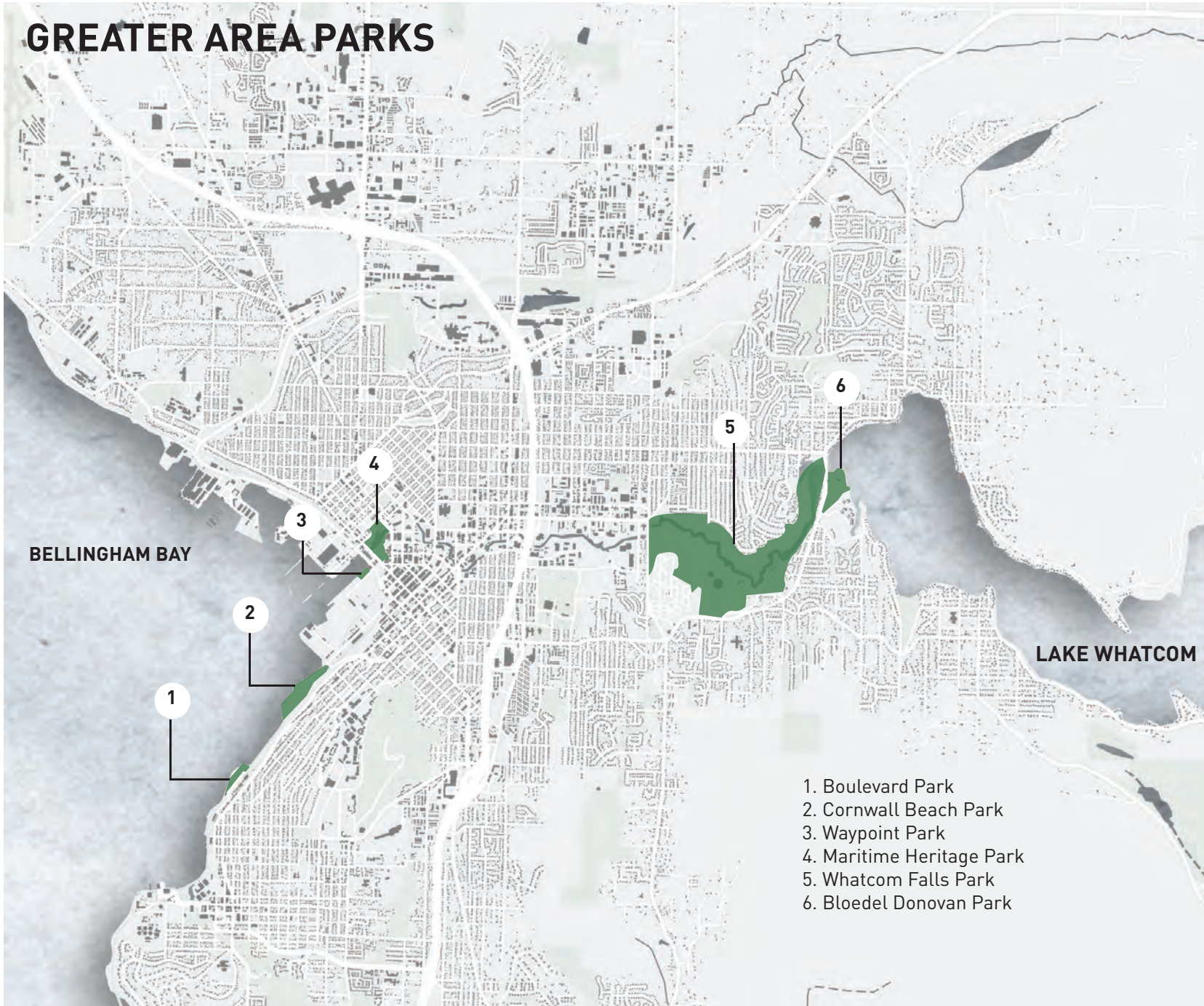
In order to complete their life cycles in freshwater systems like Whatcom Creek, salmon need cool waters with adequate flow and water quality. They need streams with riffle and pool morphology to spawn and a functional riparian zone that is biodiverse, provides shade, stabilizes soil, and encourages ecosystem interactions.

Salmon populations have declined due to various reasons such as overfishing and threats to their upstream passage like dams.

These diagrams are far from exhaustive. The waterfront and Whatcom Creek are home to many more native species of plants and wildlife, and many nonnative insavives as well.

Some nonnative inasvise species include Apple Maggots, Gypsy Moth, Asian Giant Hornet, Southern Green Stink Bug, Lily Leaf Beetle, and several bivalve species among others. Design interventions on site should consider strategies to support native plant and animal species, in and beyond the waterfront, because of how the site serves as a transitional space that connects many systems and species.

## GREATER AREA PARKS



## WATERFRONT PARKS



CURRENT

1. Breakwater Trail
2. Central Avenue Pier
3. Waypoint Park



PLANNED

- |                             |                              |
|-----------------------------|------------------------------|
| 1. I & J Waterway Park      | 6. Whatcom Waterway Park     |
| 2. I & J/ASB Connector      | 7. Log Pond Promenade        |
| 3. ASB/Marina Walkway       | 8. Cornwall Beach Connection |
| 4. Waypoint Park Connection | 9. Cornwall Cove             |
| 5. Bay Street Plaza         | 10. Cornwall Beach Park      |

# WATERFRONT RECREATION



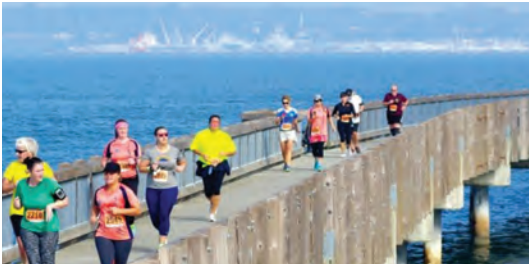
PUMPTRACK: (KGMI/Jim Fix)



SKATEPARK: (Salish Current/Jack Finley)



SEA KAYAK: (Dragonfly Kayak)



RUNNING: (The Dyrt Magazine)



PADDLEBOARDING: (Community Boating Center)



BIKING: (bellingham.org)



WILDLIFE WATCHING: (whales.com)



PLAYGROUND: (cob.org)

## CURRENT ACTIVITIES

The current waterfront site is an ever-lively area that provides a variety of passive and active outdoor recreation. Bellingham's temporary skate park and bicycle pump track provide recreation for the more adventurous while the wildlife observation and yoga studio encourage a slower, more peaceful site interaction. For families with children, Waypoint Park has a dynamic and fun playscape adjacent to the beach. The waterfront is also a popular spot for running, paddle boarding, kayaking, and running!

## APPLICATIONS TO DESIGN

Our section on the environment, topography, and parks aims to ground the waterfront site within larger contexts and processes that go beyond the property boundaries. Since we aim to connect the waterfront and greater Bellingham area, the site expands beyond the immediate surface of what we will eventually propose designs for. The environment, the soil, the topography, as well as the plants and wildlife will all have impacts on the ways humans will gather.

The areas of focus apply to design because there are parameters and efforts that can be made in order to improve ecologies of the site. In our research we consider many aspects of the site's overall ecology: the water systems and connection of the waterfront to Bellingham Bay and Whatcom Creek, the potential to connect the waterfront to other nearby parks, the soil and topography, and finally, the social aspects of the waterfront for eventual human use. The waterfront is a place where life comes together. Supporting plants and wildlife (aquatic and terrestrial) through design can also make the waterfront a desirable place for humans, creating opportunities to reconnect to nature.

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# HEALTH, SAFETY AND HAZARDS

Lauren Corn + Dominique De Gracia

*"The Bellingham Waterfront was a seat of industrial activity for more than 100 years, an era that ended with the closure of the Georgia-Pacific tissue mill in 2007. Industries left behind a legacy of toxic pollutants in the soil... The shoreline was also physically altered by armoring off beaches, dredging up sediment, and filling in parts of the natural shoreline to build on." (RE Sources, n.d.)*

## TECTONIC HISTORY

The Pacific Northwest is susceptible to earthquakes due to the shearing of the Pacific Plate along the western edge of the North American Plate and Cascadia Subduction Zone.

**1891**

Great Northern Railroad Company completed their rail trestle across the mud flats. This allowed for Bellingham to ship and import goods from around America. The railway was the first transportation hazard on site.

**1900 - 1920**

Dredged soil from the Whatcome Creek Waterway was deposited along Bellingham's waterfront. Fill makes up today's waterfront and increases the risk of environmental hazards.

**1920 - TODAY**

The Port of Bellingham was established and pollution increased as industry thrived due to spilled petroleum and waste. Environmental regulations in the 1970s reduced pollution.

**1926 - 1963**

After the Pulp mill opened, toxins from the mill begin contaminating the soil exacerbating the impacts of environmental hazards.

**1963 - 2007**

Georgia Pacific bought and expanded the mill continuing to produce toxic materials on-site until 2007.

**1965 - 2001**

Georgia Pacific expanded their operations by building the Chlor-Alkali facility that operated until 1999.

**1978**

Aerated Stabilization Basin (ASB) functioned as the plant's wastewater treatment system. It is enclosed by an earthen breakwater.

**2007 - 2016**

The Port began cleaning up contamination from the mill.

**2006 - TODAY**

Georgia Pacific sold the waterfront to the Port of Bellingham. Since 2006 the Port has been responsible for clean-up efforts. It continues to work on remediating the Chlor-Alkali plant.

# TRANSPORTATION HAZARDS

## RAILROAD

The Burlington Northern and Santa Fe rail line carries crude oil, including Bakken crude oil and tar sands oil, as well as coal (Lavelle 2021). Crude oil is brought in from British Columbia, Alberta, and North Dakota to oil refineries in the Bellingham periphery, such as BP's Cherry Point Refinery (Lavelle 2021). Derailment is a serious threat to the site and could result in fire, death, and contamination of surrounding soil and water, particularly if carrying crude oil.

At the site scale, the railroad runs across the southeastern edge, on average 15 times per day. The trail used its horn to alert pedestrians throughout the site. In addition, the freight truck route, along Cornwall Ave adds additional noise to the site (site visit interviews Oct 8, 2021). Train locomotives are responsible for PM2.5 and other exhaust emissions. Initiatives to improve locomotive exhaust include Tier 4 locomotives, which achieve over 90% reductions in NOx and PM2.5 compared to unregulated locomotives (Tier 0) prior to 2000 (CARB 2020; TERC). BNSF has yet to upgrade to Tier 4 (2015

-present) locomotives on the railroad running through Bellingham, thus relying on Tier 1-3 which have significantly worse emissions (Zumwalt 2021).

## CORNWALL ROADWAY

The truck route runs along the east side of the site. The roadway is heavily used by both large construction vehicles and vehicles of residents. This is the major roadway to the site from the east side of the site accessing the Bellingham Shipping Terminal.

## HEALTH IMPACTS

Diesel trucks emit a variety of pollutants that are harmful to human and environmental health. Fine particulate matter (PM2.5), nitrogen oxides (NOx), black carbon contributes to the Greenhouse Gas Effect, and are also known to irritate human lungs (EPA). Diesel emissions are linked to cases of asthma, lung disease, and cardiovascular illnesses, particularly for communities living in close proximity to diesel pollution (Schulte et al 2013).

The 110-decibel level train horn exceeds the CDC recommended noise exposure of >75 decibels. At this level and frequency repeated exposure cause hearing loss, along with physical and emotional stress. Noise over 75 decibels disrupts sleep and hormone regulation, impacts early childhood development, and makes the area intolerable for individuals with sound sensitivity. There is limited research on the impact of train horns on wildlife. However, biologists have hypothesized that train horns have the highest likelihood of impacting bird populations by causing stress, hearing damage, and audio masking.

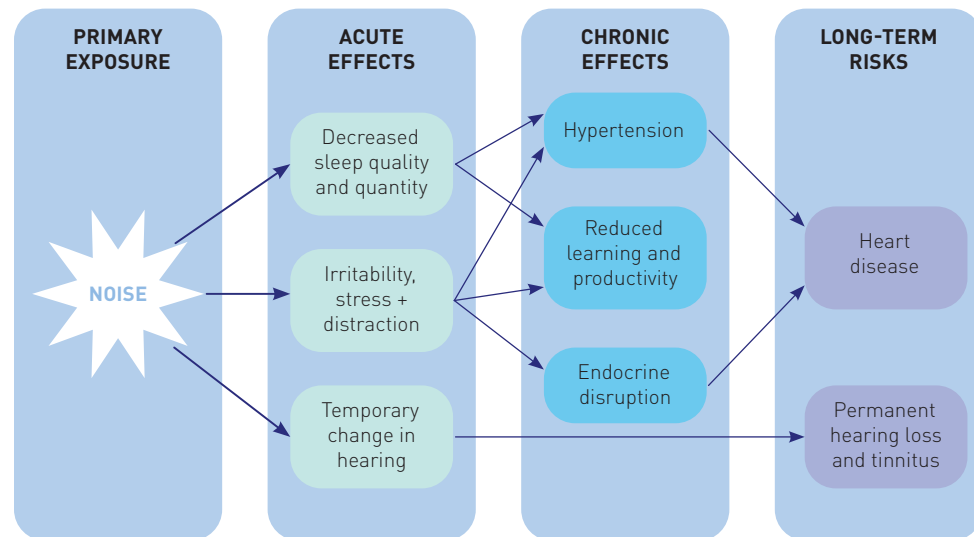
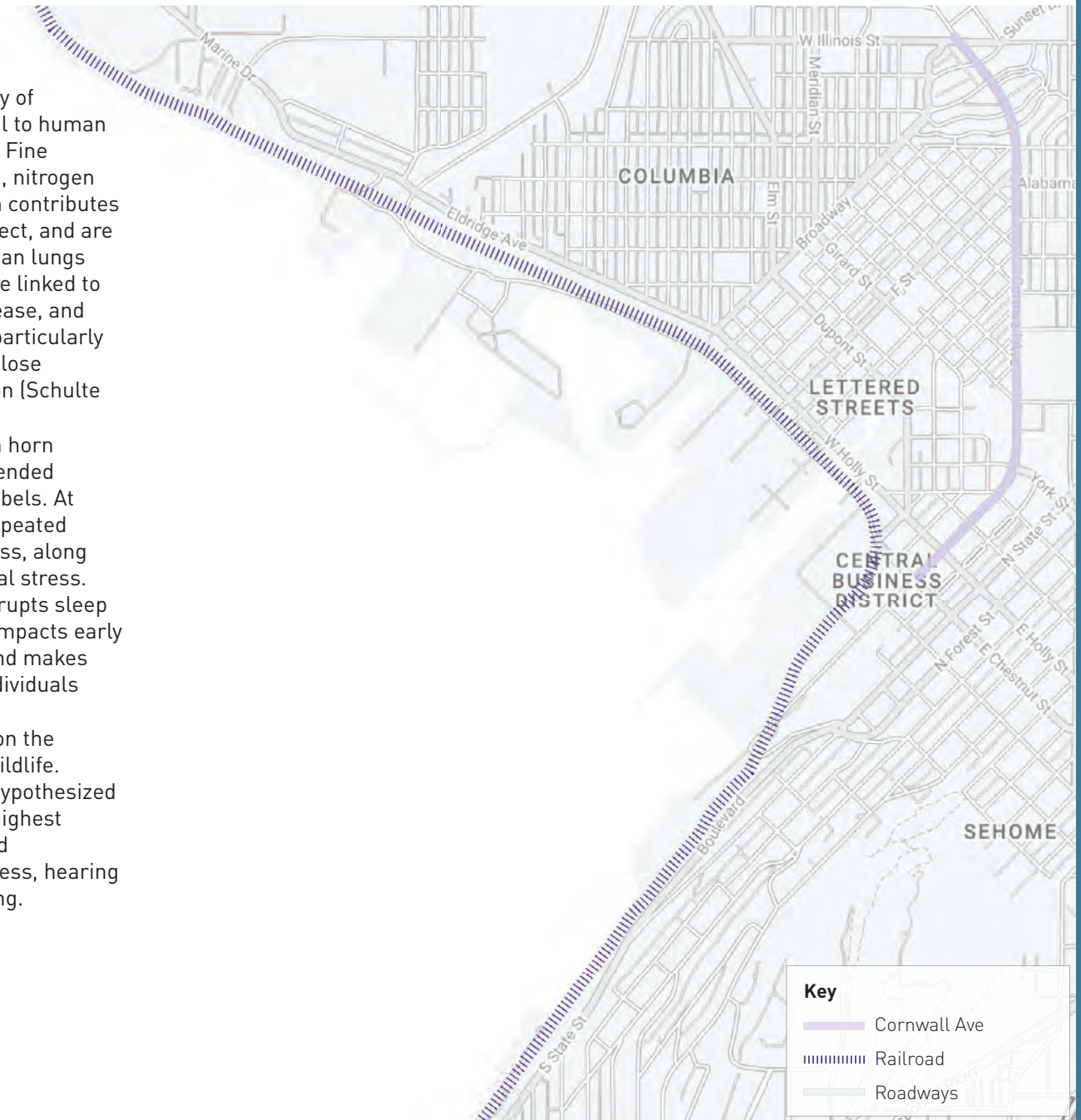


FIGURE 1: How noise impacts health



IMAGE 1: Oil car train derailment by Elaine Thompson

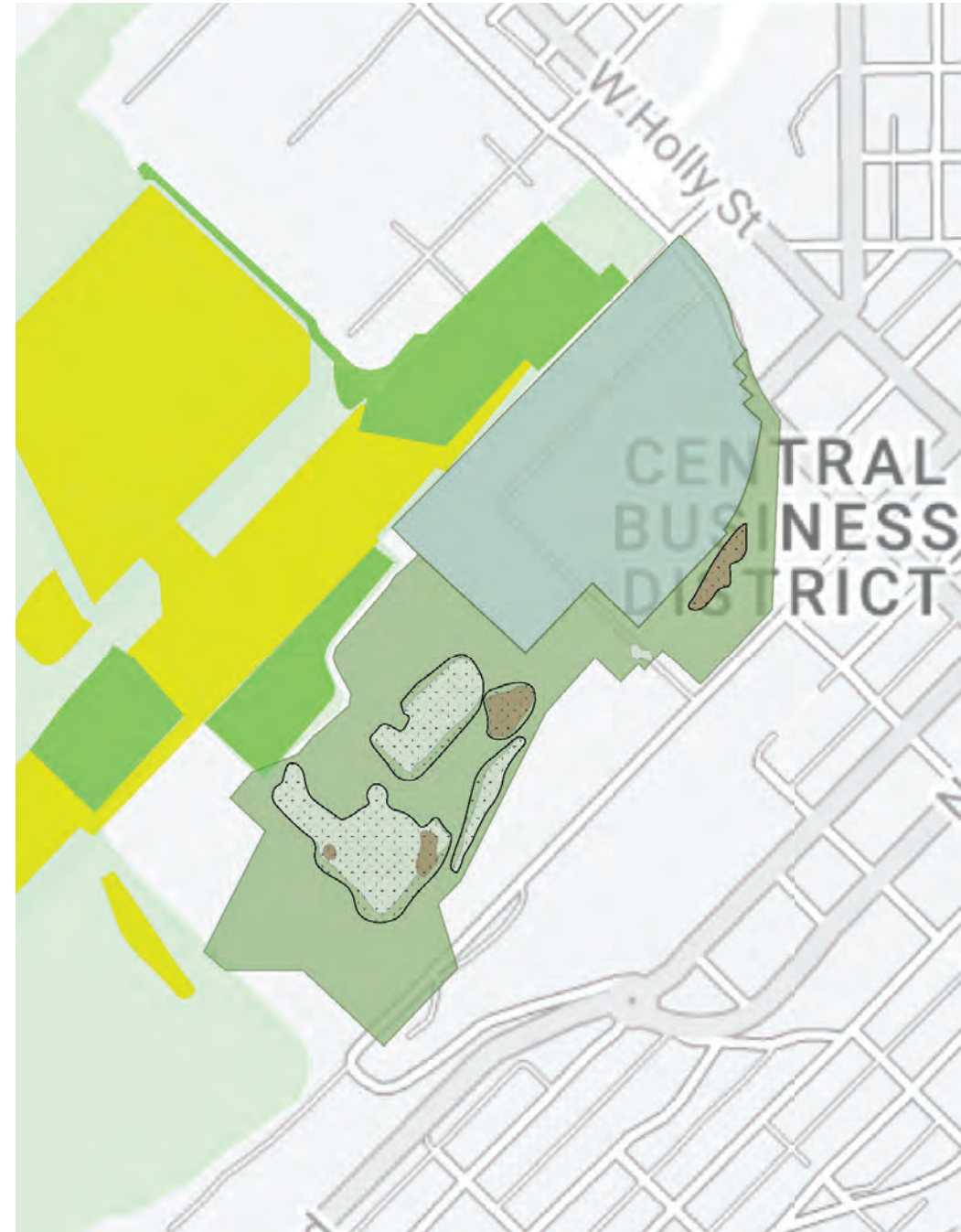




# INDUSTRIAL HAZARDS

## CHLOR-ALKALI AND PAPER & PULP MILL

Georgia-Pacific West held the 74-acre site located at 300 West Laurel Street, along Bellingham Bay and Whatcom Waterway. Between 1926 and 2007 a pulp and tissue mill operated. In 2005, the port acquired the property from the George Pacific Corporation. The chloralkali process involves the electrolysis of sodium chloride solution to produce chlorine and sodium hydroxide used at the mill. Facilities involved in this process were found on the western half of the site. After an environmental investigation into the property in 2013, it was found that both the mill site and the Chlor-Alkali Area contained high levels of contaminants. Remediation of the Pulp and Tissue site concluded in 2016. Today, the Chlor-Alkali area contains high levels of mercury, low pH, polycyclic aromatic hydrocarbons (PAHs), and petroleum hydrocarbons. Capping is the dominate strategy for remediating this area (WSDP, 2020).



## HEALTH IMPACT

The pollutants found in the Chlor-Alkali Area have serious health hazards to humans, animals, and plants. In humans and animals, exposure to high levels of mercury causes serious neurological conditions. High levels of mercury in the soil are toxic to most plants and can suppress growth or kill the plant. Highly alkaline soils reduce micronutrients in soils hurting plant development. If rainfall washes these soils into the waterways it will wash low pH sediments into the bay resulting in the dissolution of shells and skeletons made from calcium carbonate. Polycyclic aromatic hydrocarbons are toxic to both human and animal life. Plant transpiration, respiration, and photosynthetic rates are negatively affected by hydrocarbon pollution. Petroleum hydrocarbons cause serious problems to the central nervous system (ATSDR, 2022).

## REMEDIATION PLANS FOR INDUSTRIAL HAZARDS

**Cleanup Action Plan:** Conducted in 2017, the action plan describes the cleanup work to address contamination at the Chlor-Alkali Area of the Site. This process includes soil removal, consolidation, and capping in order to prevent contaminated runoff, prevent contact with contaminants, reduce erosion, removal of underground objects, remove 7,000 cubic yards of mercury and petroleum-contaminated soils, and neutralize low pH levels (WSDE, 2022).

**Agreed Order Amendment:** The legal agreement between the Department of Ecology of the State of Washington and the Port of Bellingham requires the design of the work described in the cleanup plan (WSDE, 2022).

**Model Toxins Control Act:** Washington's environmental cleanup law that funds and directs investigation, cleanup, and prevention of sites that are contaminated. (WSDE, 2022)

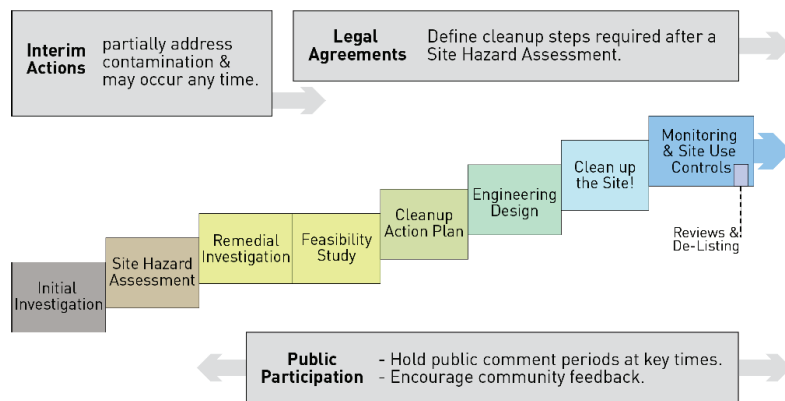


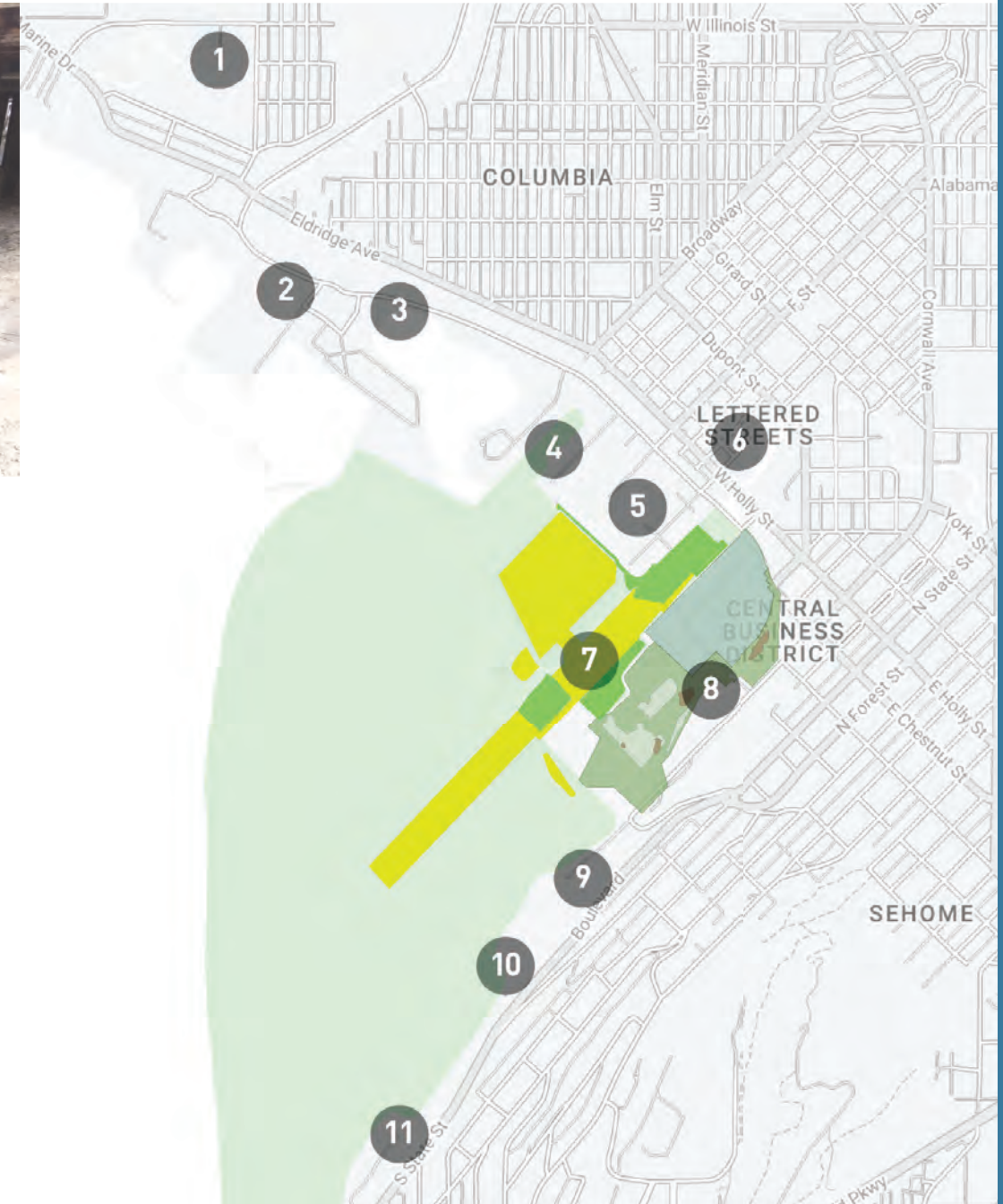
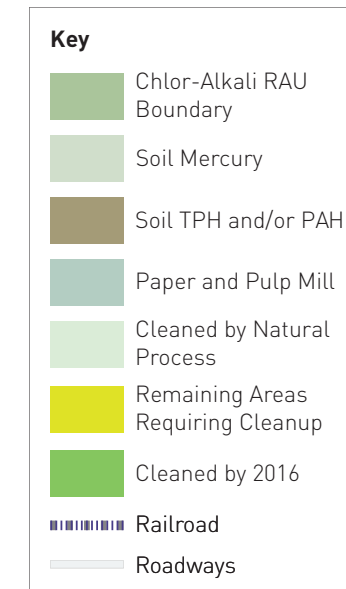
FIGURE 2: Adapted from the Formal Clean up Process by the WA Department of Ecology

CLEANUP SITE INFORMATION	
1	<b>Eldridge Municipal Landfill</b> Contaminated soil due to former municipal landfilling activities.
2	<b>Weldcraft Steel &amp; Marine</b> Contaminated soil, sediment, and groundwater associated with former shipyard practices.
3	<b>Marine Services NW</b> Contaminated sediment associated with past boatyard practices.
4	<b>I &amp; J Waterway</b> Contaminated sediment associated with former industrial practices.
5	<b>Central Waterfront</b> Contaminated soil and groundwater associated with former municipal landfilling and industrial activities.
6	<b>Holly Street Landfill</b> Contaminated soil due to former municipal landfilling activities.
7	<b>Whatcom Waterway</b> Contaminated sediment associated with past pulping operations.
8	<b>Georgia Pacific West</b> Contaminated soil and groundwater associated with former industrial operations.
9	<b>R.G. Haley</b> Contaminated soil, groundwater, and sediment associated with former wood treatment facility.
10	<b>Cornwall Avenue Landfill</b> Contaminated soil, groundwater, and sediment associated with past municipal landfilling activities.
11	<b>South State St. Manufactured Gas Plant</b> Contaminated soil, groundwater, and sediment associated with a former gas manufacturing facility.

FIGURE 3: Cleanup Site Information from the 2021 Cleanup Update by the Department of Ecology, State of Washington



IMAGE 2: Eelgrass harvesting for cleanup, by WA Department of Ecology



# HAZARDS RESULTING FROM CLIMATE CHANGE

## RISING TEMPERATURES

Scientists project that western Washington summers will become increasingly warmer and with fewer rain showers. Winters will also increase in temperature resulting in more rain and less snow. Lake Whatcom, the water supply source for Bellingham will be negatively impacted by climate change. This puts in question the future of the water supply for western Washington and Bellingham.

Increasing summer droughts result in an increased likelihood of prolonged fire season. Wildfires in excess of natural rhythms can cause erosion, warm water temperature, increase stormwater runoff, and destroy historic forests. Globally, changing temperatures can

impact storm surge levels potentially washing toxic material into the Bay. See impacts of sea level rise for more info.

## HEALTH HAZARD

Prolonged heat waves will cause significant loss of life by humans, animals, and plants that are not equipped for these changing temperatures. Human injury and death might result from long periods of heat waves as many residents do not have adequate air conditioning units. Other health impacts for humans include respiratory illness, increased water-borne diseases and food-borne diseases, zoonoses, and non-communicable diseases. This could overwhelm the current standards of care at PeaceHealth St. Joseph Medical

Center in Bellingham. (WHO, 2018) Warmer winters have detrimental effects on fish and salmon populations. Salmon rely on timely, abundant, cold, and clean water to spawn. Projections indicate increased fall and winter flooding and peak flows shifting earlier into the spring. Low flows during salmon migration result in warmer water that holds less oxygen and if the water continues to warm it will exceed tolerable limits for ocean fish. Warmer temperatures will likely increase wildfires. Wildfires, which play important ecological roles for our forests, will occur at levels that could cause serious health risks from PM2.5 and incinerated chemicals from burned built environment materials and forests (Public Health Insider, 2021).



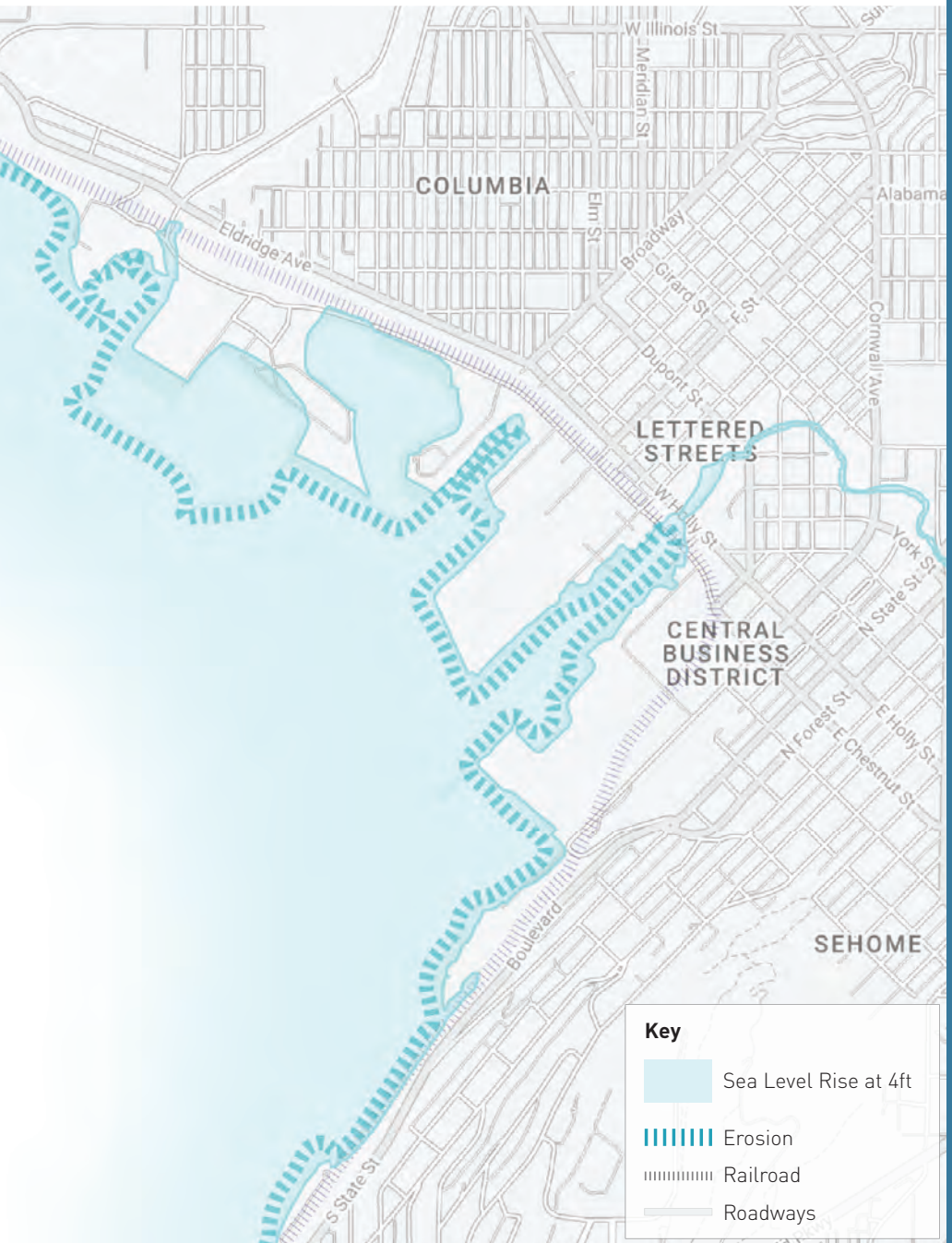
FIGURE 4: Section of projected sea level rise impacts on the Waterfront District, informed by the Bellingham Waterfront District Sub-Area Plan 2019

## SEA LEVEL RISE

The Bellingham Waterfront Sub-Area Plan projects sea level rise by 2100 will be 15 inches to 50 inches above today's high water mark (City of Bellingham, 2019). From site visits on Oct 8, 2021, our class heard that the City is currently planning for 4.5 feet of sea level rise, which is consistent with the predictions from the University of Washington Climate Impacts Group's relative sea level rise projection tool (Climate Impacts Group "Sea Level Rise Visualization"). The reality of sea level rise along the Bellingham Waterfront District poses serious concerns for the future of development on the site, as the majority of the site is between 15 - 20 feet above sea level. This means that, especially with the uncertainty of climate change and compounded effects from more severe and frequent winter storms, areas of the site may become completely and/or occasionally underwater depending on the daily tides, sea level rise, and storms.

## HEALTH IMPACT

While no one currently lives on the site, sea level rise will impact current conditions and potential future residents. While current predictions estimate that sea level rise will range between 3-4 feet, some models show that the ocean could raise as much as five feet in the pacific northwest. Flooding of this area could hurt future residents. Additionally, floods will harm the ecology of the bay astoxins on site will flow into the ocean.



**Key**

- Sea Level Rise at 4ft
- Erosion
- Railroad
- Roadways

# SEISMIC AND SECONDARY HAZARDS

## EARTHQUAKE

While Bellingham is far enough from the majority of the fault lines to be at risk of immediate earthquake damage, damage from secondary hazards poses a risk to the site.

## TSUNAMI

Following an earthquake, coastal regions are at risk of being inundated by tsunamis that can cause major destruction to low-lying areas. While the majority of Bellingham is built on a raised bluff and outside of the inundation zone, the artificial fill along the waterfront is within range of a large wave. Fortunately, Bellingham is buffered by a series of coastal islands that would slow a large tsunami and provide up to two hours of notice before landfall. In this situation, it would be important to provide clear and legible evacuation routes from the waterfront, particularly if residential buildings are proposed for the site.

## LIQUEFACTION

The artificial soil fill that makes up the majority of the waterfront puts the site at increased risk of liquefaction. Liquefaction causes soil particles to shake loose and groundwater to rise to the surface, causing harm to people, buildings, and infrastructure.

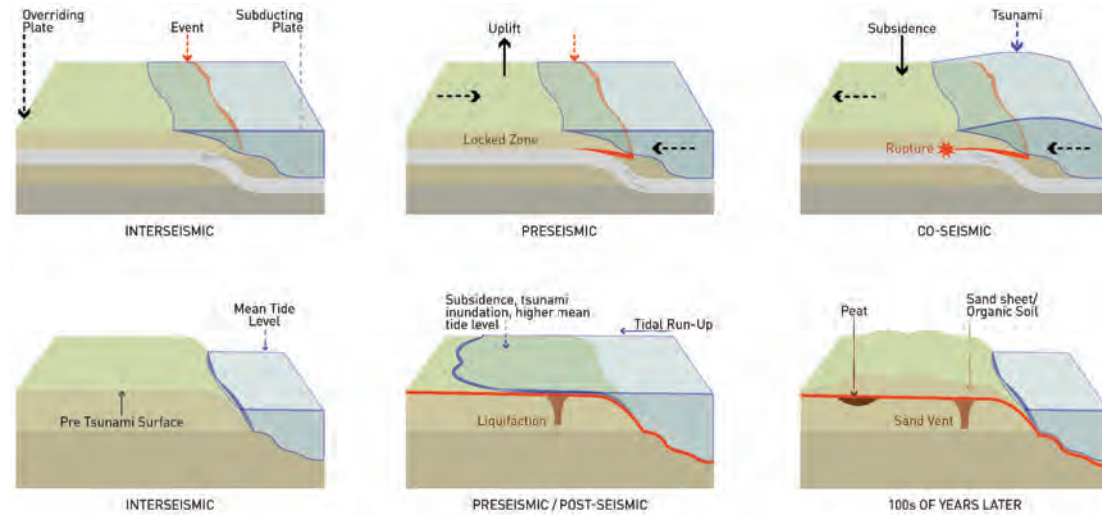


FIGURE 5: Seismic hazard diagrams and different stages of seismic event, adapted from AGU's schematic seismic representation diagrams

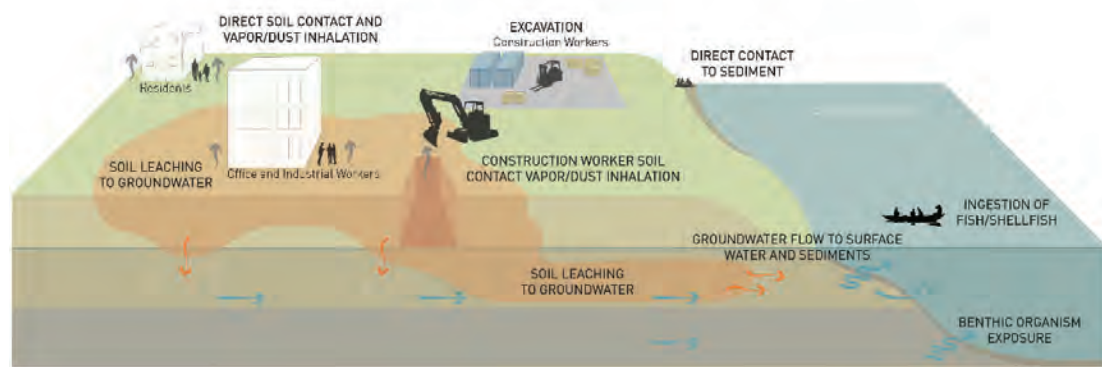
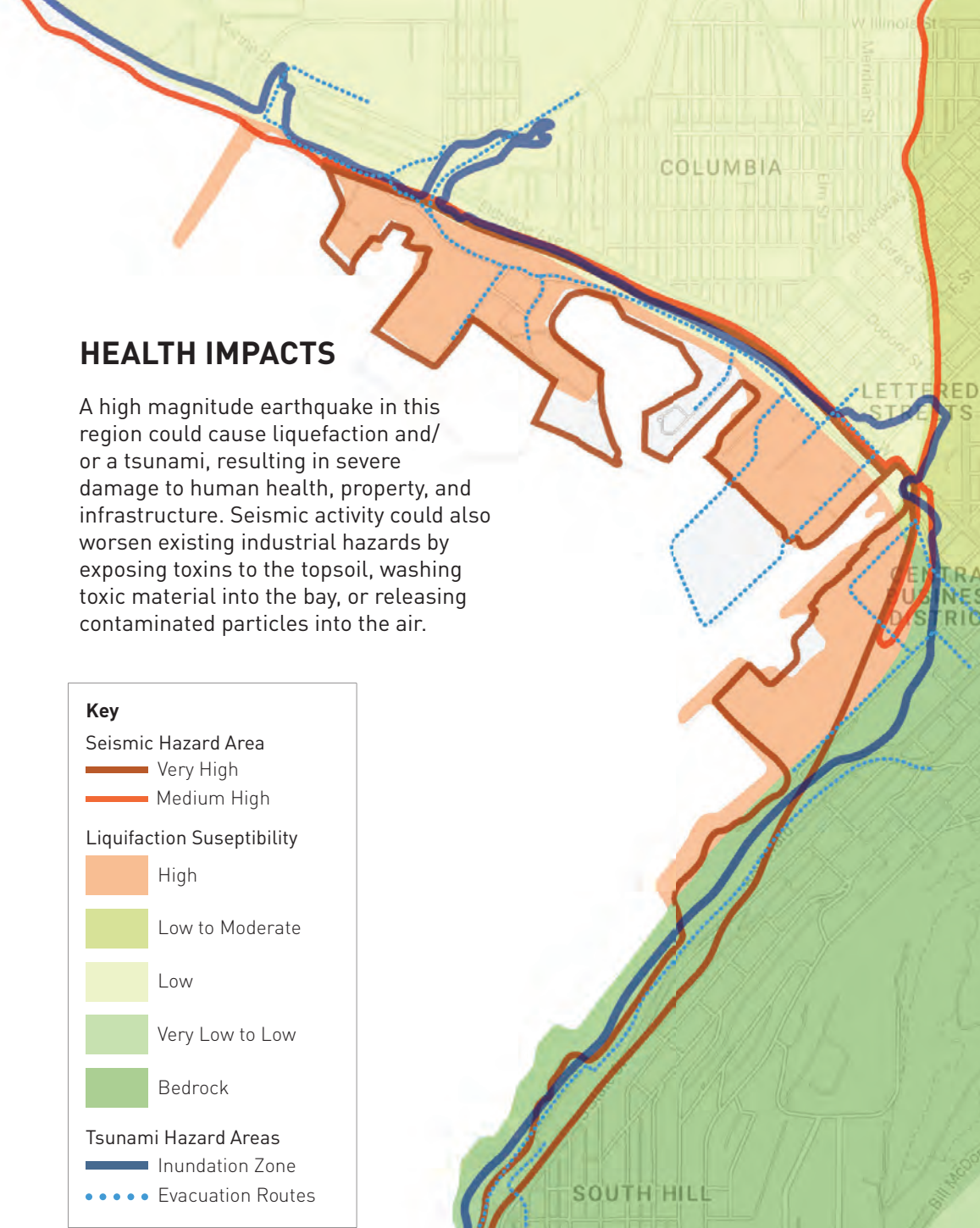
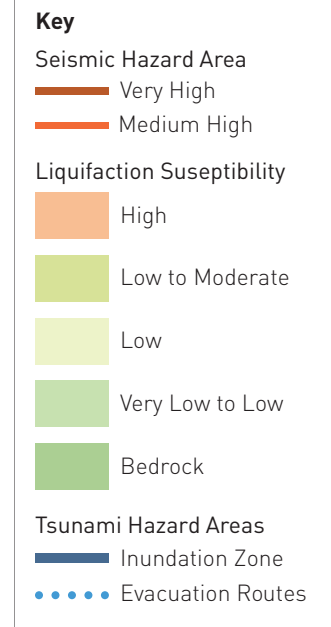


FIGURE 6: Potential contaminant exposure diagram, adapted from the WA Department of Ecology Conceptual Site Model by Aspect Consulting

## HEALTH IMPACTS

A high magnitude earthquake in this region could cause liquefaction and/or a tsunami, resulting in severe damage to human health, property, and infrastructure. Seismic activity could also worsen existing industrial hazards by exposing toxins to the topsoil, washing toxic material into the bay, or releasing contaminated particles into the air.



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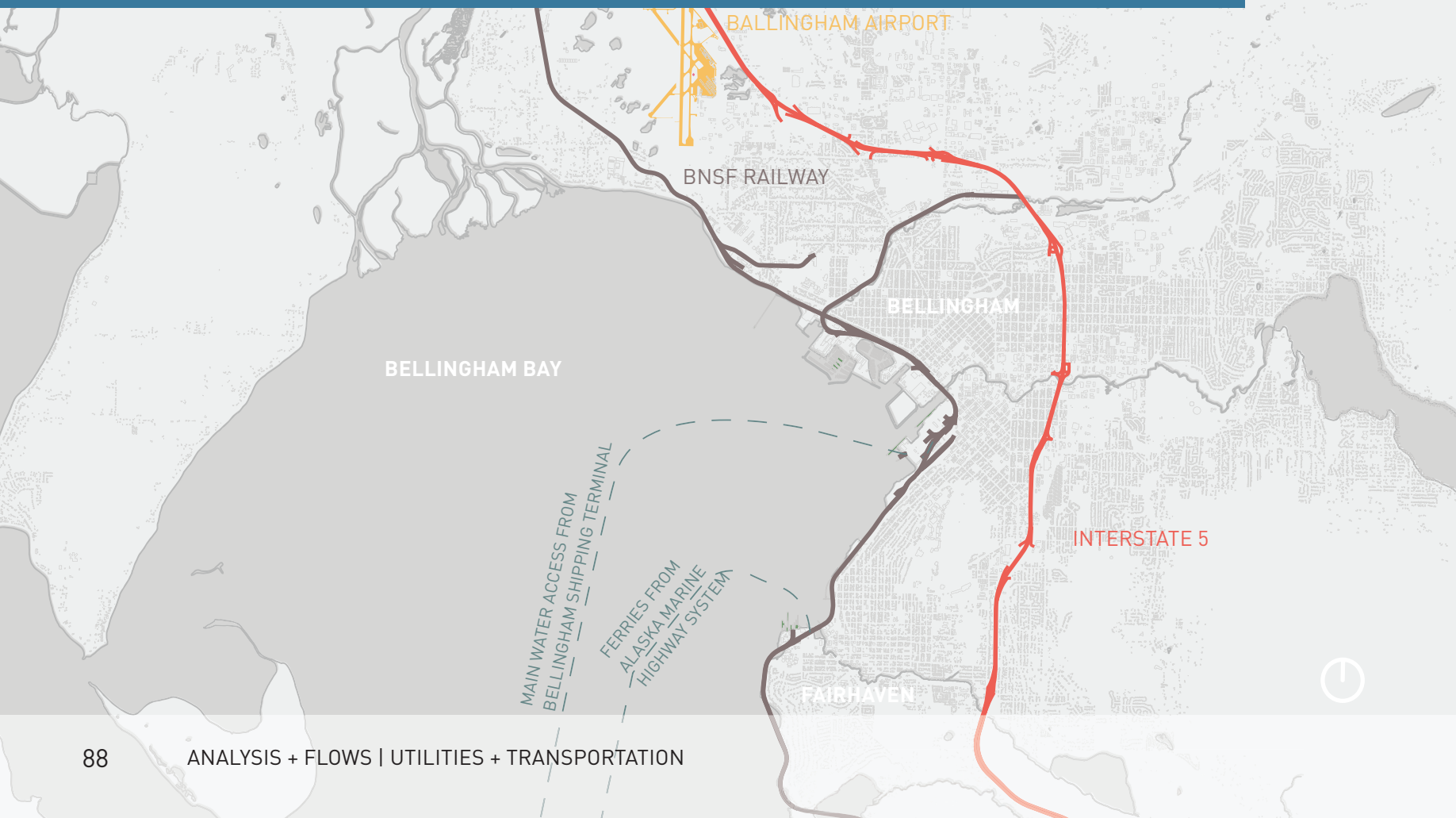
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# UTILITIES AND TRANSPORTATION

Arundhatee Sarvaiya + Yen-Chia Pan + Yi-Lin Khor



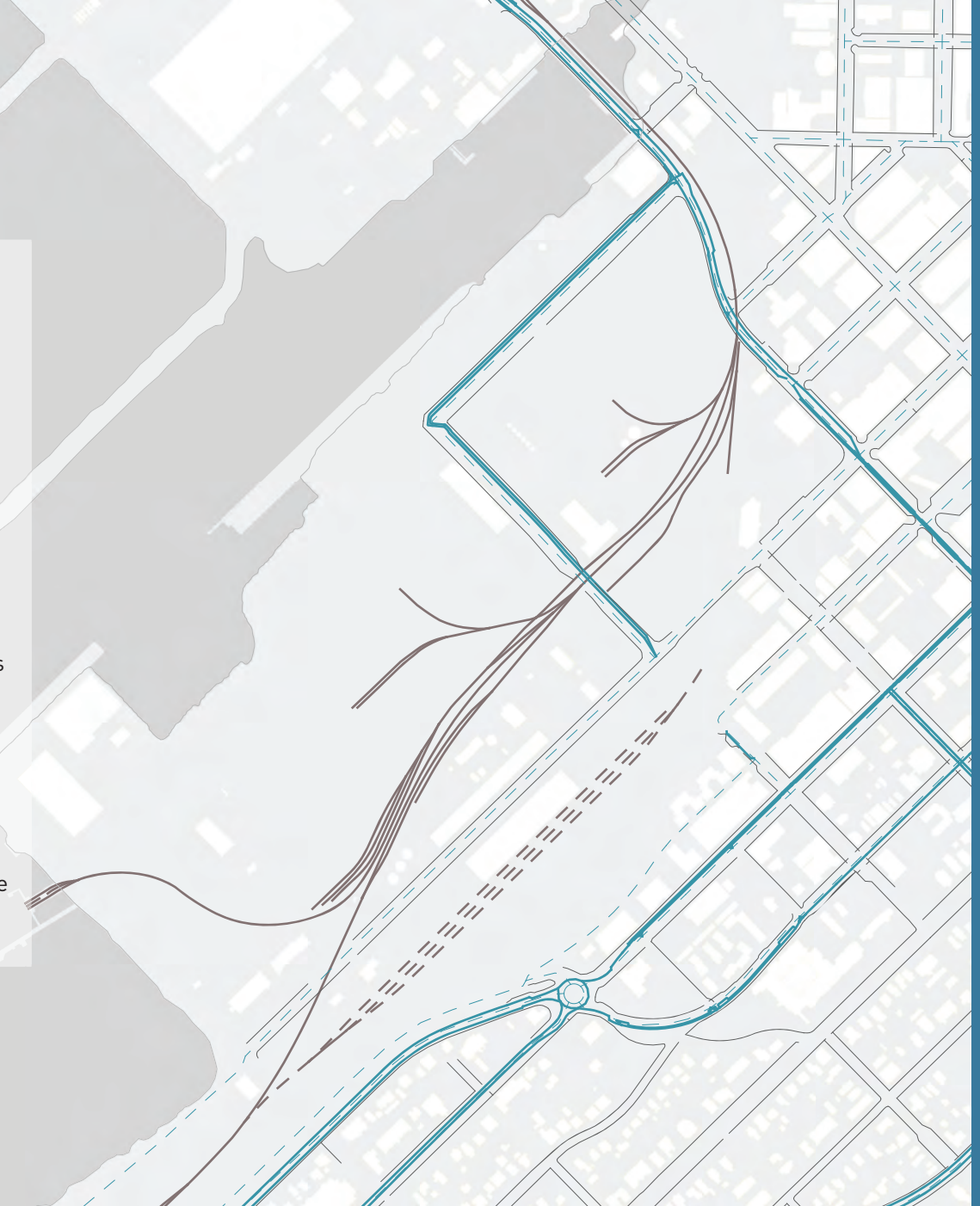
## TRANSPORTATION

Certain conditions of the site including topography, industrial access, and the active railway pose unique circulation challenges to the future development of the Bellingham Waterfront District. Currently, the site has three formally constructed roads: Granary Ave, W Laurel St, and Cornwall Ave. Proposed streets in the 2019 Sub Area Plan intend to link Bellingham's downtown to the new development and provide safe and accessible infrastructure for pedestrians and bikers.

While automobile access is necessary for those traveling from across the city, building designs will need to integrate parking within and underneath the structures, mostly on sites off of the shoreline to promote walkability near the water's edge.

- EXISTING RAILROADS
- - - PROPOSED RAILROADS
- EXISTING BIKE LANES
- - - PROPOSED BIKE LANES

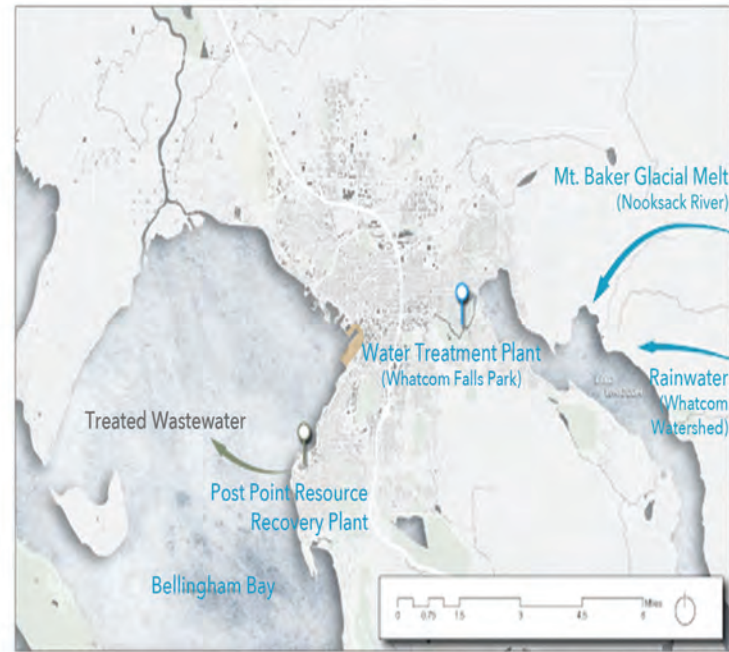
SITE TRANSPORTATION DIAGRAM: The railroads and bike lanes within the site.



# WATER SYSTEMS

Lake Whatcom water reservoir currently provides around ten million gallons of water per day for municipal use and far less for industrial uses following the closing of the Georgia Pacific paper mill. It was treated at the filtration plant near Whatcom Creek downstream of the lake outlet earlier.

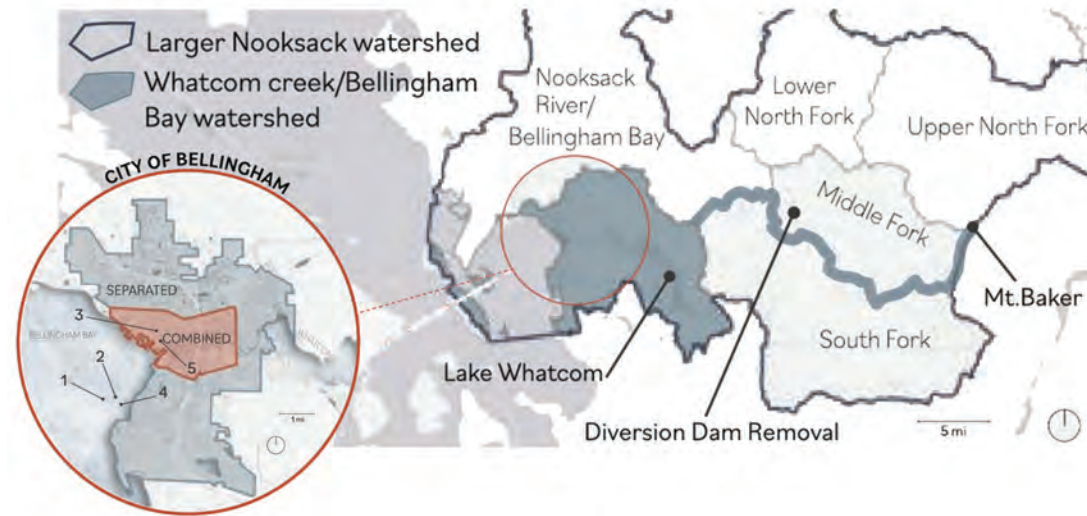
In 1974, Bellingham replaced the Whatcom Creek treatment plant with the Post Point Resource Recovery Plant at 200 McKenzie Avenue. This plant now provides primary treatment and the treated effluent is then discharged into Bellingham Bay.



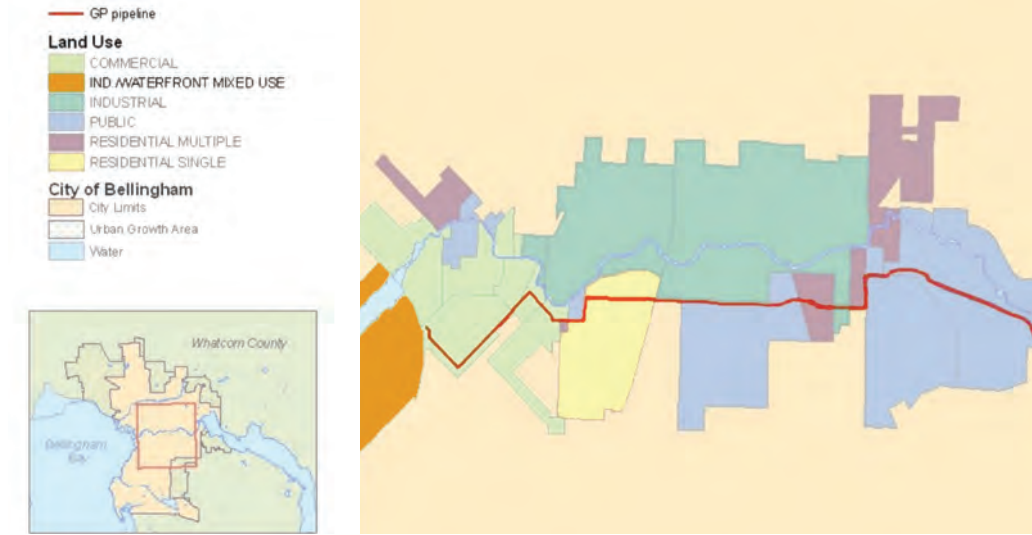
WATER CIRCULATION FOR BELLINGHAM (Scan Design 2021)

# WATER SOURCES

Bellingham is situated in the Whatcom creek/ Frontal Bellingham Bay watershed within the larger Nooksack watershed. Bellingham sources its drinking water from lake Whatcom via a 1,200 ft wooden gravity fed pipe. From the 1960s-2020 water would periodically be diverted to Lake Whatcom via a dam in Deming. The Lummi Nation and the Nooksack Indian Tribe led the fight for dam removal and prevailed, opening up 16 miles of critical salmon habitat.



WHATCOM CREEK WATERSHED



RAW WATER PIPELINE AND ZONING IN VICINITY OF SITE (Jena Christiansen, Western Washington University)



RAW WATER PIPELINES ON SITE (Jena Christiansen, Western Washington University)Associates)

# RAW WATER

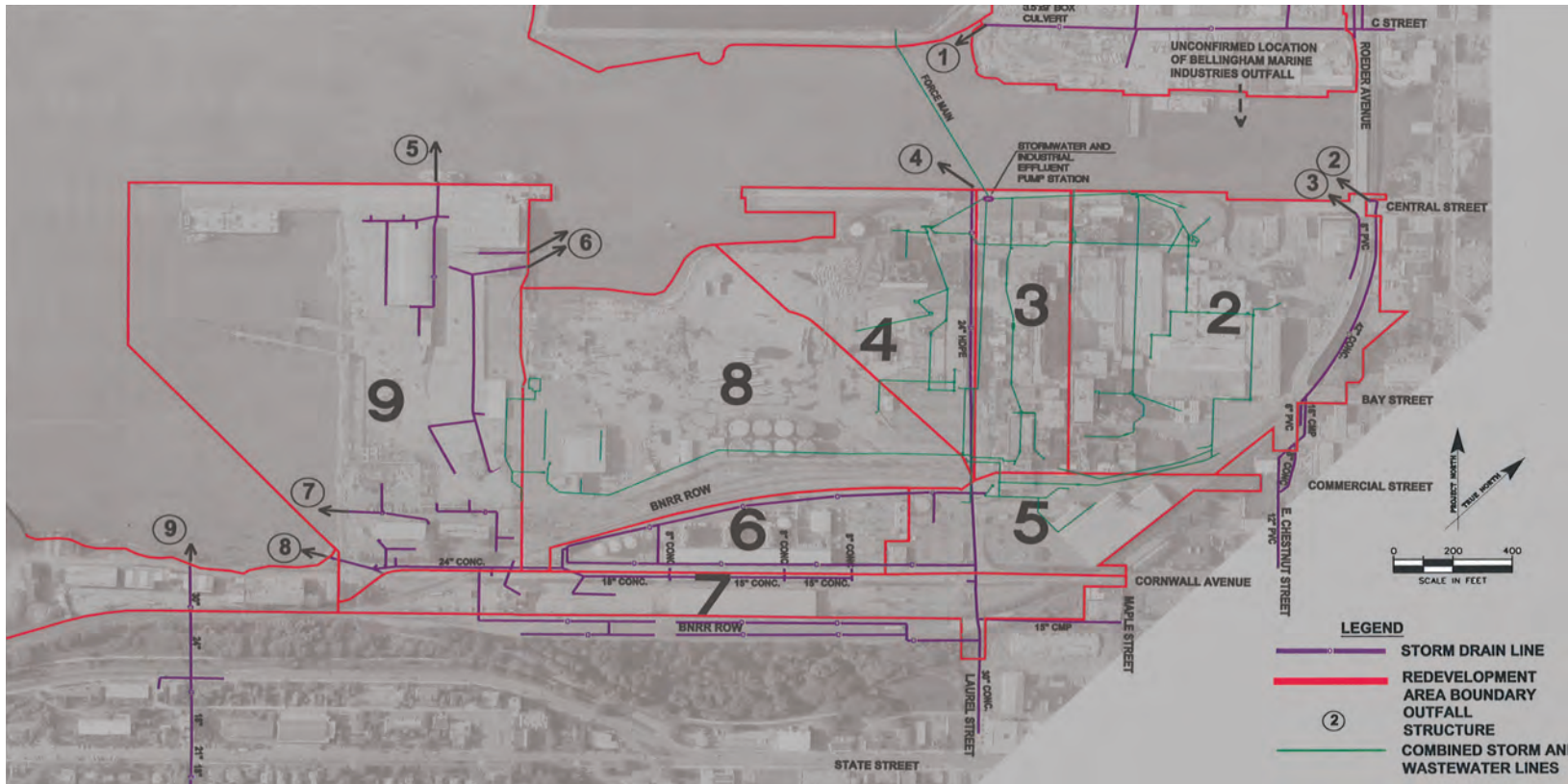
The water supplied to the former Georgia Pacific pipeline is currently not treated; it is passed through a screen room for removal of debris and flooded down the pipeline. Georgia Pacific required that the water be chlorinated at this stage but that chemical treatment is no longer practiced. The pipeline will need to be cleaned prior to turbine startup using a mechanical technique to clear algae buildup currently obstructing the pipe.

District water systems utilize district-scale infrastructure to provide non-potable water to multiple buildings thereby reducing the amount of potable water use consumed by the district. Non-potable water could be supplied from Lake Whatcom via existing industrial water conduits that were previously used to serve the GP facility with a hydraulic capacity of 50 million gallons of water per day. Wastewater reuse systems significantly reduce water usage by using advanced treatment to recycle water to support landscape features, toilet flushing, and other building operations.

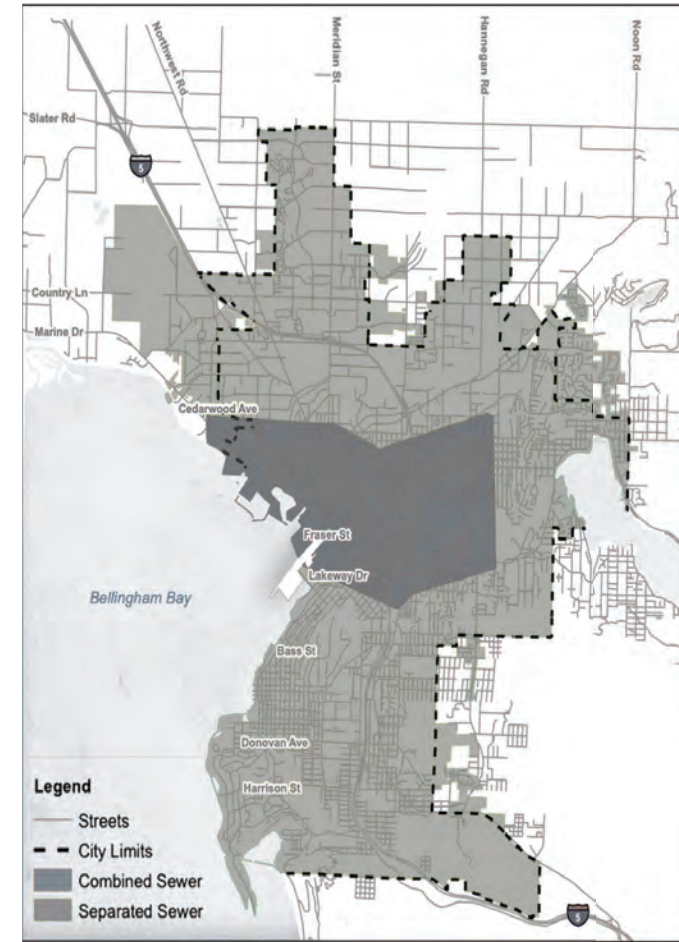
## WASTEWATER & STORMWATER

Sewers were first installed in 1892 throughout the developed areas of Bellingham. Consisting of heat-hardened clay pipe, the sewers collected both sewage and rainwater and discharged into Whatcom Creek and Bellingham Bay.

Bellingham is described as a combined sewer system (CSO), meaning that both sanitary sewer and storm sewer systems are combined in some sections of the city. CSO collection systems are usually the result of older portions of a city's collection system before waste-water plants were built or required.



EXISTING STORM SYSTEMS (New Whatcom Storm Report- David Evans Associates)

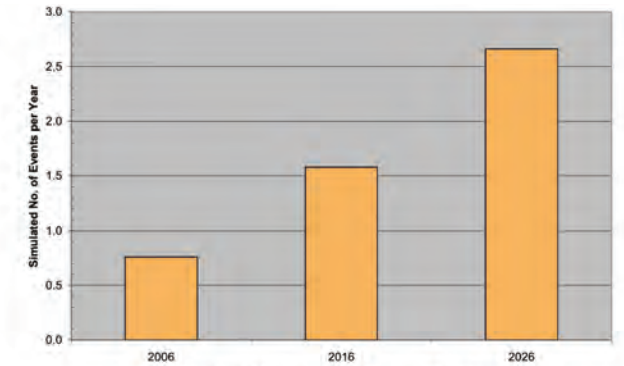


COMBINED AND SEPARATED SEWER AREAS (City of Bellingham, Comprehensive Sewer Plan)

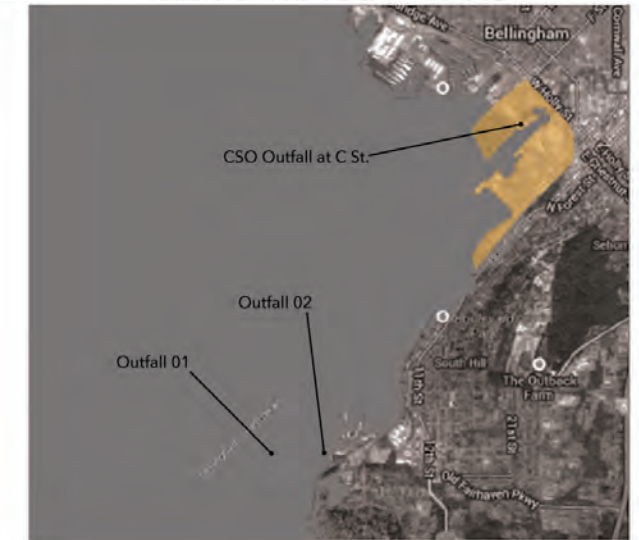
Although most of the flow from the combined area receives treatment at the Post Point plant, the system includes an overflow outfall at the base of C Street that allows untreated combined sewage to discharge to the bay during large storm events. City has recorded 2 overflow events from this outfall in the past 6 years (2014). Bellingham estimates that three percent of their

total collection system, based on total collection system piping, is combined.

A third combined sewer overflow outfall at the end of "C" Street in an old portion of Bellingham is only used during significant rain events that cause both stormwater collection systems and sewage collection systems to combine and overflow. Only Outfall 003 meets



SUMMARY OF EXPECTED CSO EVENTS PER YEAR



the definition of a combined sewer overflow (CSO) as it is comprised of both untreated sanitary sewer and storm sewer waters.

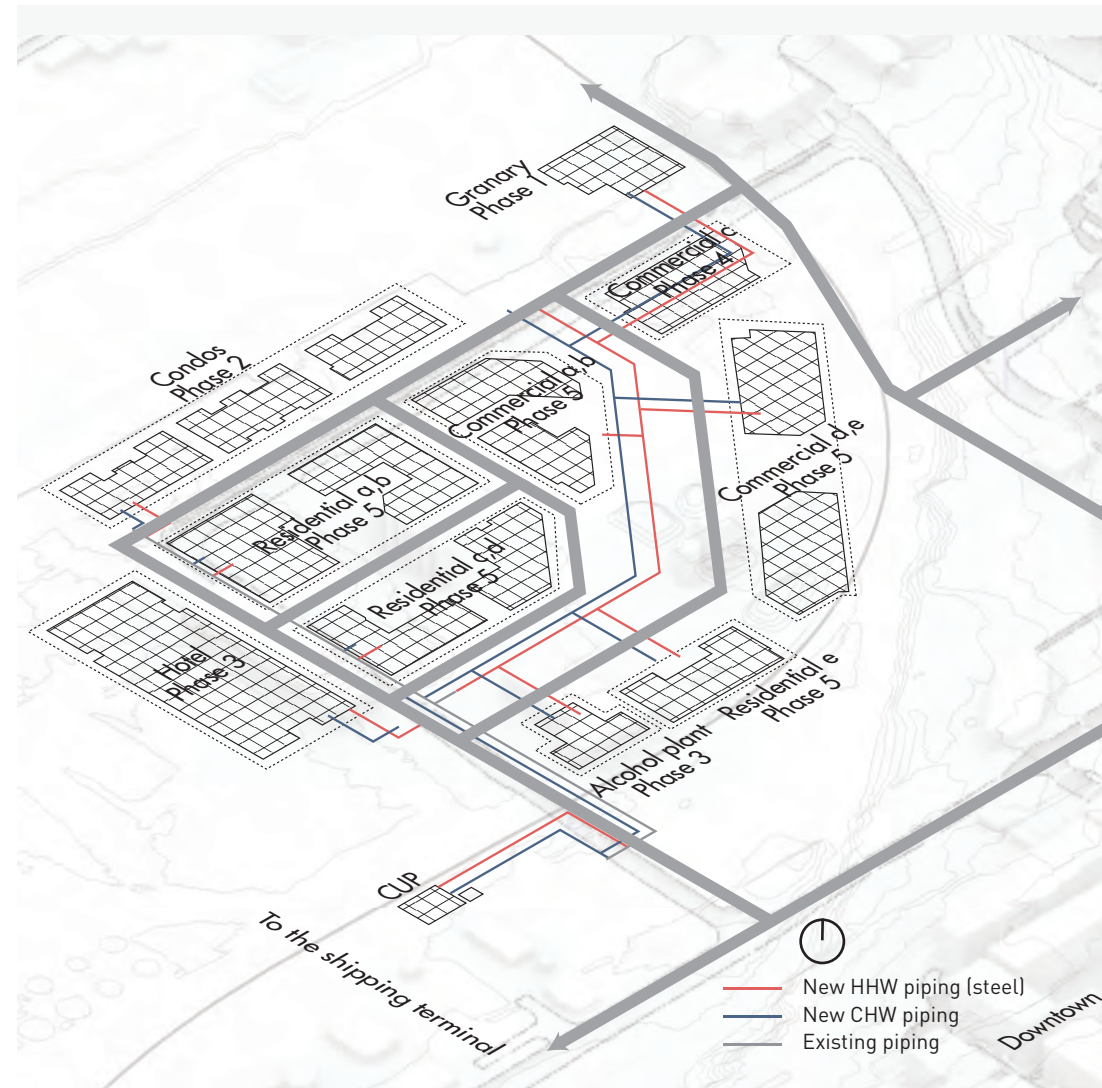
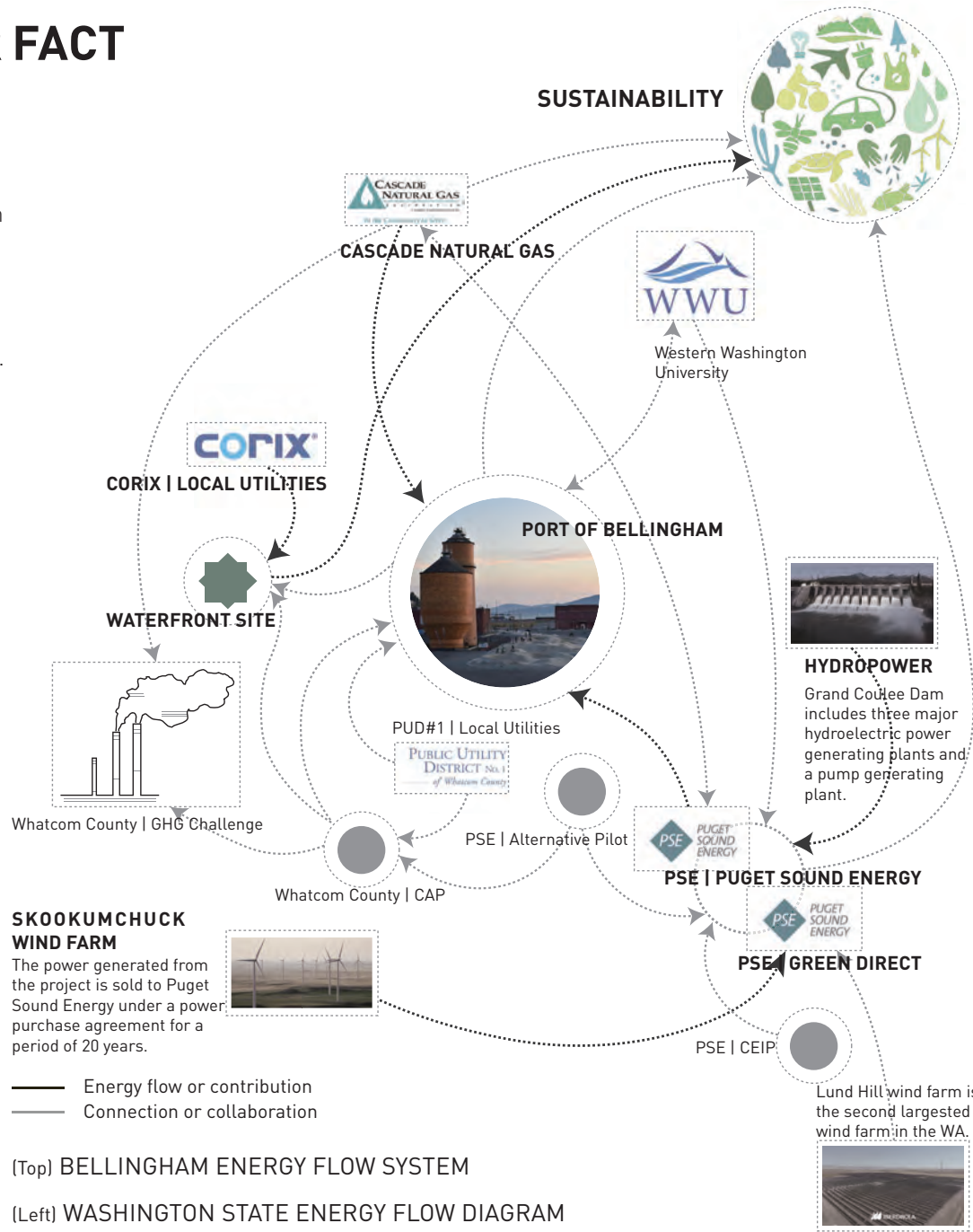
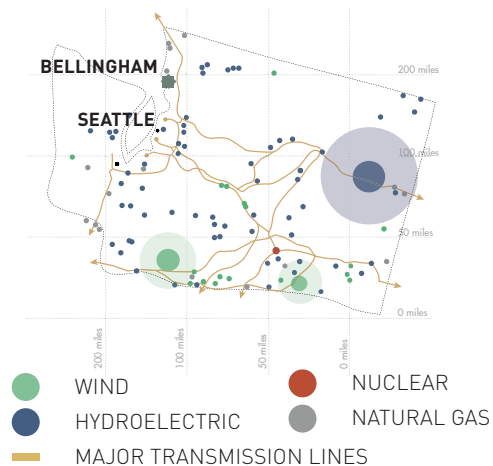
The facility discharges the treated and disinfected effluent primarily through Outfall 001 and rarely via Outfall 002.

# BELLINGHAM POWER FACT

Bellingham Washington is a nexus of infrastructure, both in oil and natural gas. With a well-connected electricity grid extending across the Western states and even up to Canada, the city lies at the junction on a large network connecting Washington, and the rest of the country. The city relies on Cascade Natural Gas for its natural gas supply and Puget Sound Energy for electricity.

**Puget Sound Energy (PSE)** is an energy utility based in the U.S. state of Washington, providing the Puget Sound region with electrical power and natural gas. The company's electric and natural gas service area spans 6,000 square miles (16,000 km<sup>2</sup>)

**Cascade Natural Gas:** Until the early 1950s, Pacific Northwest communities outside the larger metropolitan areas were passed over for natural gas service. In 1953, the Cascade Natural Gas Corporation was formed to serve these communities with affordable natural gas.



DISTRICT ENERGY SITE PLAN & PIPING SYSTEM:

## ENERGY OPERATION

- Central Energy Plant
- Thermal energy production
- Distribution Piping System
- Hot or Cold water distribution to the buildings

- Energy Transfer Station
- Interconnection of the DE system with buildings (Heat Exchangers)

# DISTRICT ENERGY

District energy systems are a highly efficient way to heat and cool many buildings in a given area from a central plant. The site is planned to run on a district energy system. A main spine of district energy infrastructure is already present under Laurel Avenue, and will expand as the site is further developed.

## ECOGEN NATURAL GAS PLANT

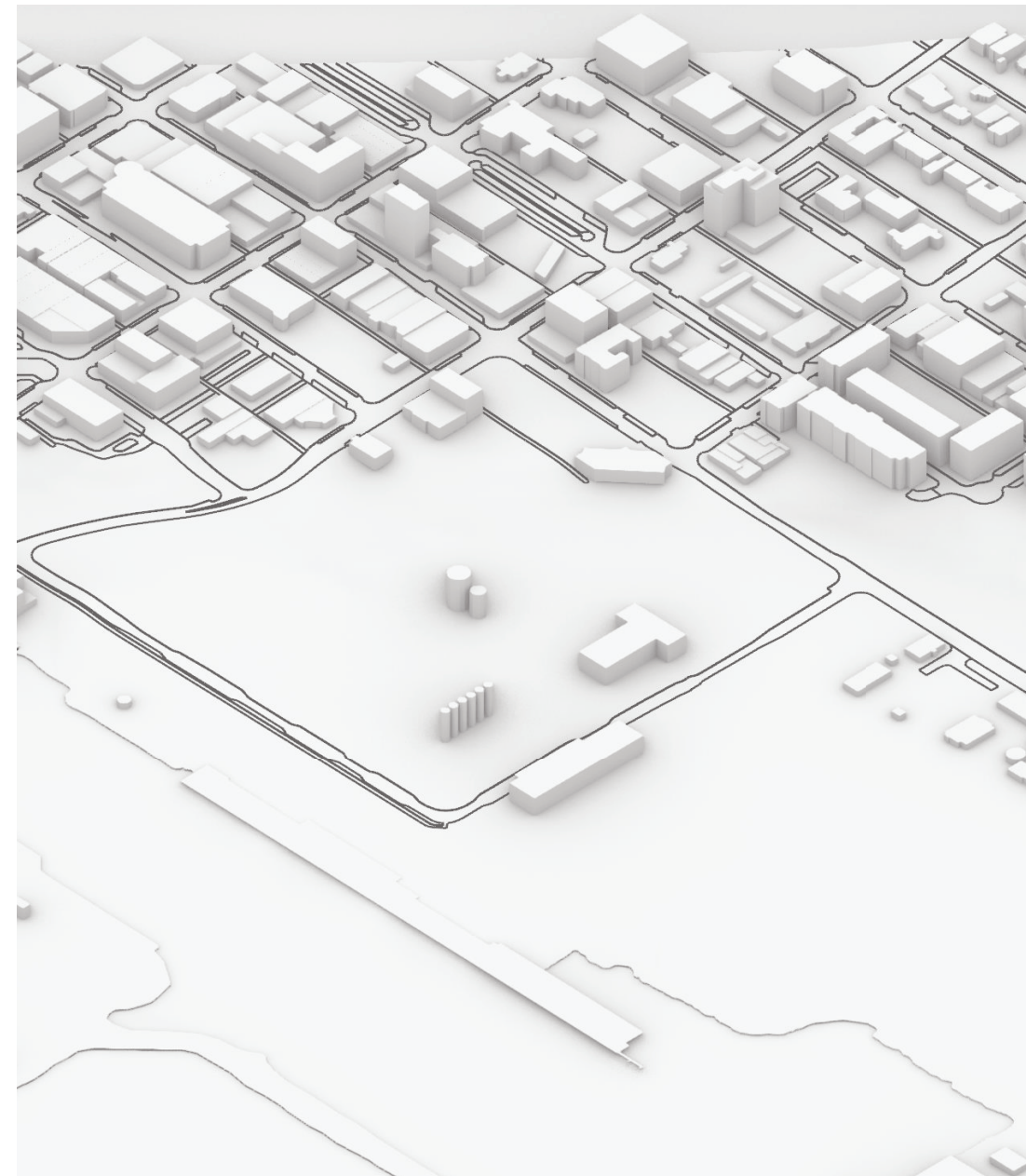
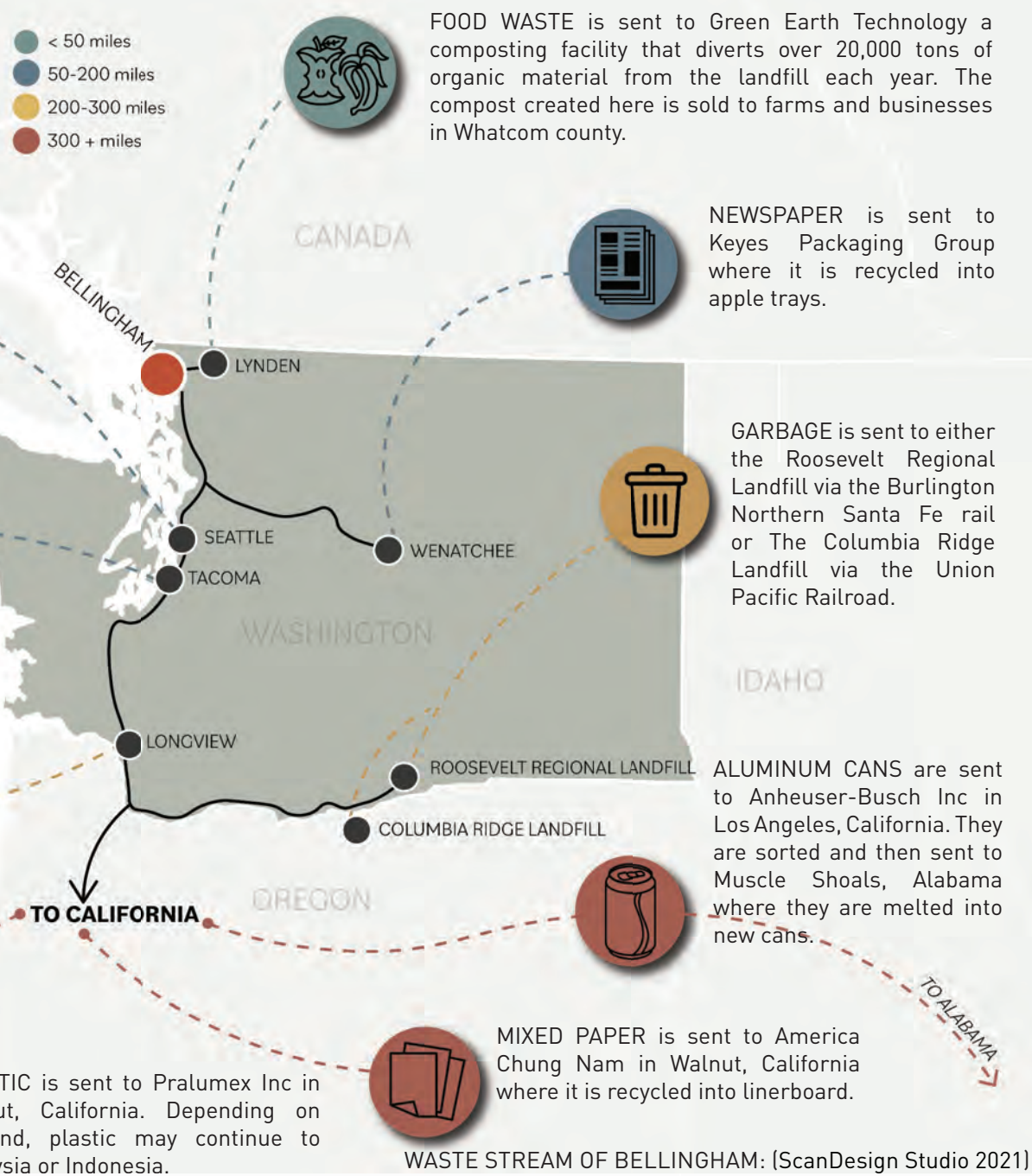
The site currently hosts a natural gas-fired power plant (Ecogen). The plant sends energy down to California during "peaker events". What are Peakers? Peakers are the last resort power plants that turn on when grid energy demand is peaking. For example, a peak event is a hot day when everyone turns on their air conditioners at the same time. It's more energy demand than the regular grid can handle.

## GREEN DIRECT OPPORTUNITY

Green Direct is a program designed to provide PSE customers the ability to purchase 100 percent of their energy from a dedicated, local, renewable energy resource. Bellingham participates in this program, however, when peak power events happen, non-renewable energy is tapped.



# WASTE STREAMS OF BELLINGHAM



CURRENT BELLINGHAM WATERFRONT SITE

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## CHAPTER 3

### SITE PROPOSALS | GROUP MASTERPLANNING



BELLINGHAM WATERFRONT  
Image Courtesy of Constantine Chrisafis

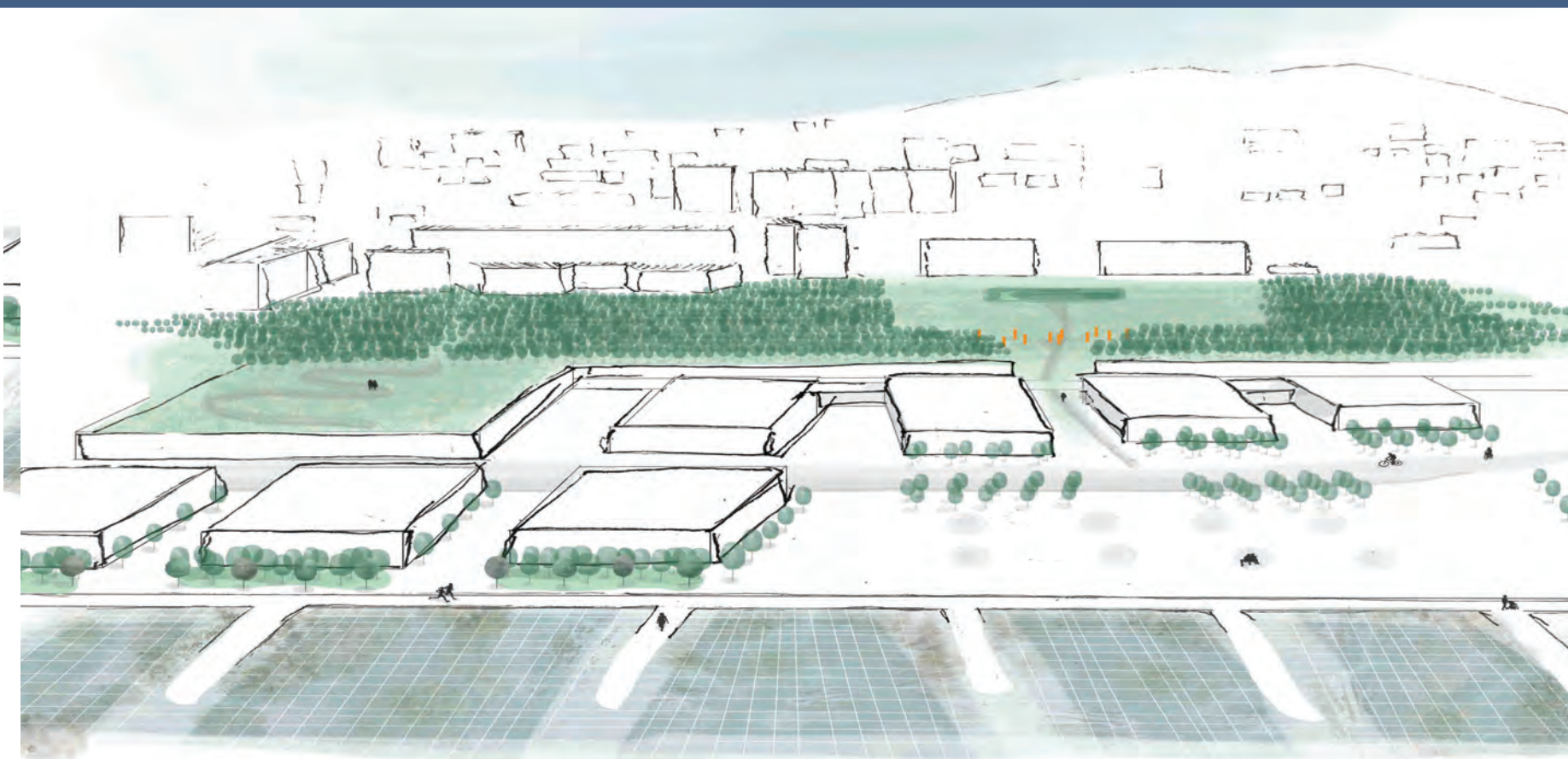
## PROPOSALS

- 101 **SPLINE**
- 132 **WOVEN**
- 162 **(RE)WORKING**

This chapter presents design proposals for the Downtown Waterfront developed by three separate groups of interdisciplinary graduate students in the Studio. Carefully integrating multi-layered contexts and potential site uses, teams propose distinct actions and portions of the waterfront to serve as model Climate Districts, addressing both local and global needs related to climate mitigation and adaptation.

# SPLINE: A SYMBIOTIC LIVING INDUSTRY DISTRICT

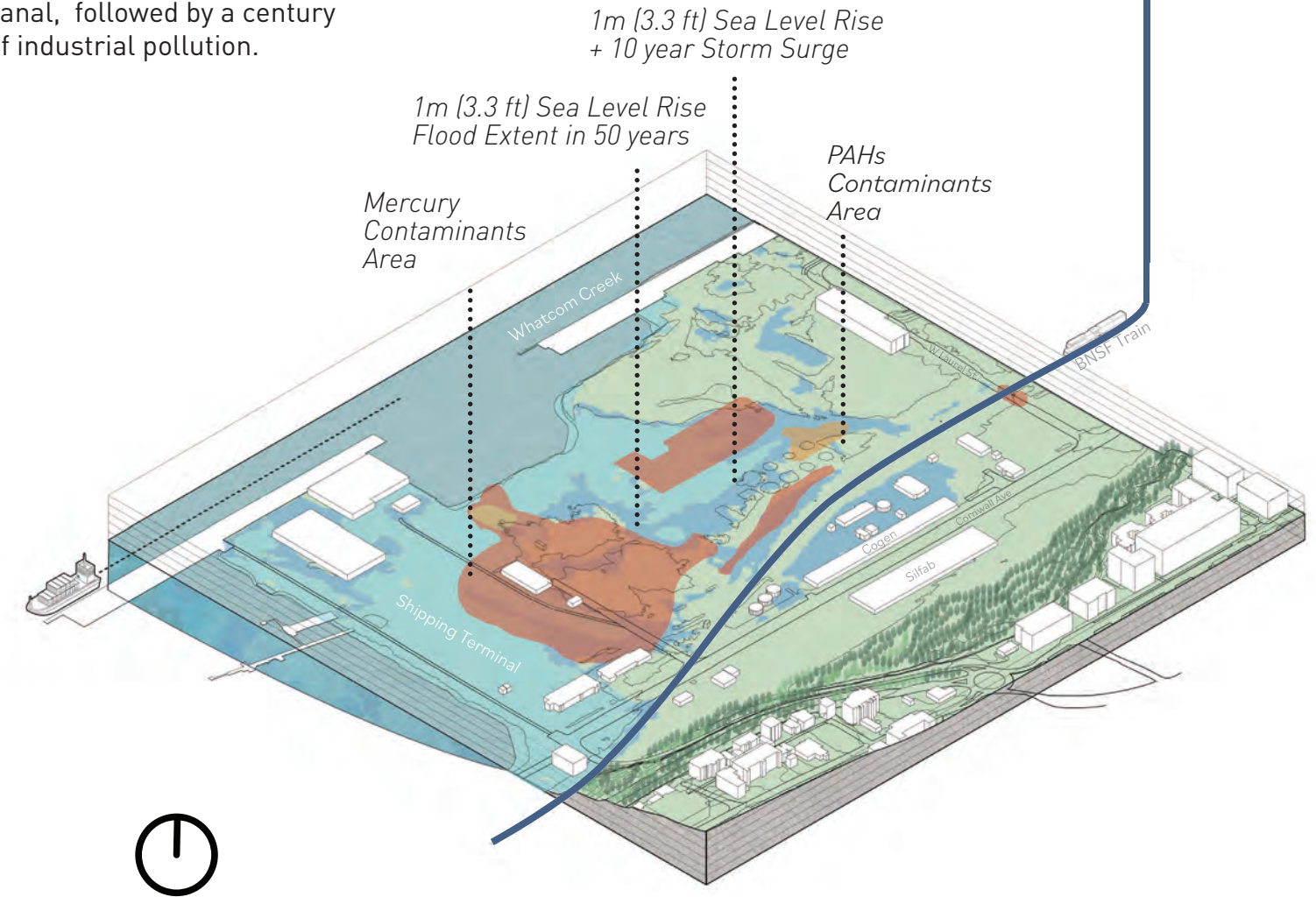
Seyyada Burney, Lauren Corn, Yi-Lin Khor, Akeo Maifeld-Carucci



## THE WATERFRONT DISTRICT

The Bellingham waterfront is characterized by severe environmental degradation beginning when this land was formed through the dredging of the Whatcom canal, followed by a century of industrial pollution.

We see this project as an opportunity to mend the green and blue ecology of this space through the creation of a Living Industry eco-district.



## SITE HISTORY

The Bellingham waterfront is a complex site with a complicated history. Land and people are inextricably linked and their relationship dramatically impacts the sustainability of the social and natural ecologies. (Burney)

● **9000 BC** | Coast Salish peoples inhabit areas around the Puget Sound. They maintain a fishing village and trading node near the mouth of 'noisy, rumbling waters', or 'What-coom' creek.



● **2005** | Port of Bellingham acquires former Georgia-Pacific site in exchange for clean-up and remediation by the WA Dept. of Ecology.

● **1750-1852** | Coal mining, timber, and a brief gold rush bring over 75,000 people to the area. Land claims and resource extraction cause conflict between local tribes and settlers.

● **1855** | Treaty of Point Elliot formally displaces indigenous tribes from their lands. Lummi, Nooksack, and other re-locating tribes are promised access to ancestral fishing and hunting grounds, but this is ignored by local authorities and settlers.

● **1900** | Bellingham Bay hosts world's largest shingle mill and salmon cannery. Industrial and municipal waste piles create new fill-land on mudflats.

● **1904** | Lower Whatcom creek and estuary are dredged to create a deeper waterway for shipping.

● **1920** | Port of Bellingham is established.

● **1926** | Puget Sound Pulp and Timber company builds tissue mill on

● **1940s** | Puget Sound Pulp and Timber company expands into alcohol manufacture to support war efforts. After WWII, the alcohol plant becomes a global hub for timber bi-product chemicals research and supports entry into bleached pulp products.

● **1947** | Georgia-Pacific purchases plywood mill in Bellingham.

● **1960s** | Port undertakes major infrastructural improvements to facilities, including filling in six acres of land to create a larger unloading

● **1963** | Georgia-Pacific purchases Puget Sound Pulp and Timber Company, becoming the single, largest mill on the waterfront.

● **1967-71** | Georgia-Pacific dumps mercury from chlor-alkali pulp-bleaching operations into the Whatcom waterway.

● **1960s** | Native communities engage in non-violent activism, or 'Fish-Ins', to reclaim their fishing rights. They are met with intense - and often violent - resistance.

● **1972** | Passage of the Clean Water Act forces local industries to mitigate their environmental impacts. Georgia-Pacific constructs a 38 acre Aerated Stabilization Basin to treat effluent water before discharging it into the Bay.

● **1974** | Boldt Decision grants tribes rights to 50% of harvestable fish catch from 'usual and accustomed' fishing grounds.

● **1991** | Drastic fluctuations in building materials and pulp and paper markets causes Georgia-Pacific net losses of \$151 million.

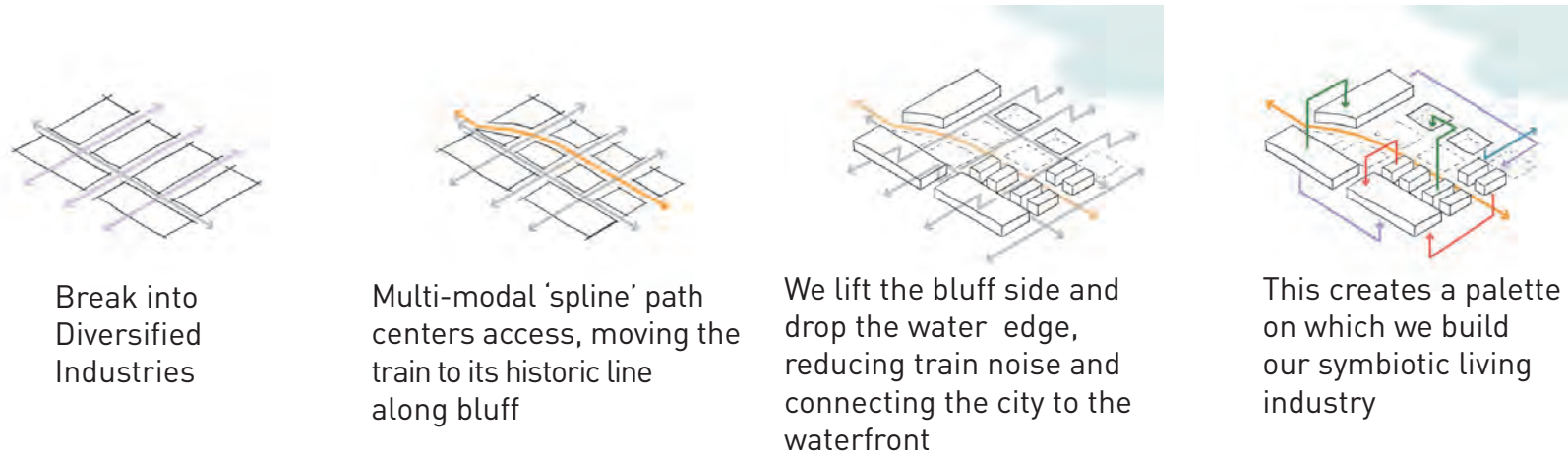
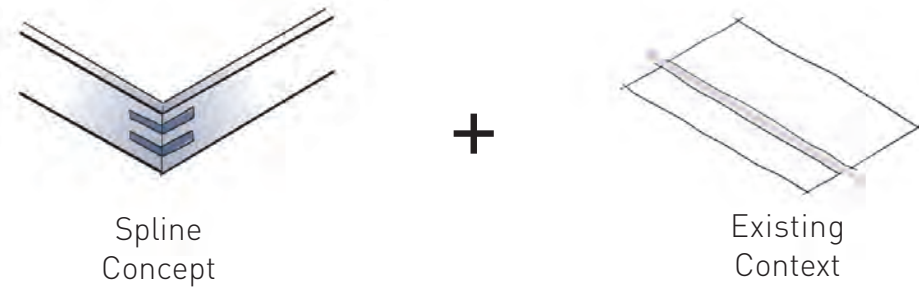
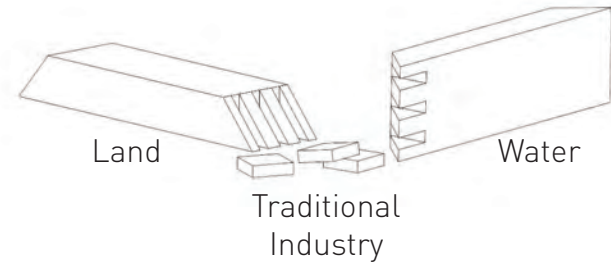
● **2000s** | Georgia-Pacific closure coincides with downsizing of Intalco Aluminum Plant operations in Ferndale, severely decreasing activity at Bellingham Shipping Terminal.

## SPLINE: CONCEPT AND FORM

A spline is a woodworking joint where a secondary wood is inserted between two unmatched surfaces resulting in the strengthening of disparate parts.

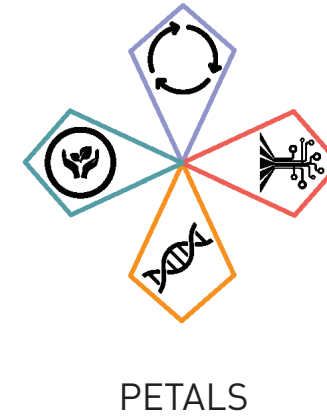
We envision green industry as a spline that joins and strengthens the ecologies of land and water allowing us to address our three primary historical challenges:

- single-use industry
- separation of people from the waterfront area
- environmental degradation



## LIVING INDUSTRY CHALLENGE CRITERIA

We developed a visionary new standard built off the Living Community and Living Building Challenges. The Living Industry goals, or petals, reframe what an industrial sector can be and do for its community.



**CIRCULARITY:**

- 'Waste' becomes Resource
- Inputs come from recycled sources



- 95% of Waste Re-Used
- 90% of Inputs come from recycled sources
- Raw Resources: 90% sourced within 100 miles

**SHARED INFRASTRUCTURE:**

- Net Positive Electricity, Water
- Shared Transit: Train, Port, Trucking



- Net Positive Energy
- Net Positive Water
- 90% of waste heat used
- Net Zero Life-Cycle Carbon emissions by 2050; Buildings < 500 kgCO2/m2
- District Noise < 85 dB

**RESILIENCE:**

- Locality Limited Growth
- Replaceability
- Economic Support Trusts



- Renewable Resources: used at a rate slower than the regeneration rate
- Non-Renewable Resource: consumption < 30% of total local source
- Industry turnover: min 10% every 25 years
- Community Owned and Operated
- 50% Profit re-invested in community

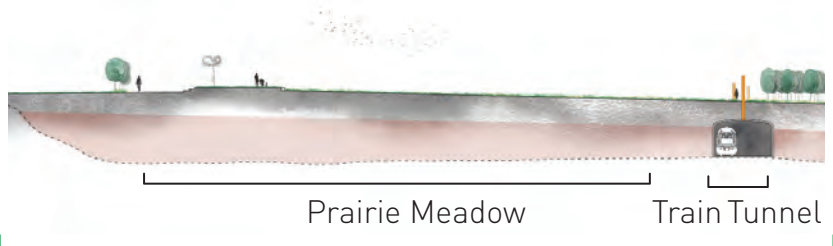
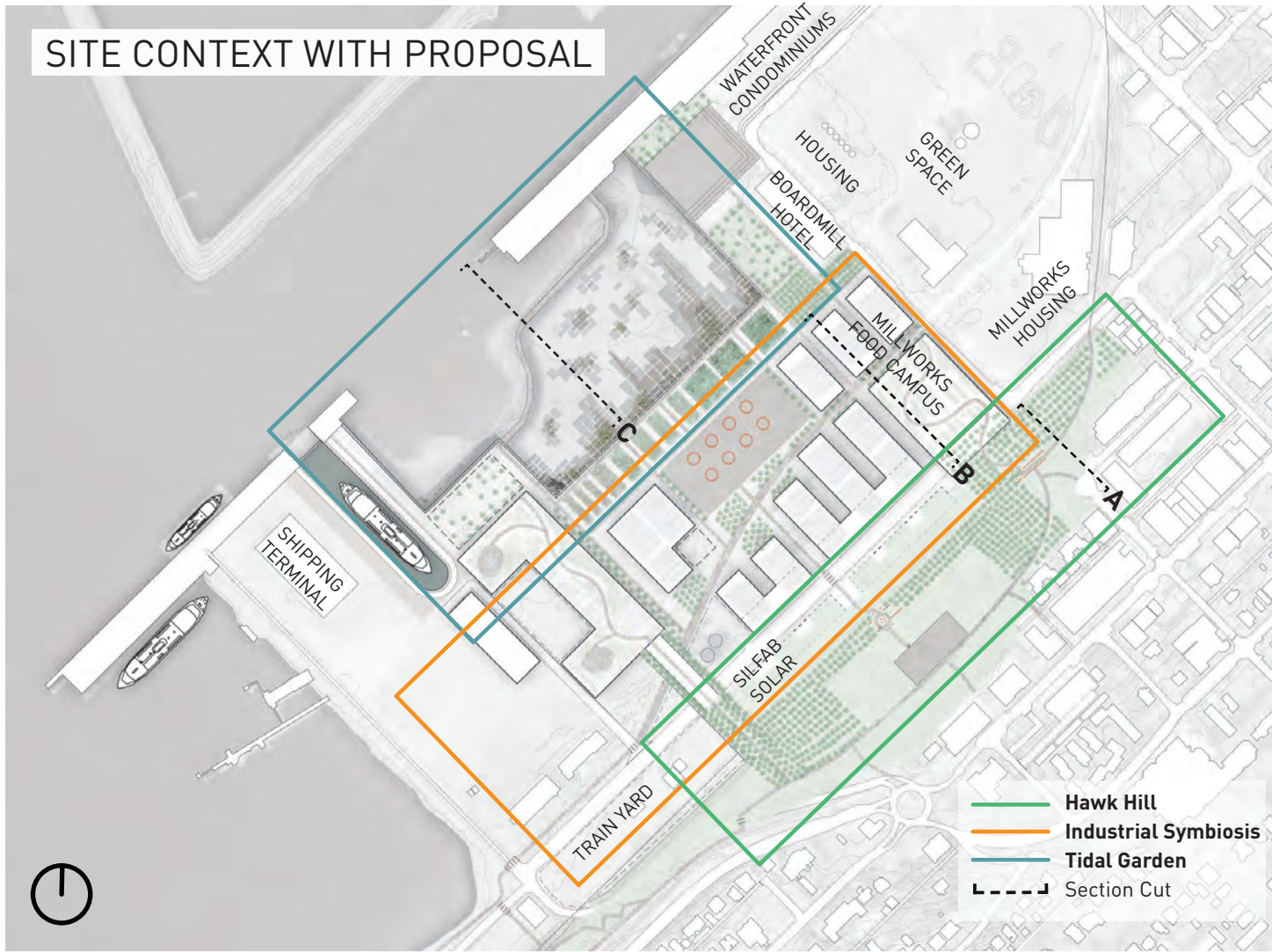
**ECOLOGICAL CARE:**

- Water
- Land
- People

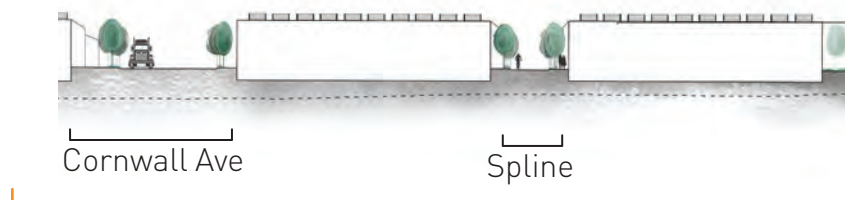


- Biosphere Integrity: restore indigenous functional and genetic diversity in 25 years
- Land-Use change: max 25% change, only within the local 100 miles radius
- Water Quality: nutrients and toxins managed on-site
- Worker diversity matches or exceeds locale
- Job Training: minimum 15% workforce turnover every 10 years

## SITE CONTEXT WITH PROPOSAL

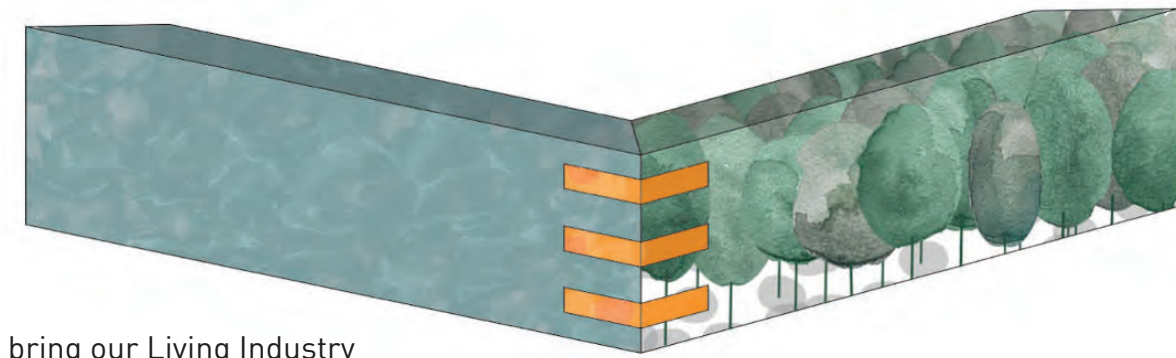


Section A: **Hawk Hill**



Section B: **Industrial Symbiosis**

## CONCEPT IN CONTEXT



We bring our Living Industry vision to life by expanding on the existing area plan and context.

Just south of the planned housing, green space and hotel areas, this industry district requires lowered noise and accessible spaces that are healthy for people and the environment.

Our proposal uses our conceptual Land, Industry and Water stakeholders to create three overlapping regions, joined and strengthened by our industrial spline:

**Hawk Hill** covers the train, contains and remediates contaminated soil, while adding connection to the waterfront.

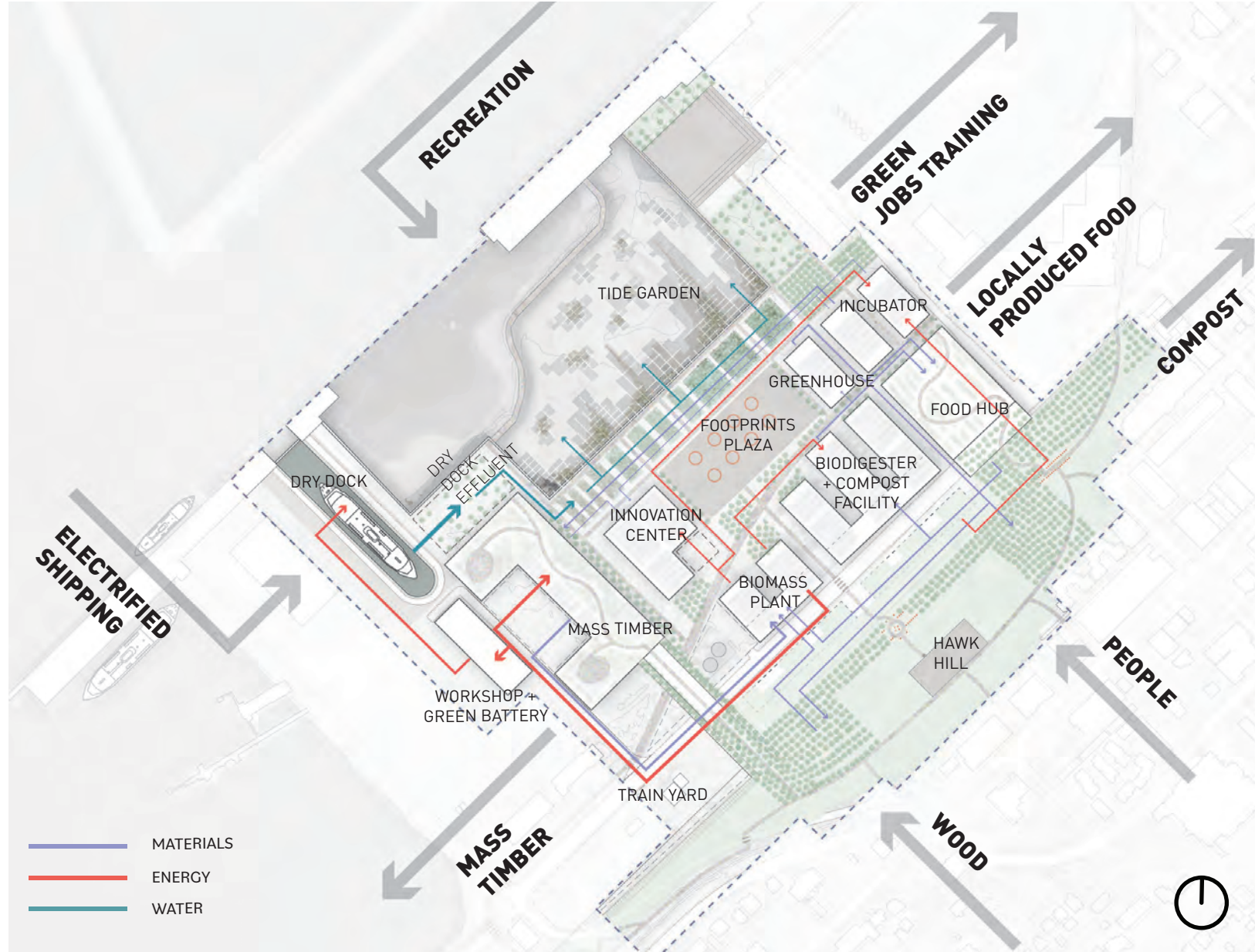
The central industry spline, creates a lively working zone where **sybiotic industry** transforms wood products from the upland wildland-urban interface to mass timber units for building construction. Excess waste from the manufacturing process is recycled as energy and biochar.

**The Tidal Garden** processes stormwater and dry-dock effluent to release clean water into a softened, resilient shoreline.



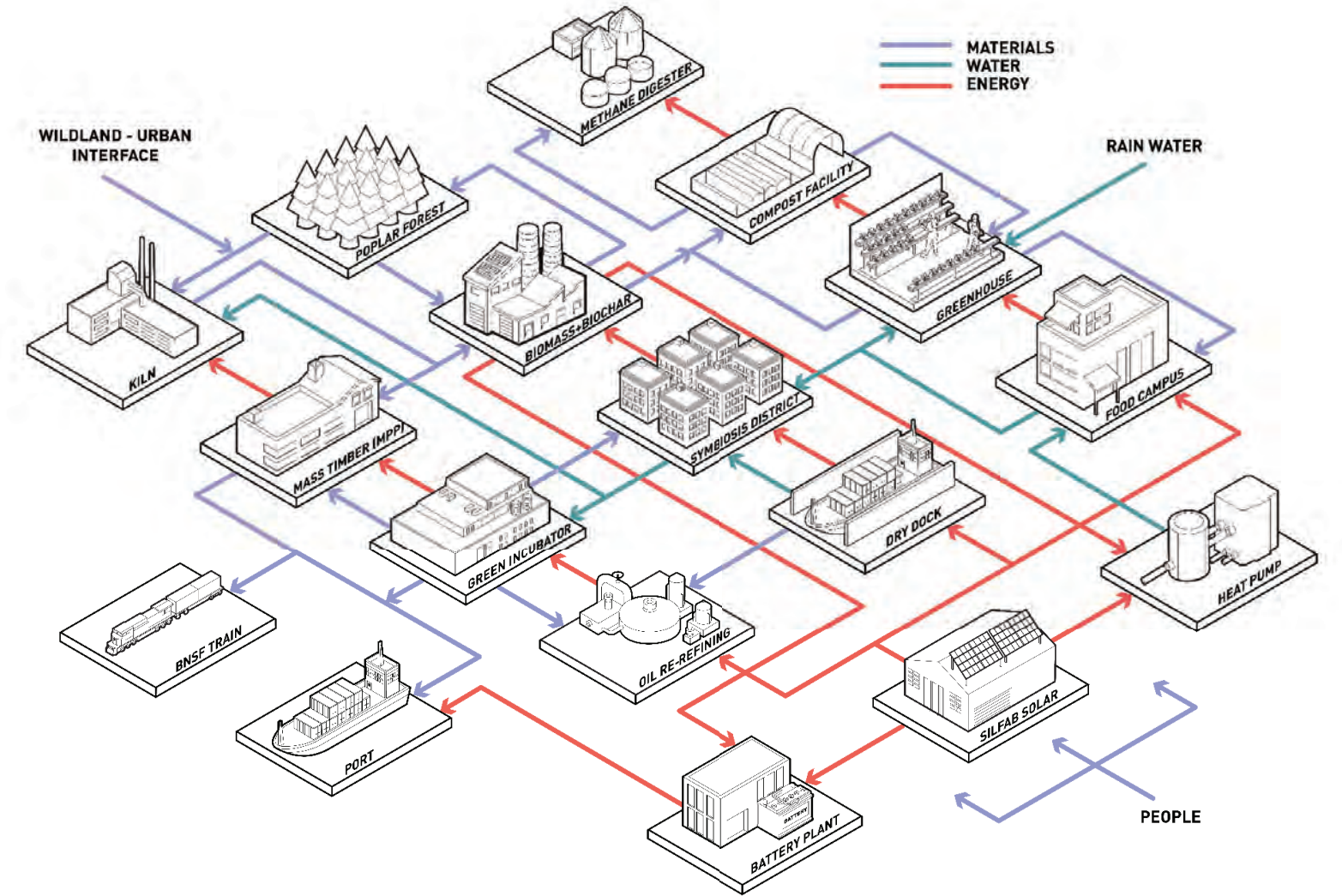
Section C: **Tidal Garden**

# SYMBIOSIS DISTRICT FLOW SITE PLAN



SYMBIOSIS ON SITE: Arrow size within the district displays relative magnitude of the flow. Arrows outside show examples of the external interactions.

# SYMBIOSIS DISTRICT FLOWS DIAGRAM



SYMBIOSIS DIAGRAM: Some of the more primary flows of materials, energy, and water between industries on site.

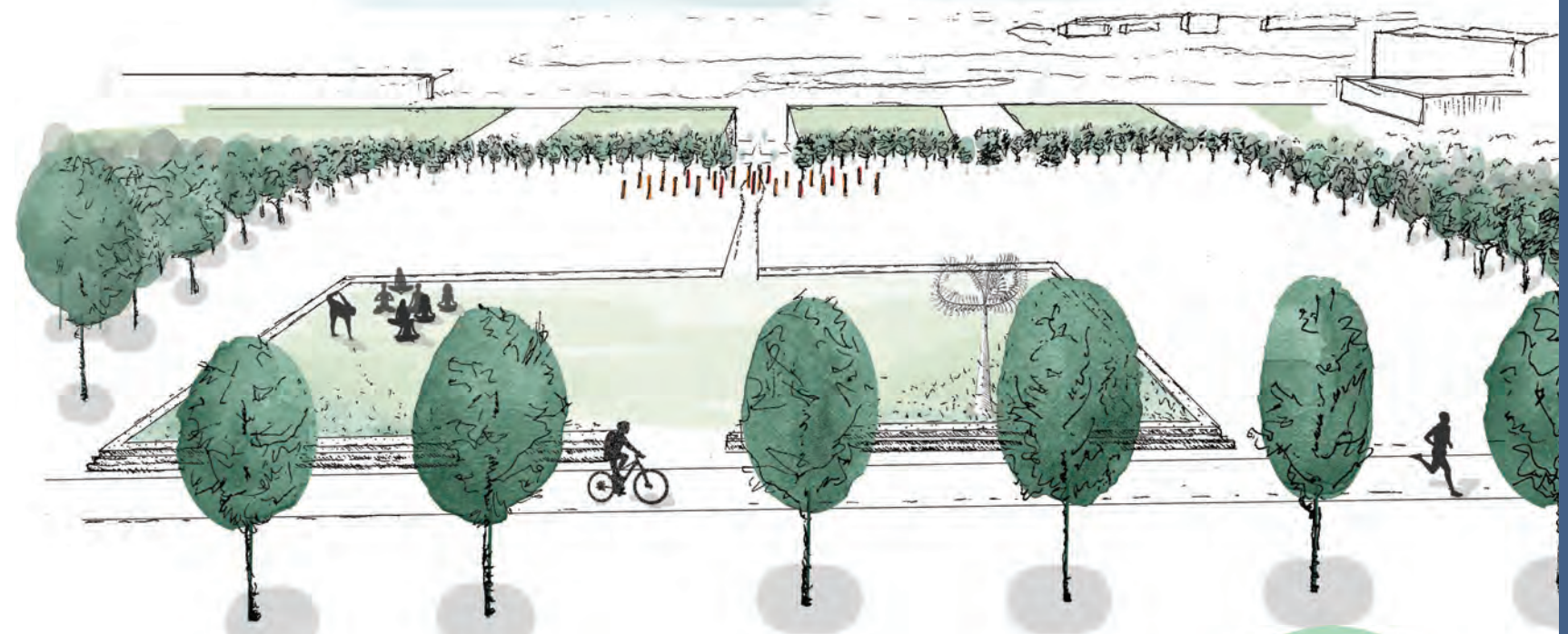


## THE HILL

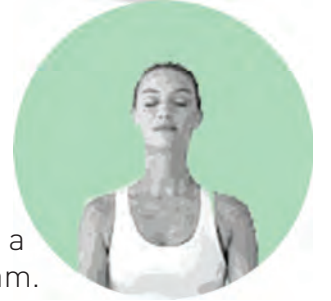
The existing train, moved back onto its historic tracks along the bluff, is bermed to create increased connectivity, store contaminated soil, and provide green space for the residents of Bellingham. To the south of the site a new train yard expands opportunities to transport goods via rail. Here the tunnel opens into a wall of shipping containers overflowing with native plants.

On top of the berm, a multi-modal path traverses the new site. From the south, the trail is covered with large poplar trees that shade the site. Midway across the berm the canopy opens to reveal sweeping views of new symbiosis district, the tidal gardens, and the San Juans and surrounding islands.

## HAWK HILL



Hawk Hill, a rectangular grass field, lofted on gabions of oyster shells, is at the highest point of the hill. On the soft clover residents enjoy the view, fly a kite, watch the birds, or admire the spinning wind sculpture.



Lucy is designer and a resident of Bellingham. She enjoys opportunities to participate in outdoor yoga classes on the Hill, hiking with her partner on the weekends, and sipping beers at the many breweries in town.

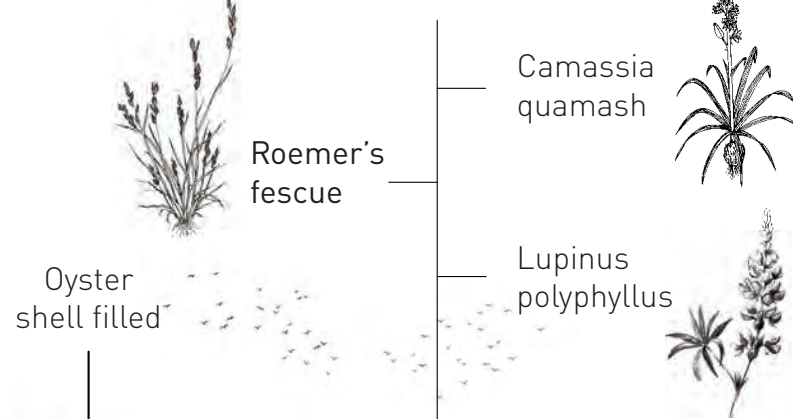


# HAWK HILL

- A new recreation space providing:
- access to the symbiosis district via multimodal trails
  - improved views
  - more plants and shade
  - un-choreographed green space



Prairie Planting  
Carbon sequestration



Oyster shell filled

# ORGAN YARD

Below Hawk Hill, stand large, rusted steel pipes. On particularly windy days or when a train passes they emit a low hum. Each pipe is tuned to a minor E flat, G, or C.

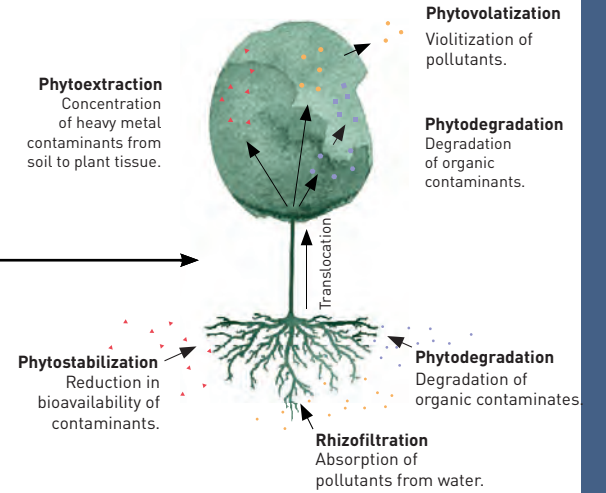


Forest Planting  
Carbon sequestration



Helianthus annuus

Populus nigra



**Phytoextraction**  
Concentration of heavy metal contaminants from soil to plant tissue.

**Phytostabilization**  
Reduction in bioavailability of contaminants.

**Phytodegradation**  
Degradation of organic contaminants.

**Rhizofiltration**  
Absorption of pollutants from water.

Silfab Solar

Contaminated fill from ASB Pond

Multi-Modal Rail Trail

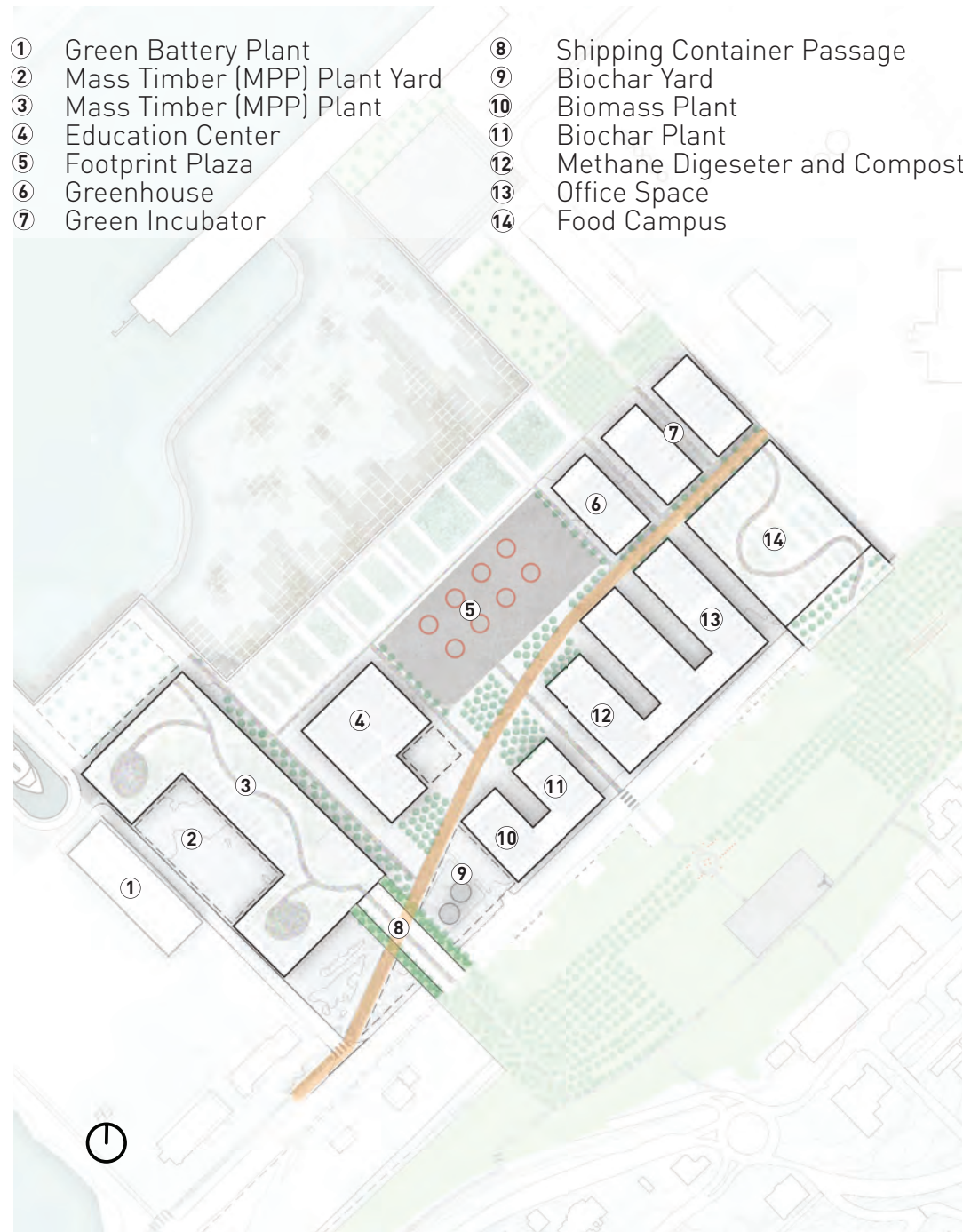
Hawk Hill

Prairie Meadow

Double-Wide Train Tunnel

Phytoremediation Forest

Cornwall Ave



## THE SPLINE

At the industrial Spline, the ocean from the west meets the forested hill on the east. The new symbiosis district retains the Silfab solar but updates the building to melt into the hillside. The retrofitted Cogen building forms the backbone for the biomass, biochar, compost, and methane digester. Across the street are the incubator and research spaces. These industrial buildings face the new roadways for the Spline district.


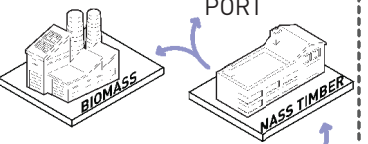



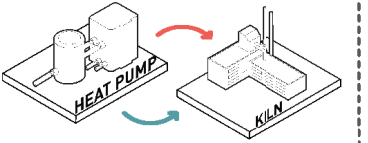
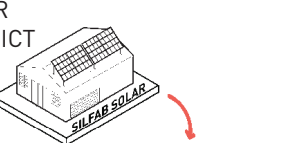
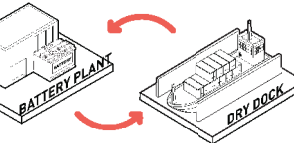

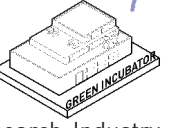


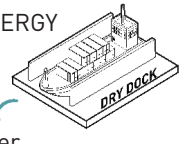

The Spline of this new district runs along the old train ties now updated as a planted row. A multi-modal street brings together slow-moving vehicles, cyclists, and pedestrians. To the left and the right residents can look through the glass into the sustainable industries within.

The new Footprint Plaza highlights eight concrete foundations of the old industrial site. Here, open space is used for seasonal arts, and productions, and as an exposition area.

The mass timber plant is a cutting-edge facility dedicated to the production of sustainable and eco-friendly building materials.

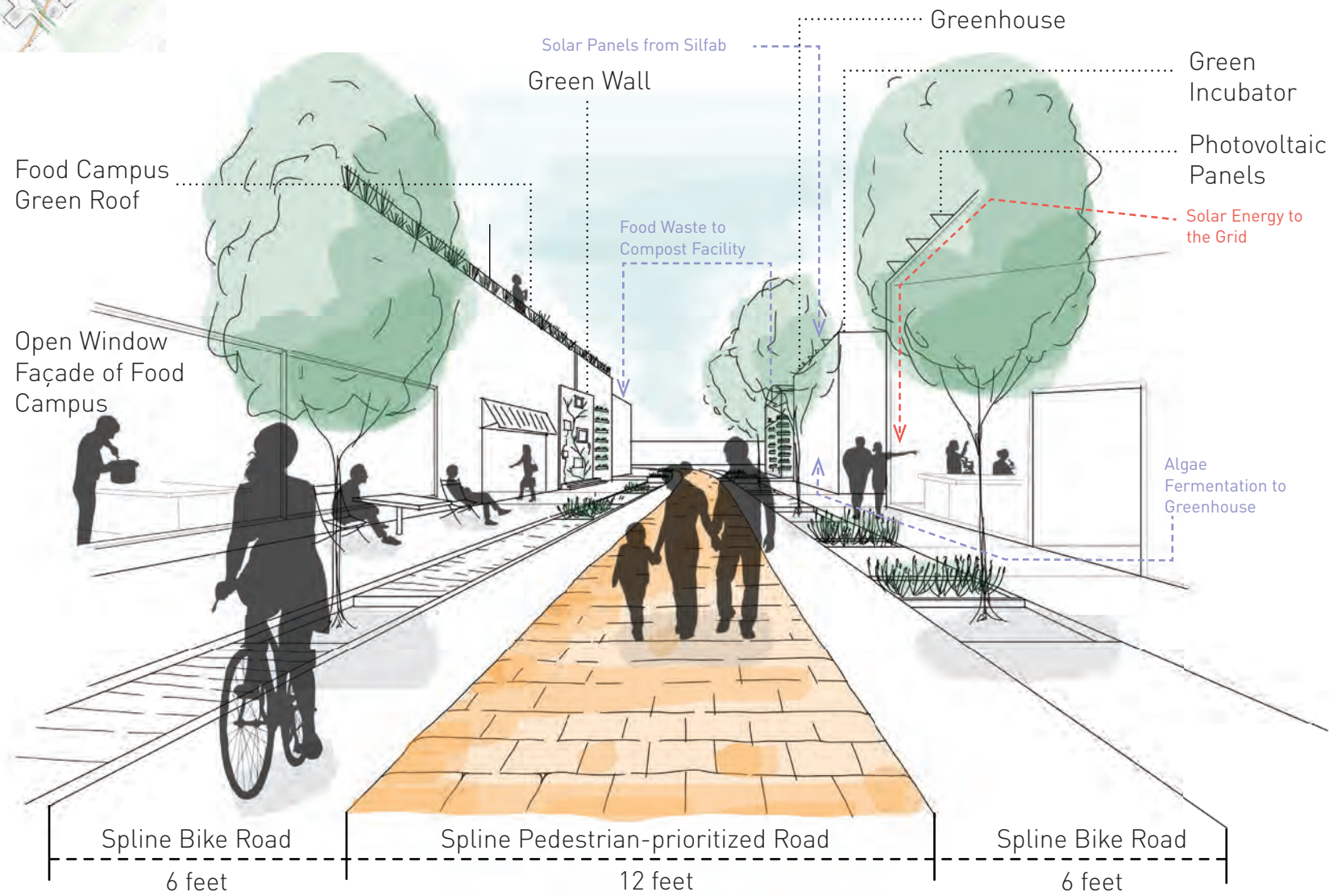
## LIVING INDUSTRY CHALLENGE:

Symbiosis District performance over time to meet the proposed new Living Industry Challenge criteria.

PETALS	BREAK LINEARITY	CLOSE THE LOOP	REGENERATIVE
	<i>short term</i>	<i>mid term</i>	<i>long term</i>
<b>CIRCULARITY:</b> - 'Waste' becomes Resource - Inputs come from recycled sources 	 LOCAL FOREST WASTE: Wildland Urban Interface	 Food 'waste' and small plant debris DRY DOCK: Bio-Diesel	 BIOCHAR + COMPOST + GREENHOUSE Supplies FOOD CAMPUS: Food to People; 'Waste' back to COMPOST
<b>SHARED INFRASTRUCTURE:</b> - Net Positive Electricity, Water - Shared Transit: Train, Port, Trucking 	 DISTRICT HEATING    KILN: Powered by Waste Heat + Solar	 SOLAR DISTRICT ALL BUILDINGS: EUI < 45 for Net Zero	 GREEN BATTERY PLANT: Electric Ship Battery Swapping
<b>RESILIENCE:</b> - Locality Limited Growth - Replaceability - Economic Support Trusts 	ADAPTIVE REUSE of Cogen Power Plant into Biomass + Biochar + Compost + Methane Digester INDUSTRY LAND TRUST: Economic Support for Start-up	 MASS TIMBER: Bio-based Glue INCUBATOR: Research-Industry Partnerships solve challenges	 ADAPTABILITY: Goal >10% industry turnover per 25 years
<b>ECOLOGICAL CARE:</b> - Water - Land - People 	Berm: Contaminated Soil POPLARS: Forest Planted GREEN Job Retraining	 NET POSITIVE ENERGY DRY-DOCK: Water cistern, separation, filtration	 BIOCHAR + POPLARS: Sequestration -> Net Zero Carbon TIDE GARDEN: Sea Level Rise + Remediate Water



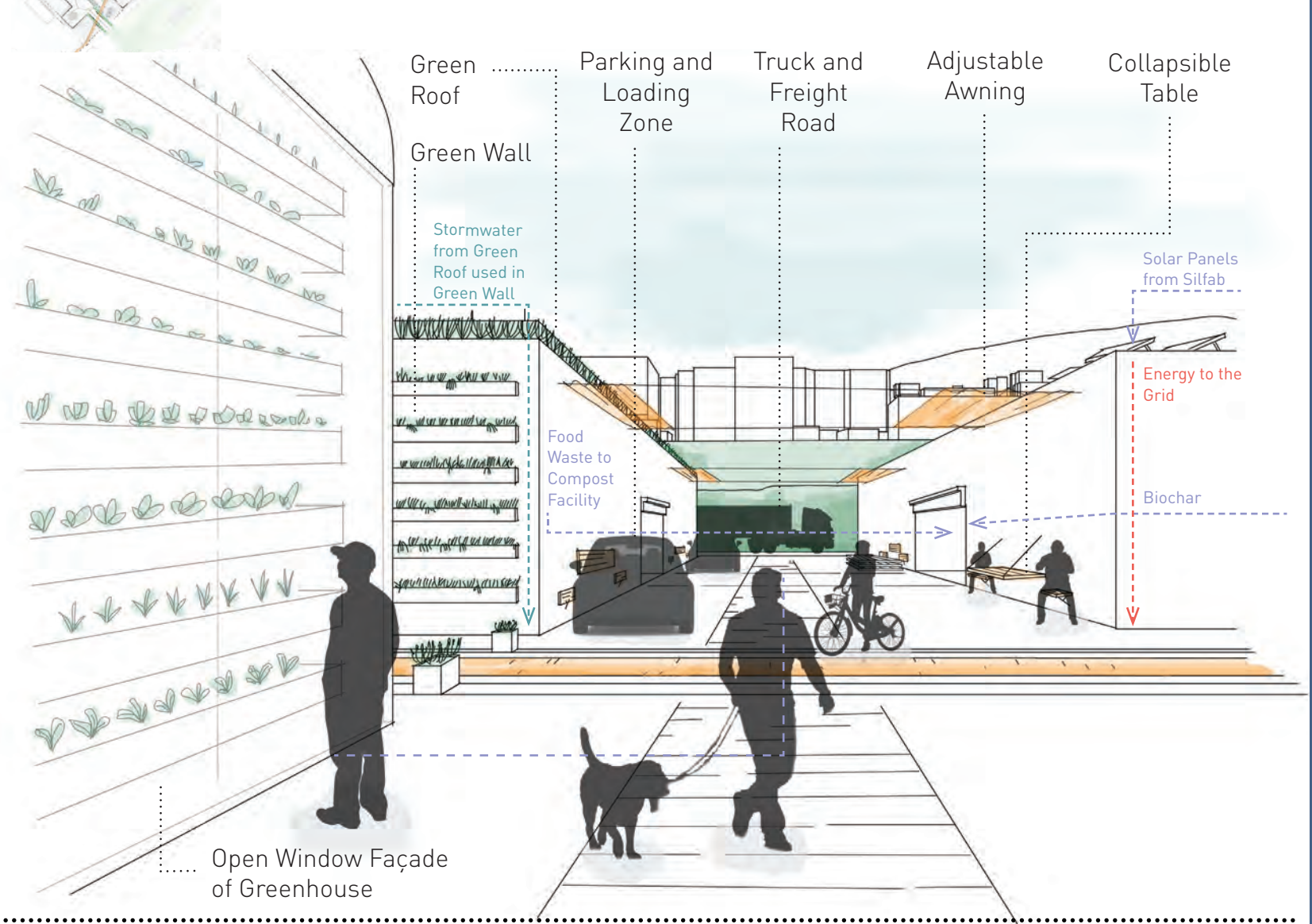
## NORTHERN ENTRY TO THE SPLINE



The view southwest down the multi-modal spline path from in between the Food Campus and Green Incubator. Railroad planter beds on the left and open display windows connect people to the past and current industry.



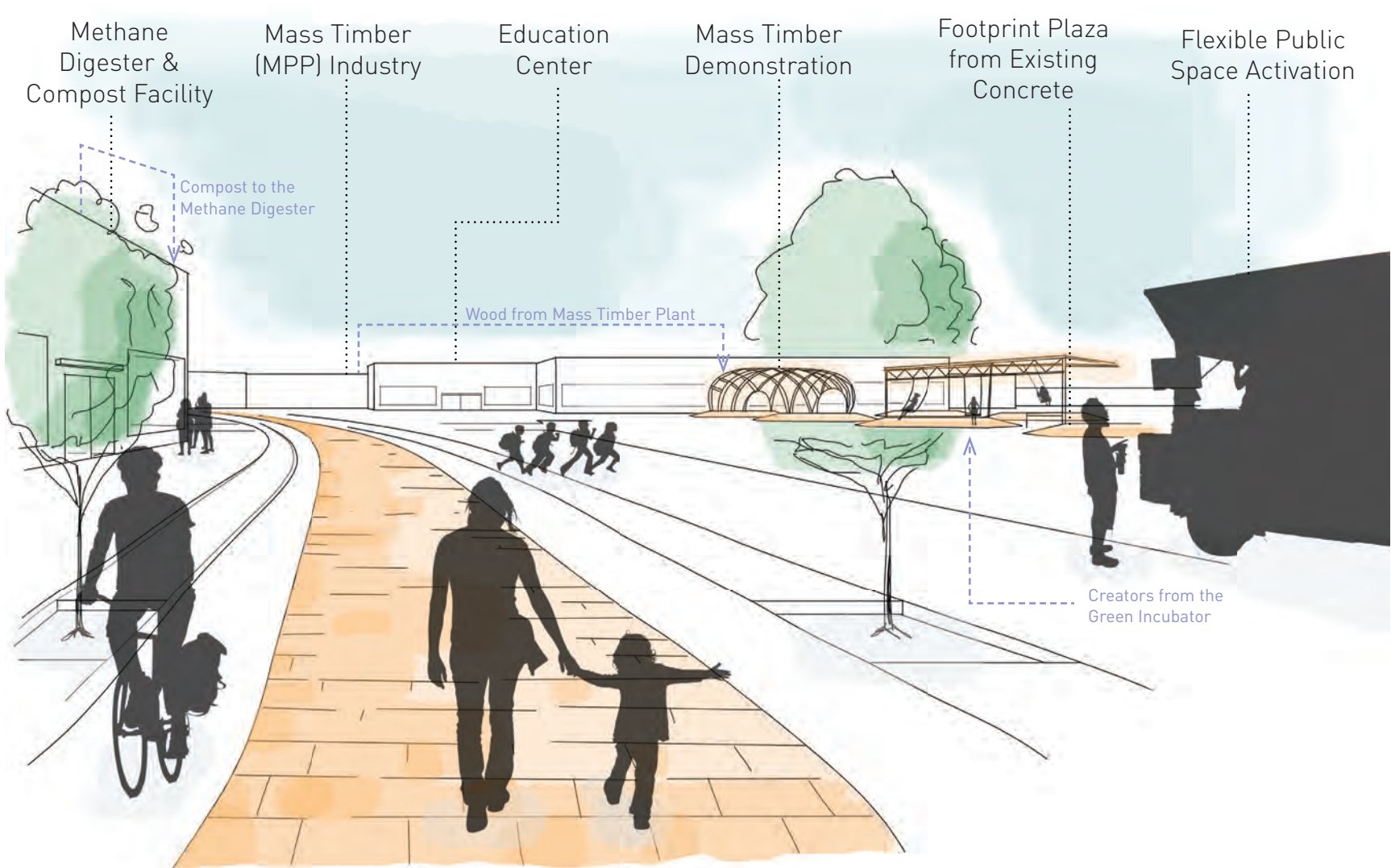
## VIEW FROM THE SPLINE TO HAWK HILL



View from next to the Greenhouse looking in between the Food Campus and Office through the semi-public worker's space and up at Hawk Hill and Bellingham.



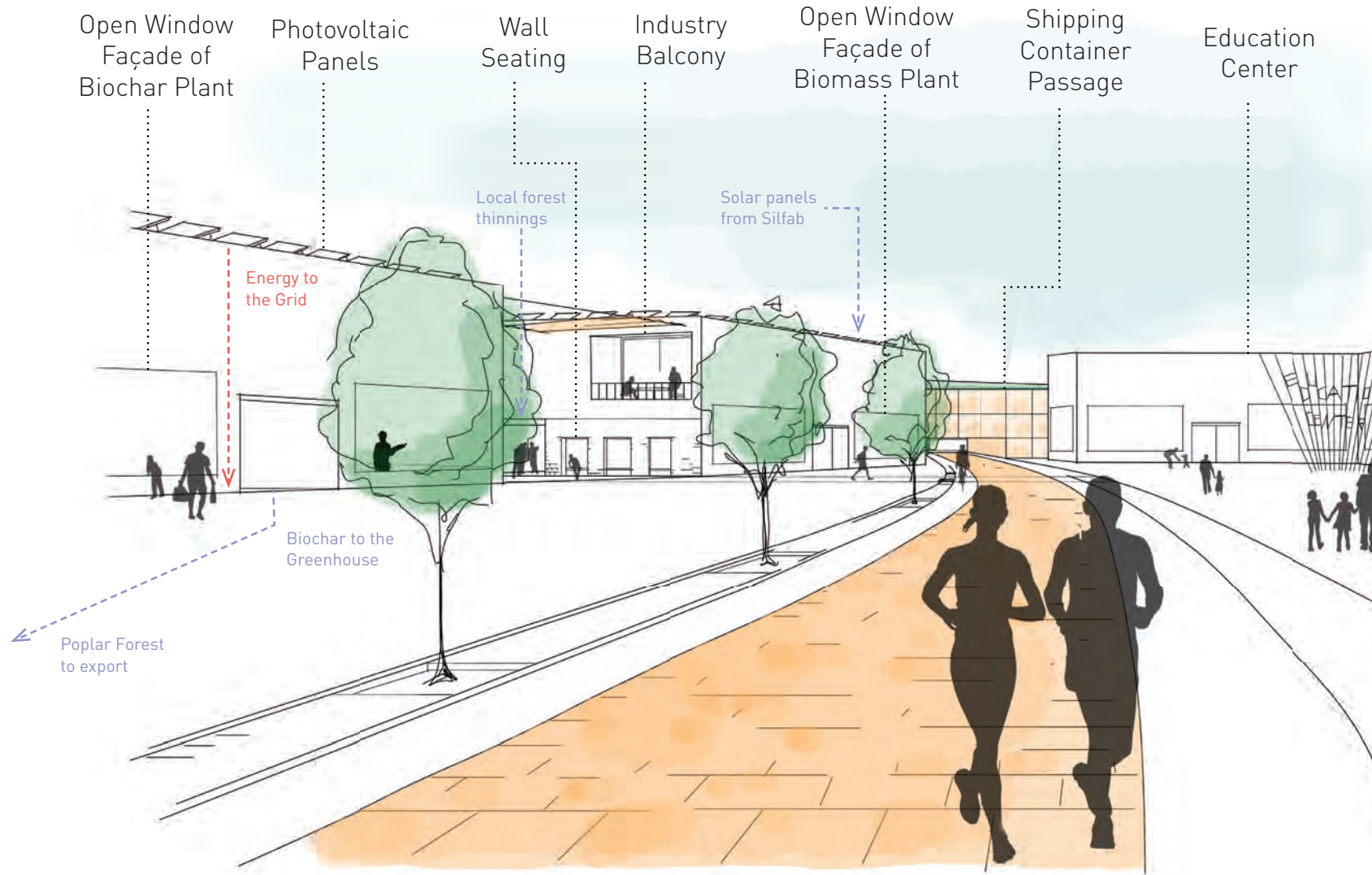
## THE SPLINE OPENING ONTO FOOTPRINT PLAZA



Looking from the spline across at Footprint Plaza, the education center and the Mass Timber plant behind. The Plaza is shown being used for a mass timber demonstration and a temporary food truck stop.



## SOUTHERN EXIT OF THE SPLINE

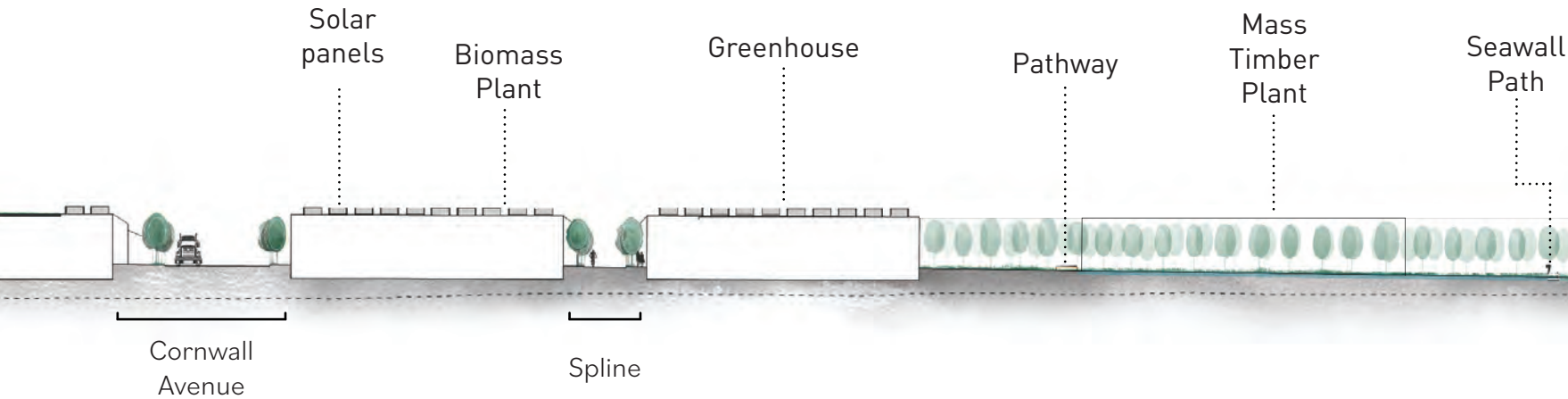


View of the southern end of the spline with the biomass and biochar plants on the left. Ahead, the shipping container passage connects people from the berm to the Mass Timber Plant's public green roof.

## CONNECTING PEOPLE TO PLACE



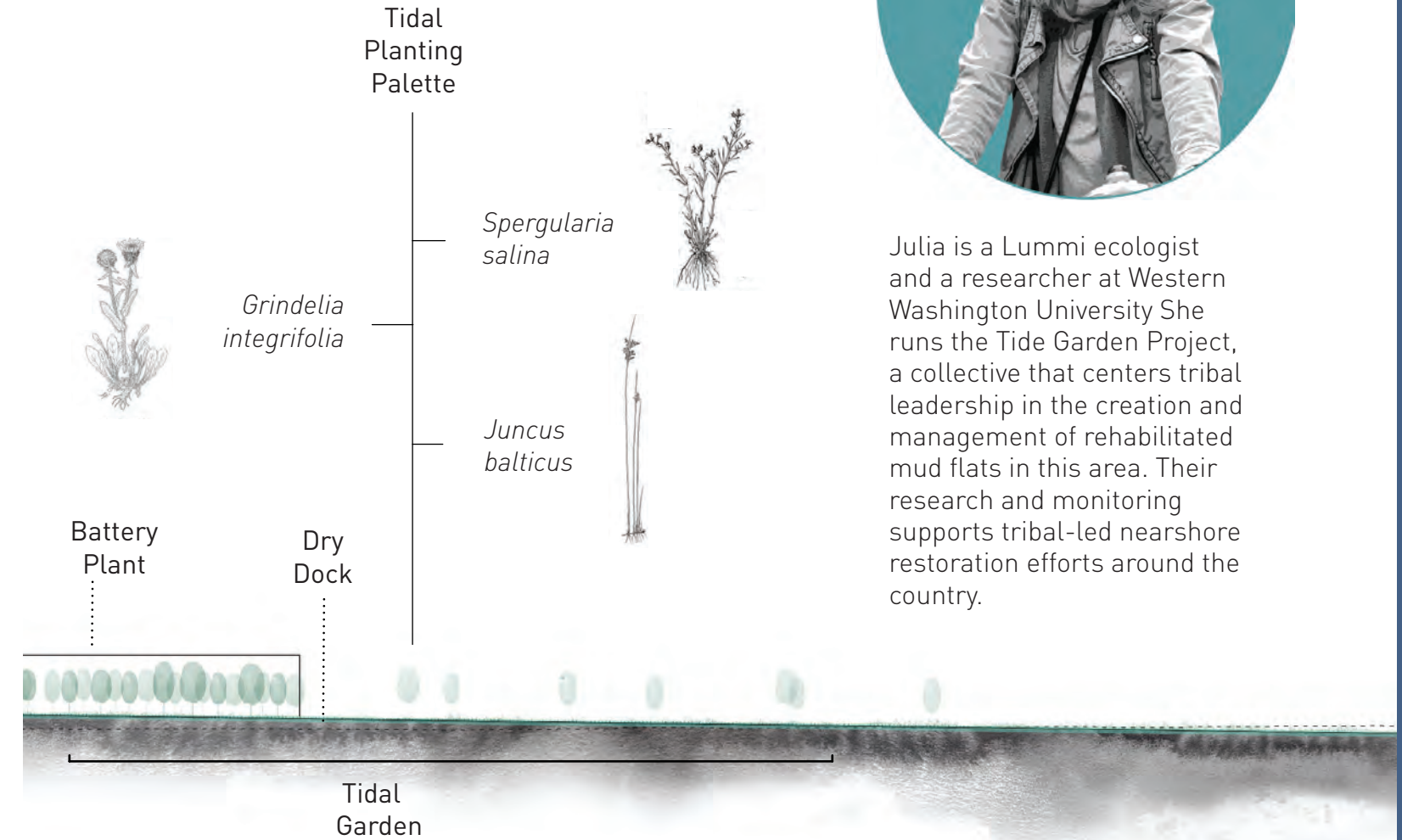
Zack is a recent graduate of Bellingham Technical College. He remembered his dad working in the timber company from the Georgia Pacific Corporation and hopes to carry on his work. Now he is employed by the Mass Timber Plant in the area and can enjoy his lunch by the water every day.



## RESEARCH-INDUSRY PARTNERSHIPS



Julia is a Lummi ecologist and a researcher at Western Washington University. She runs the Tide Garden Project, a collective that centers tribal leadership in the creation and management of rehabilitated mud flats in this area. Their research and monitoring supports tribal-led nearshore restoration efforts around the country.



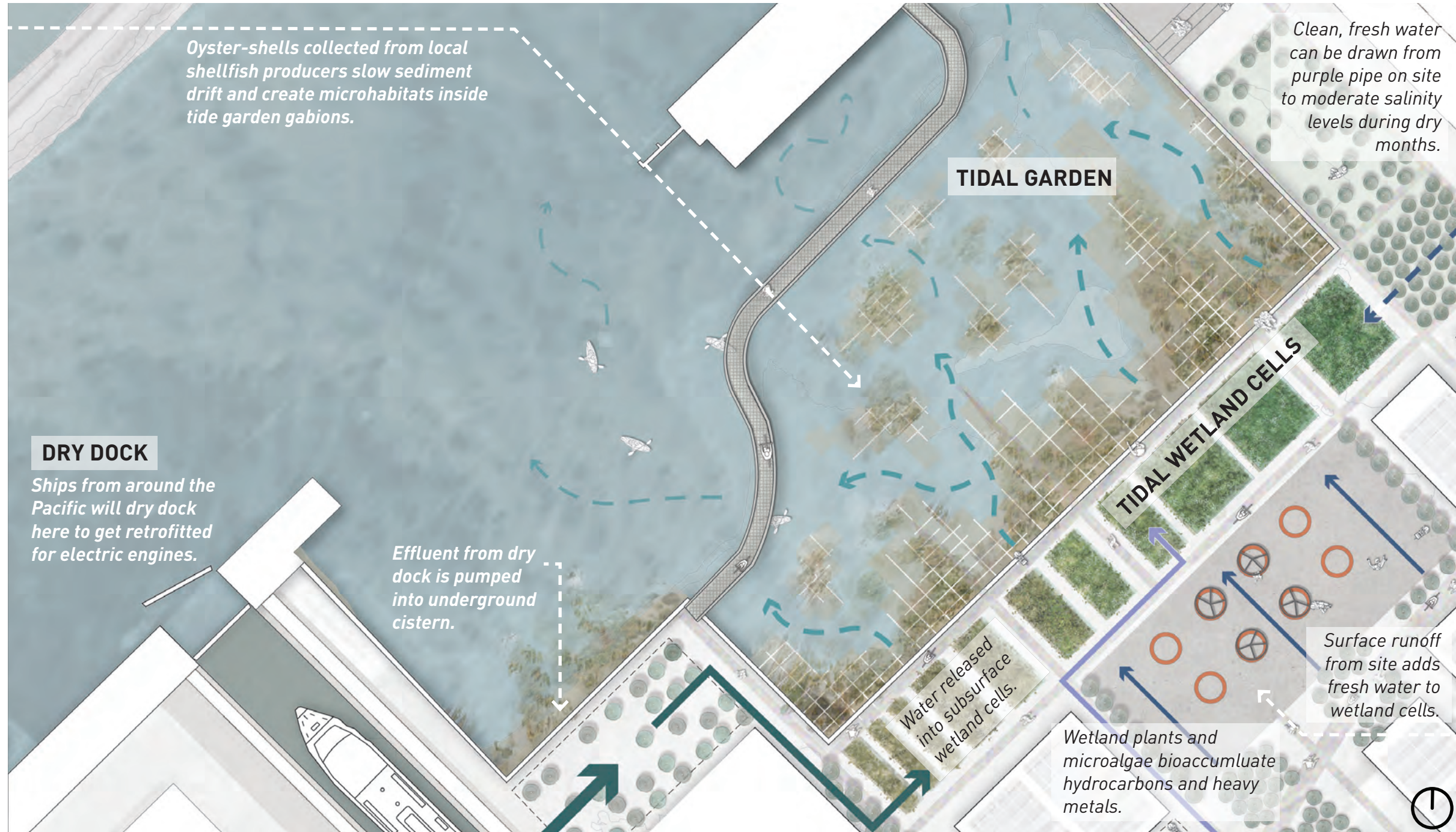
## THE TIDAL GARDEN

The tidal Garden is a connected water treatment and habitat restoration system: one where industrial wastes support life, and where 'green' is about being blue.

Typical dry docks discharge water - and water-borne chemicals and oils - directly into adjacent water bodies. Instead, ours cycles and treats water as part of the program of our symbiotic eco-district.

When ships enter the dry dock - in order to be retrofitted to run on electric batteries - water is pumped out of the dry dock and into an underground cistern.

From here, it is slowly released into a subsurface wetland cell system, where it will mix with fresh, surface runoff. Wetland plants and microfilm treat this brackish water whilst providing recreational benefits to eco-district users.



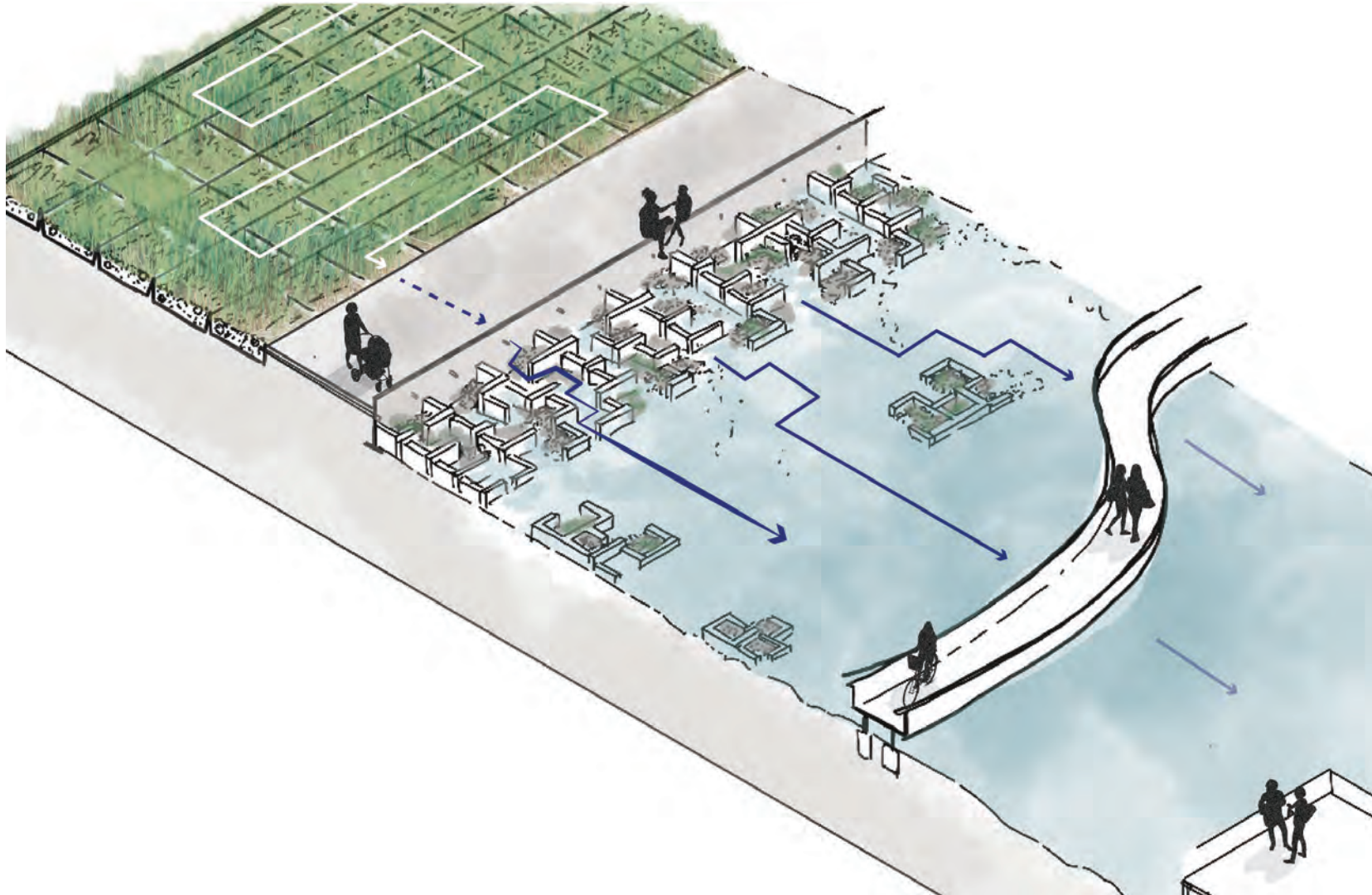
## TIDE GARDEN SITE PLAN AND WATER FLOWS

Treated, brackish water is periodically released into the tide garden, where it combines with tidal fluctuations to create a complex network of sediments and habitat.

Gabions filled with oyster-shells collected from local shellfish producers give initial form to this garden, but are eventually subsumed by the shifting sands and waters. Over time, the former log pond transforms into a rehabilitated, industrial tide flat where humans and non-humans can thrive again - and together.

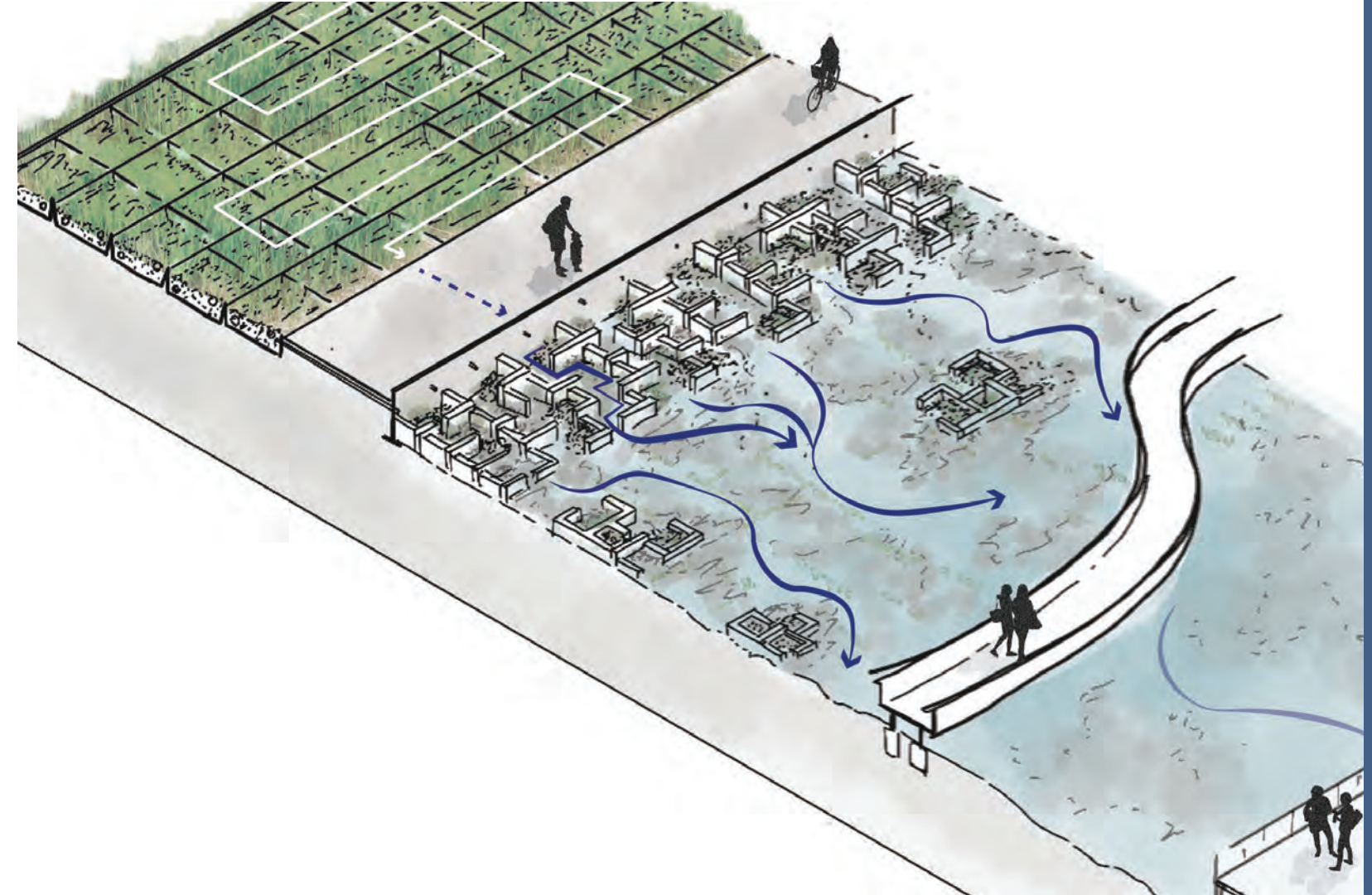
Biochar produced on-site improves water treatment and carbon sequestration in wetland cells.

## PHASE ONE



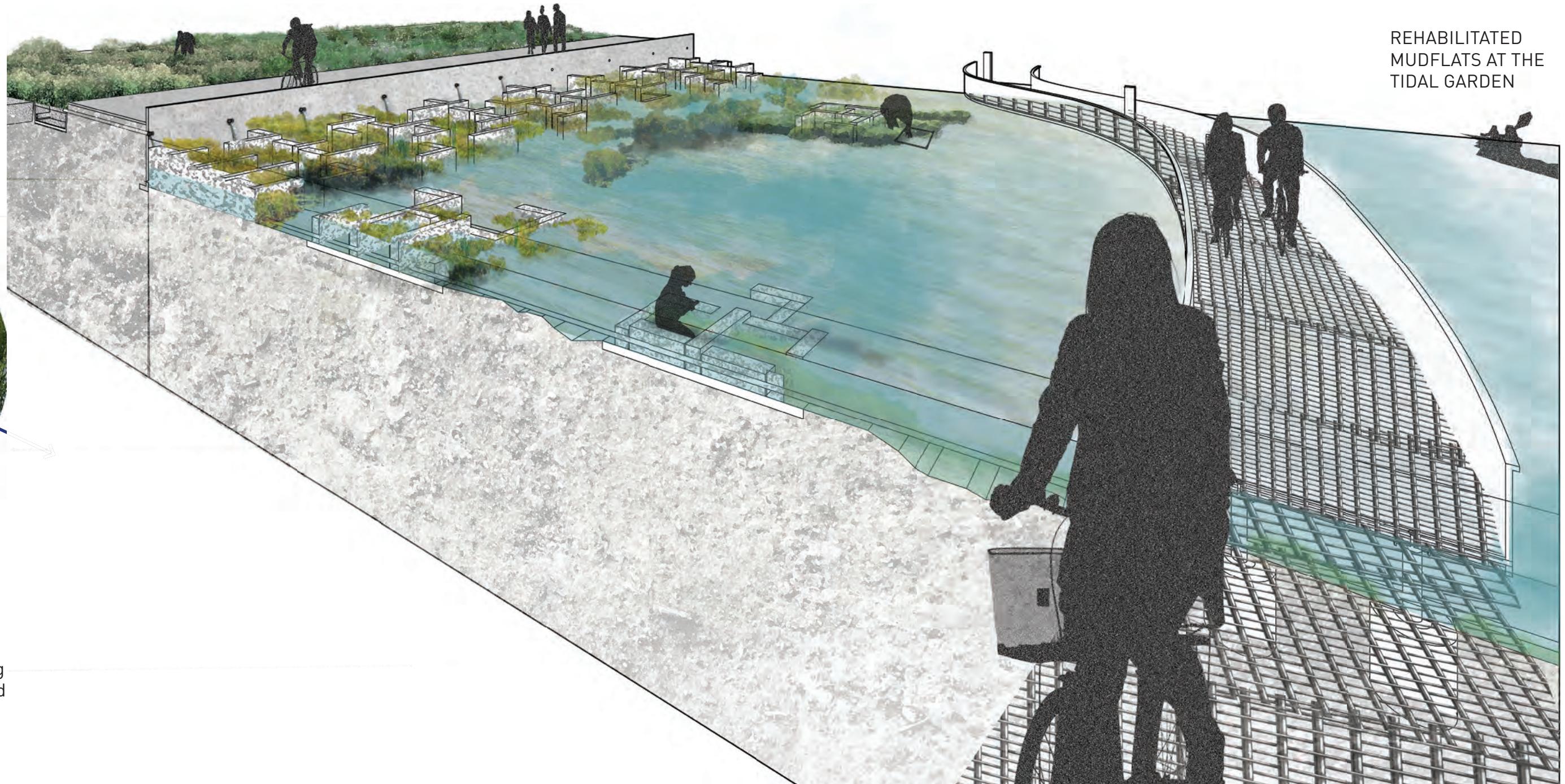
The urban grid is extended into the water using gabions filled with waste oyster shells from local shellfish producers. Some grid spaces are filled with sand, and others are left open. Treated water-flows and tidal fluctuations transform this grid into more organic channels and islands over time.

## PHASE TWO

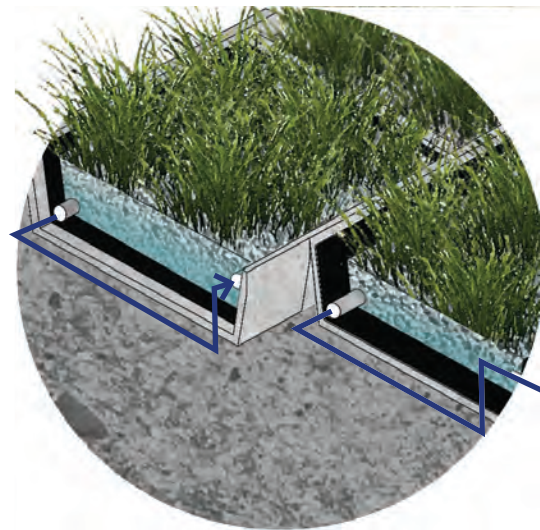


Brackish water-flows and tidal fluctuation create a complex network of channels and islands over time. Community members help stabilize sediments and build habitat by periodically planting these areas with nearshore vegetation, such as eelgrass.

### PHASE THREE



REHABILITATED  
MUDFLATS AT THE  
TIDAL GARDEN

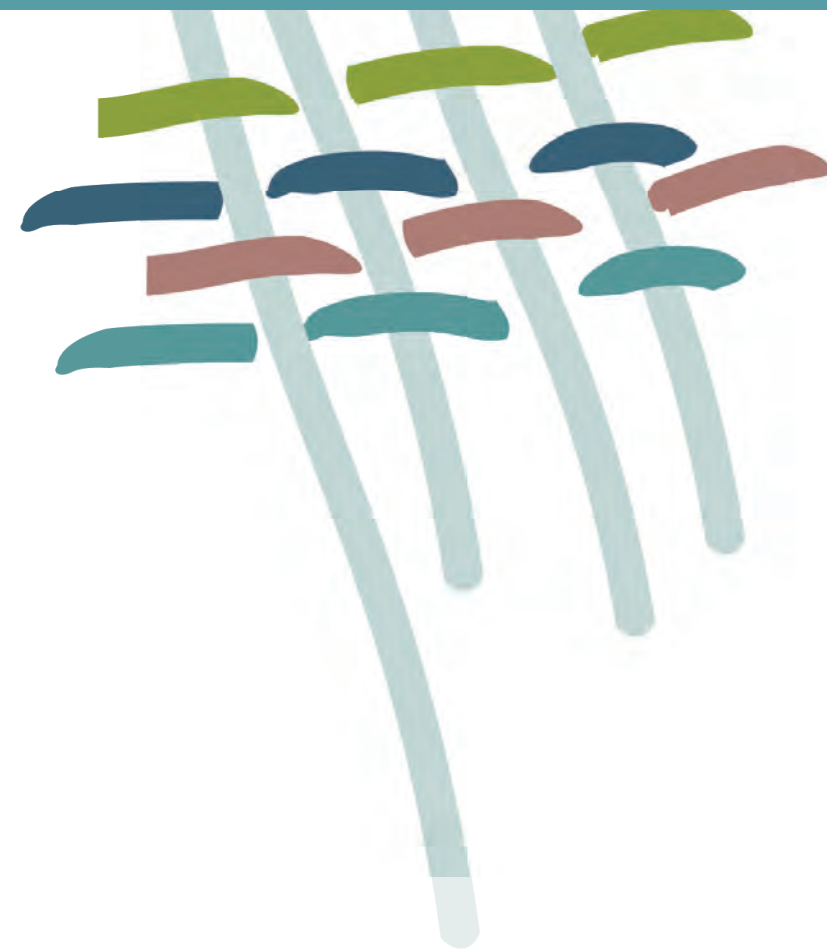


Lined concrete cells hold gravel and bioaccumulator wetland plants. Plants uptake organic nutrients in stormwater and effluent while micralgae and bacteria living on the gravel help break down chemicals. Biochar added to gravel and growing media supports water treatment and carbon sequestration.

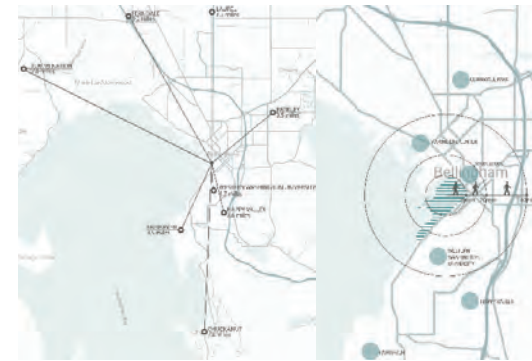


# WOVEN NETWORK

Arundhatee Sarvaiya + Autumn Davis + Phu Ngon Hnin + Yen-Chia Pan

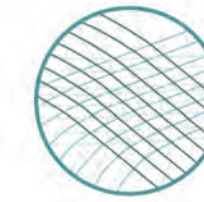


## VISION AND CONCEPT



The Bellingham Waterfront District is located west of downtown Bellingham along Bellingham Bay. The current site condition challenges include steep slopes and a lack of access for pedestrians.

The Woven Network proposal focuses on connecting the greater Bellingham Area to the Waterfront District with the goals of ceating a vibrant waterfront that provides equal access for all.



WOVEN NETWORK



VIBRANT WATERFRONT



EQUAL DESIGN



PROPOSED NETWORKS WOVEN INTO DOWNTOWN AND WATERFRONT

- NODES
- DESTINATIONS
- WATERFRONT
- PROPOSED NETWORK
- FUTURE NETWORK
- EXISTING NETWORK

# CLIMATE MITIGATION

## CARBON REDUCTION PLAN

The average annual carbon footprint per person in the United States is 16 tons with America being the second highest carbon emitting country in the world.

Using the Fairhaven Waterfront as a base line, our proposal increases pedestrian and bike access while reducing car access, thereby encouraging people to reduce their carbon footprint.



FAIRHAVEN: 18 sq.mile



PROJECT AREA: 18 sq.mile

### AVERAGE CARBON FOOTPRINT PER PERSON IN THE UNITED STATES



### AVERAGE CARBON EMISSIONS PER MILE

Source: Emissions from a Typical Passenger Vehicle (2020). EPA.



**PEDESTRIAN ACCESS**  
4.58 miles  
INCREASE by 51%

**BIKE ACCESS**  
3.8 miles  
INCREASE BY 33%

**CAR ACCESS**  
2.6miles  
REDUCE BY 35%



### PHASE 1

- Laurel Street Connection
- Cornwall Beach Connection



### PHASE 3

- Berm Development



### PHASE 2

- Millworks Connection
- Waterfront Edge Development
- Water Bridge

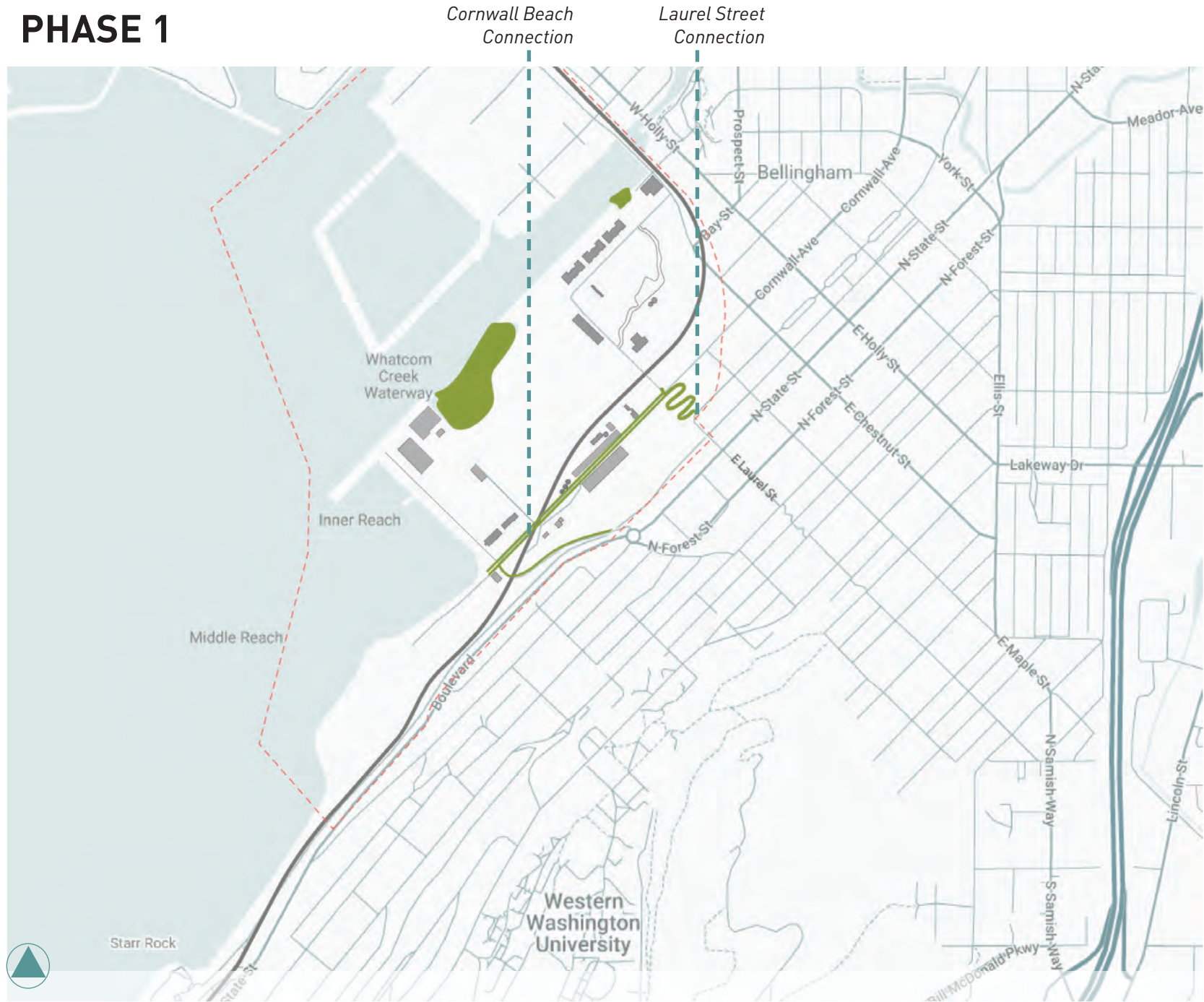


### PHASE 4

- Bay St. Parking

# 4 PHASES

# PHASE 1



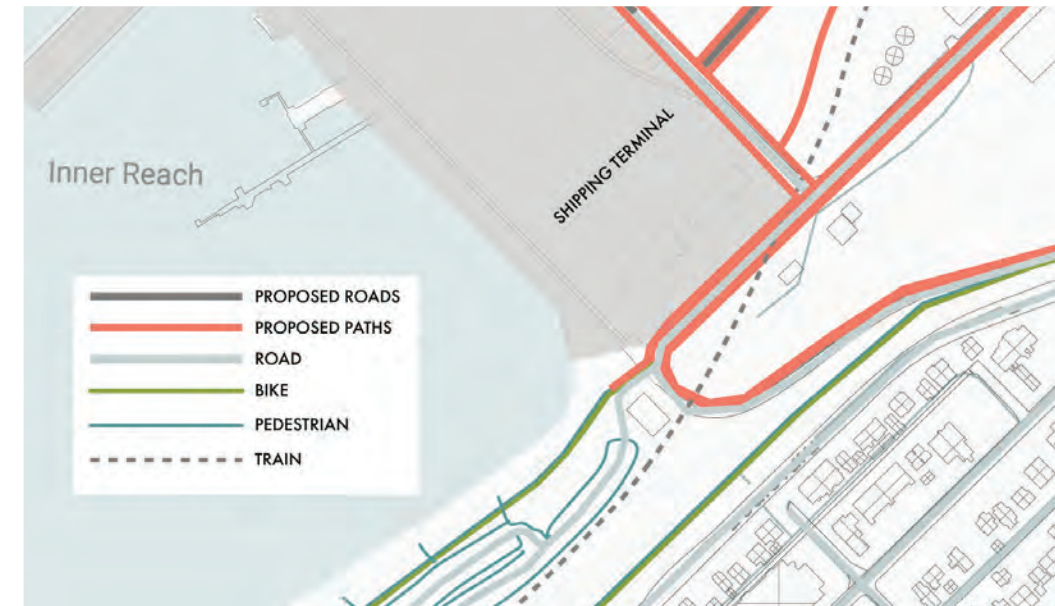
# PHASE 1

During the first phase of our plan, the Laurel Street Connection is a pedestrian and bike path that connects the Waterfront District to the greater Bellingham area. This connection helps address the 40'+ grade change between the existing streets.

The Cornwall Beach Connection provides additional bike and pedestrian paths connecting the South Bay Trail and Cornwall Beach to the Waterfront District.

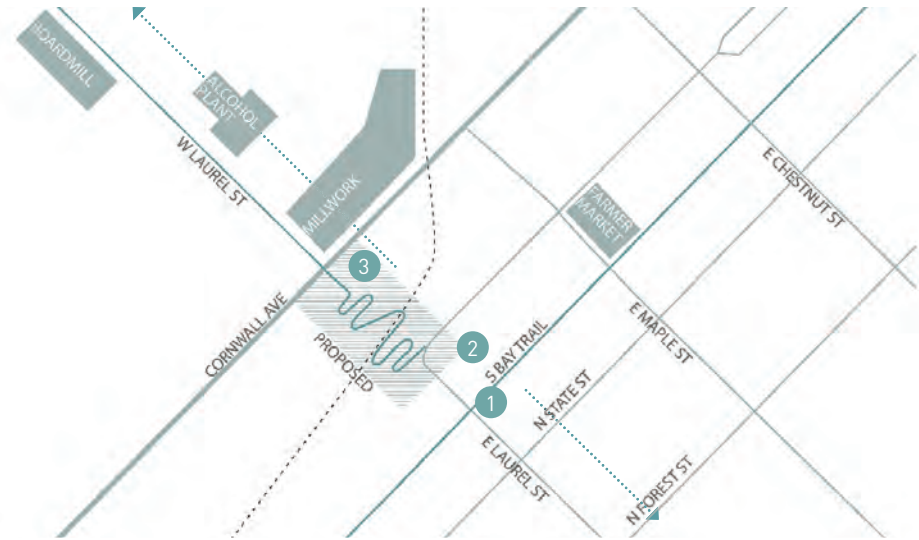


LAUREL STREET CONNECTION



CORNWALL BEACH CONNECTION

# LAUREL STREET CONNECTION

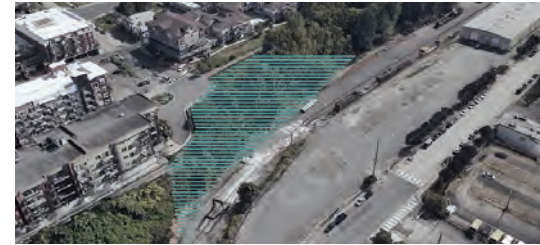


Currently, due to the challenging steep slope and underutilized street edge, W Laurel St and E Laurel St are disconnected. However, W Laurel St presents a significant opportunity for creating a continuous connection between the downtown and waterfront areas.

The proposed network is essential, not only for connecting these two areas, but also for establishing social and interactive spaces for existing and new residents, visitors, and tourists. This network can serve as places where people can gather, interact, and participate in various activities together.



1. E LAUREL ST DEAD END

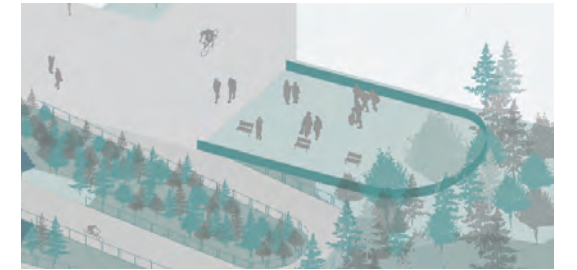
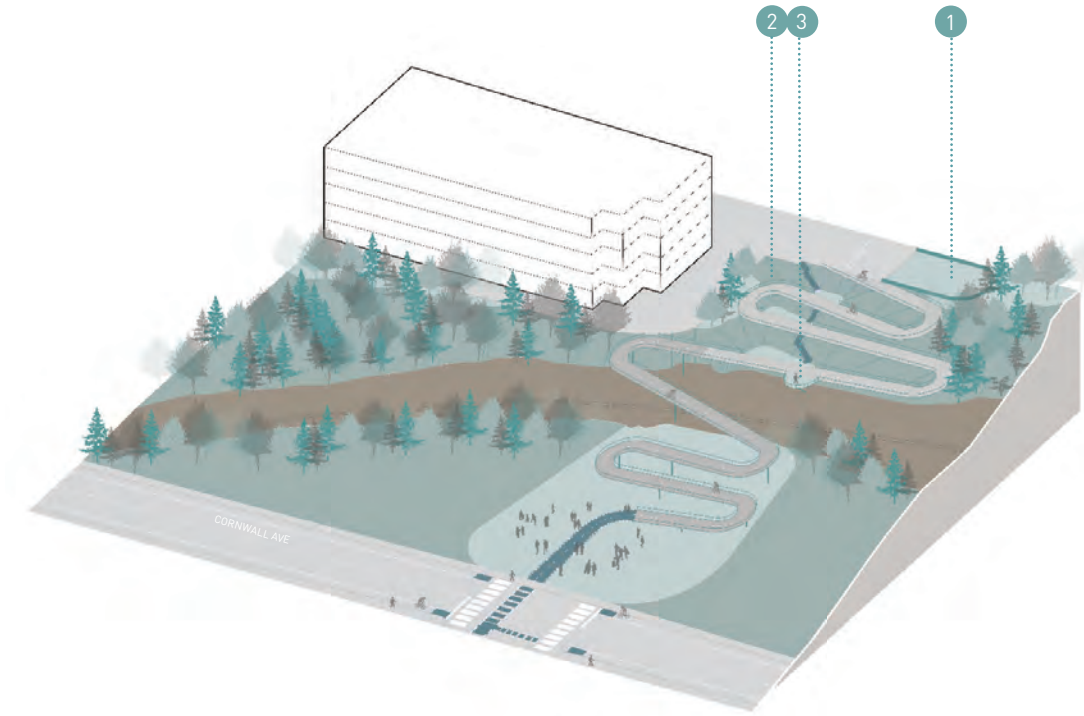


2. STEEP SLOPE



3. UNDERUTILIZED STREET EDGE

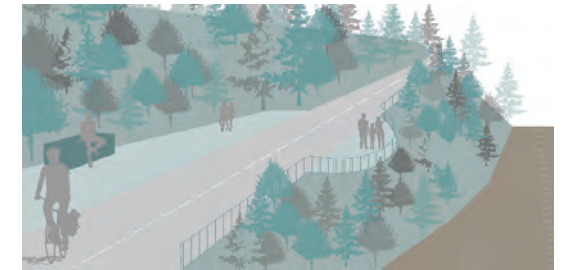
# CONNECTING W LAUREL ST AND E LAUREL ST



1. VIEWPOINT AND SHARED BIKE STAND AREA

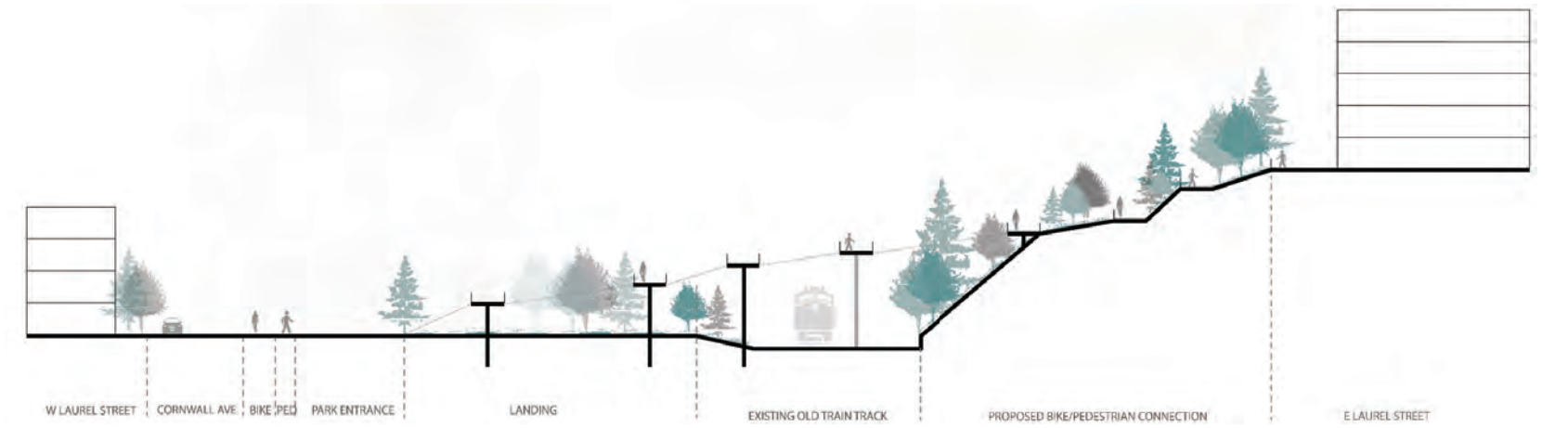
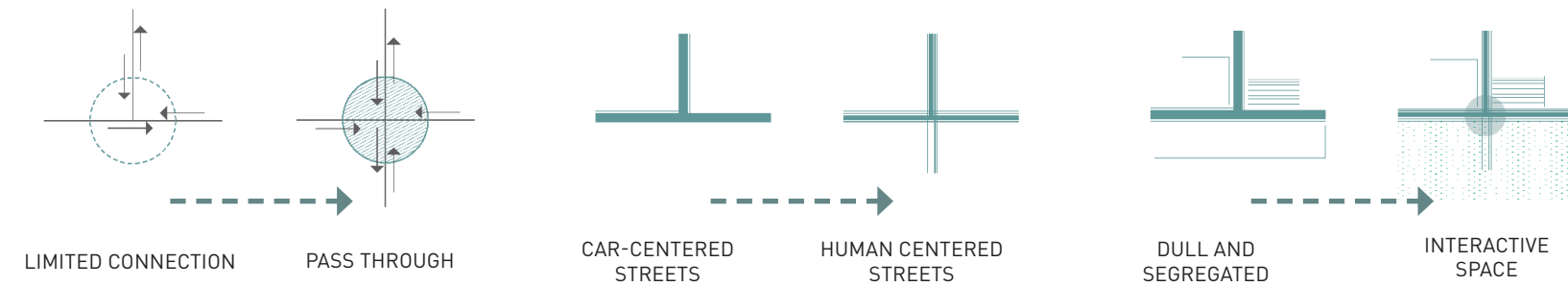


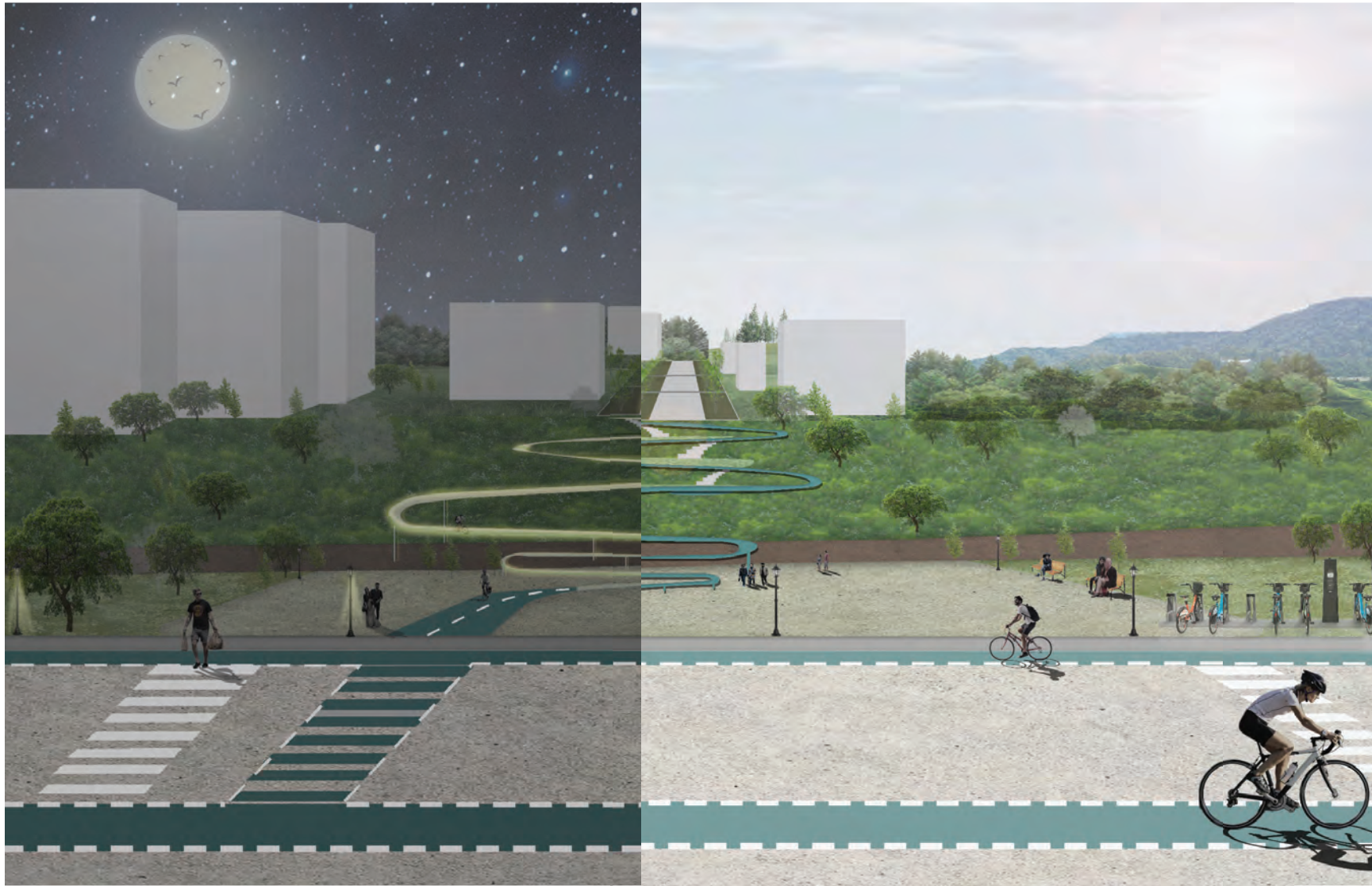
2. POCKET PARK



3. BIKE/PEDESTRIAN ACCESS WITH VIEWDECK

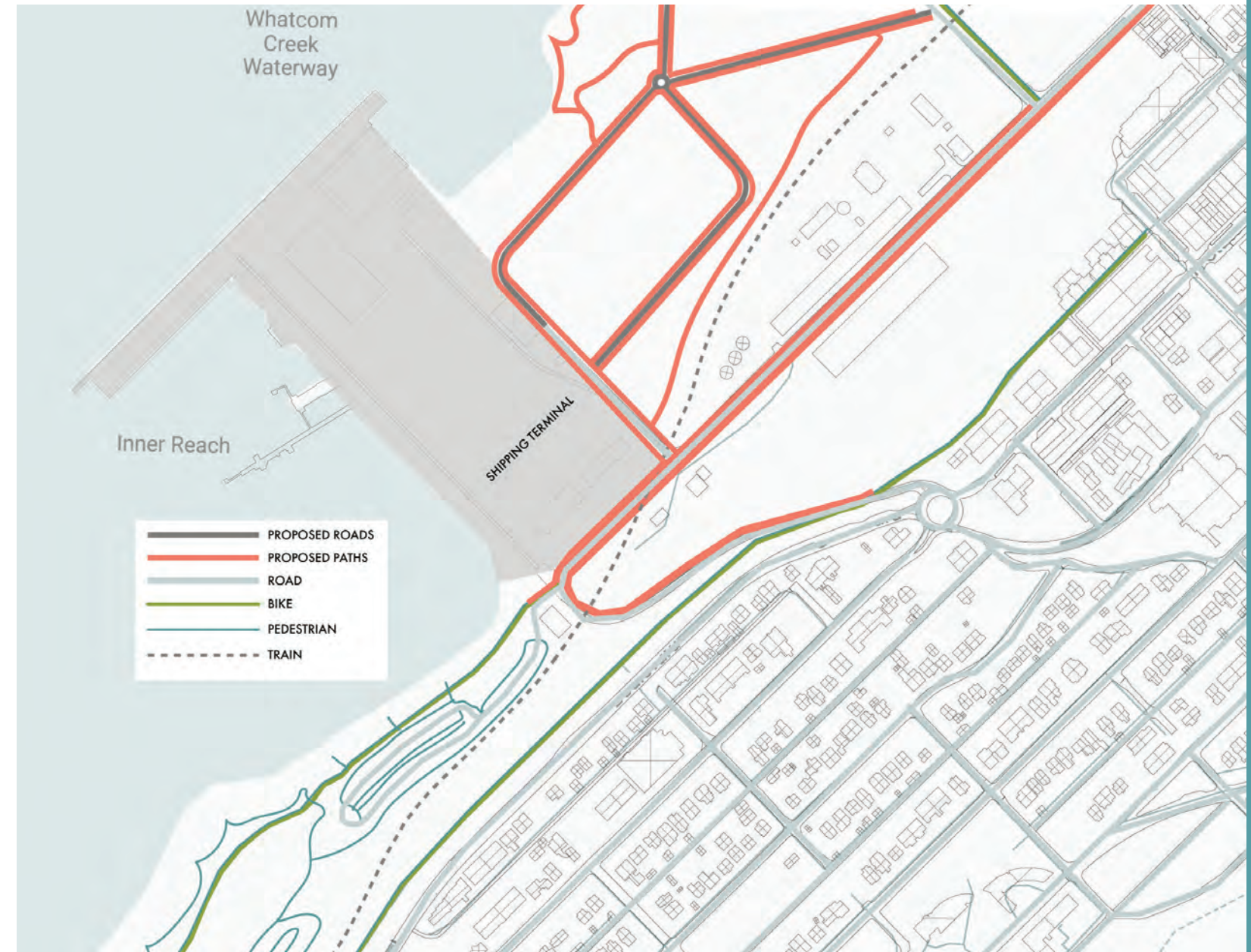
# CONSTRAINTS AND OPPORTUNITIES



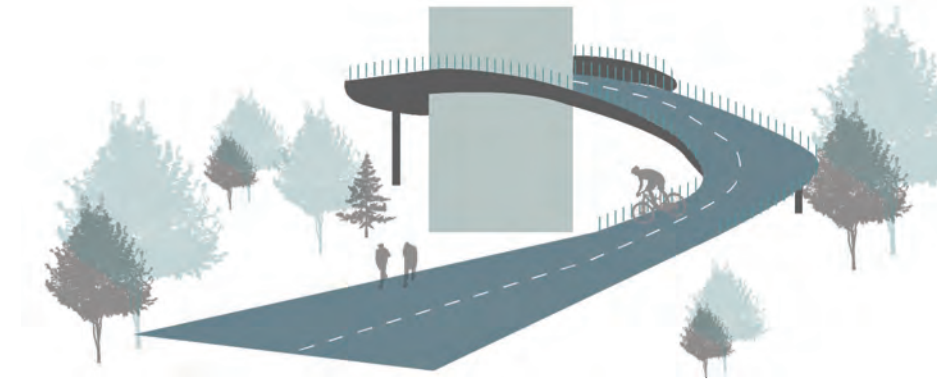
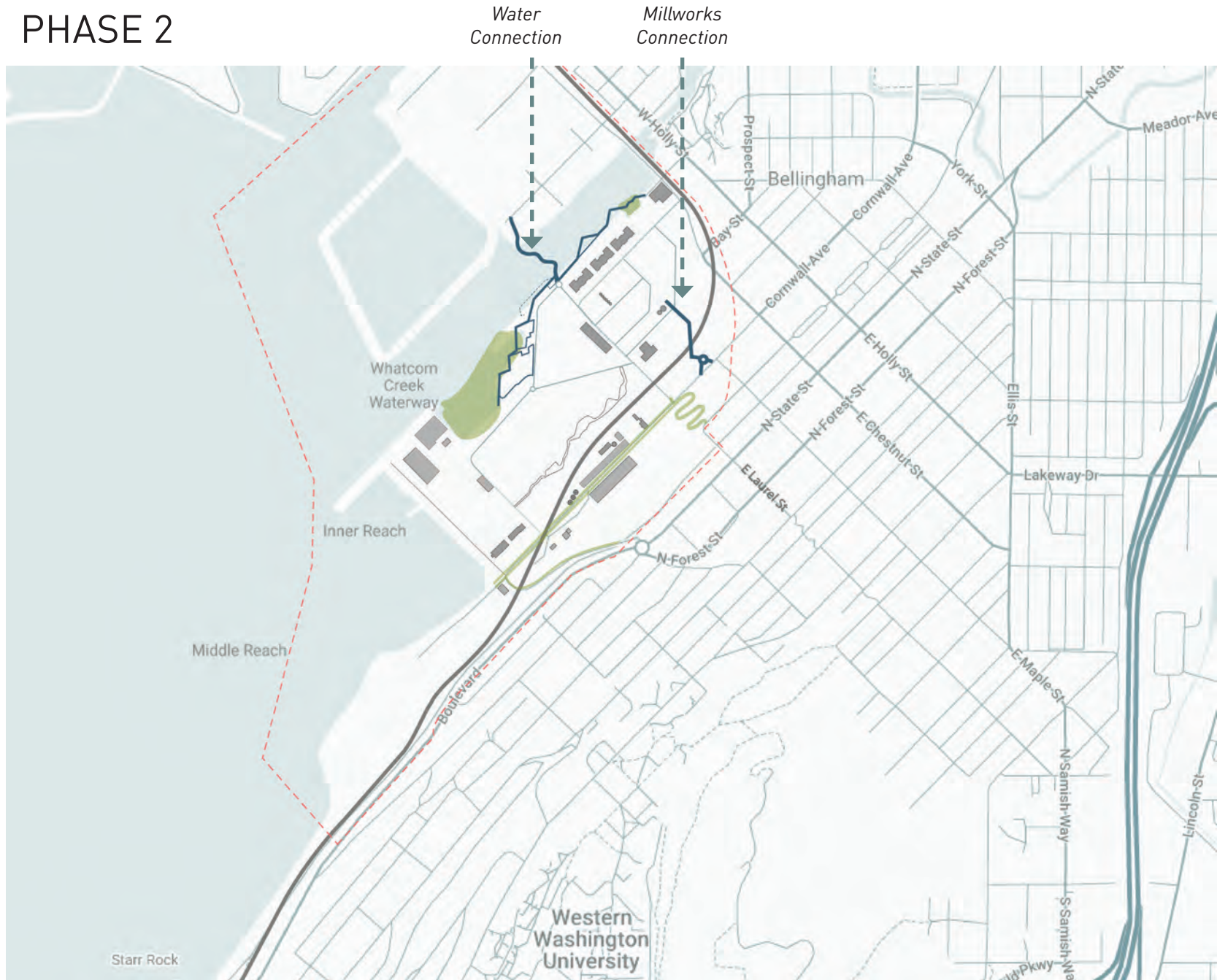


BIKE AND PEDESTRIAN CONNECTION: VIEW FROM W LAUREL ST TO E LAUREL ST

## CORNWALL BEACH CONNECTION



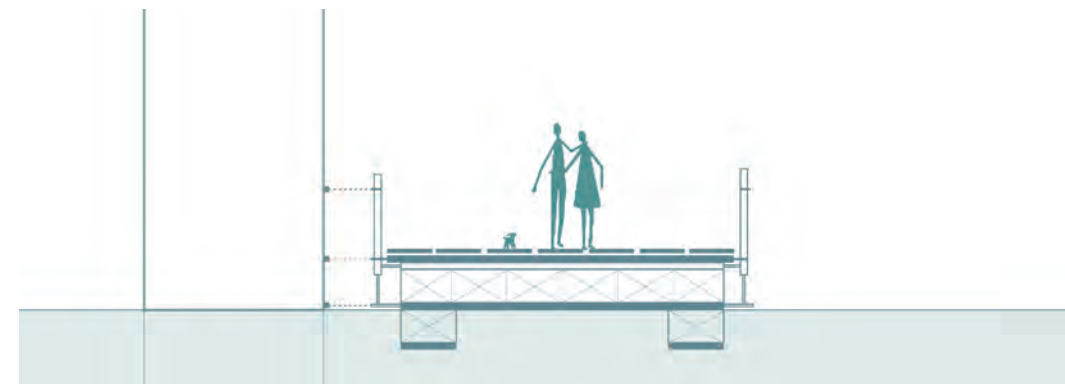
# PHASE 2



MILLWORK CONNECTION



WATERFRONT EDGE DEVELOPMENT



WATER BRIDGE

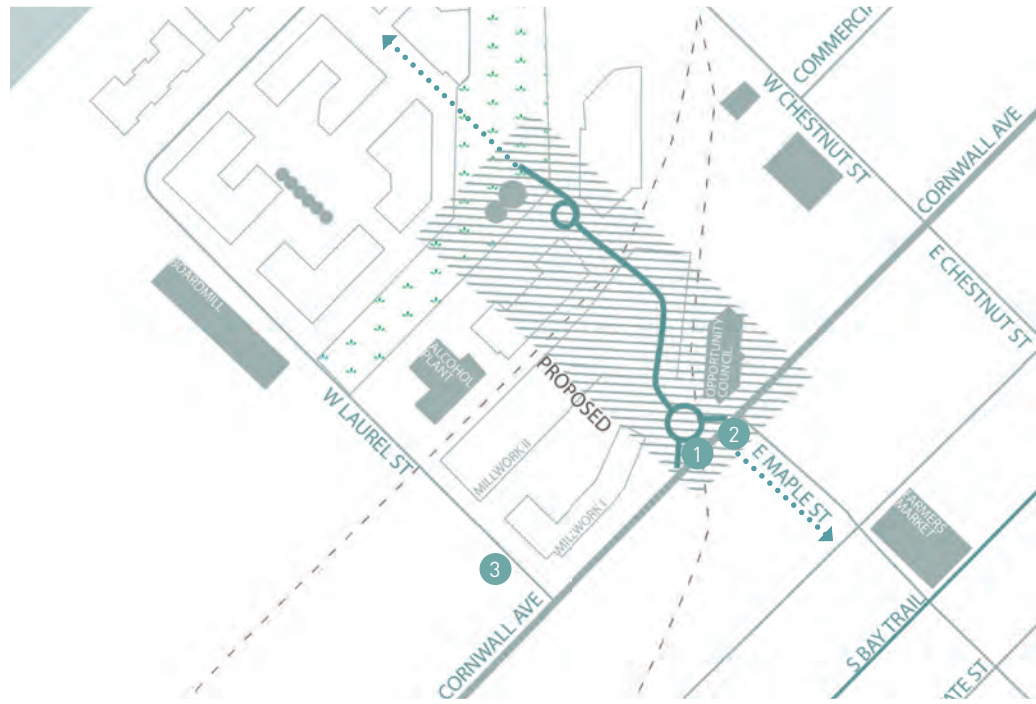
# PHASE 2

During the second phase of development, the Millworks Connection will provide bike and pedestrian access to the future Millworks project, which will provide affordable housing and a food campus.

The waterfront edge will become an active destination for play and recreation.

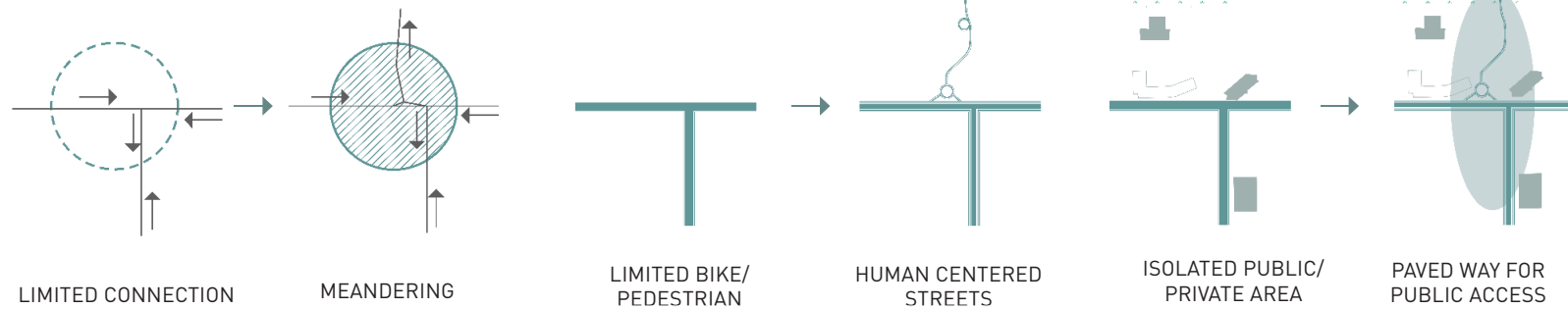
The Water Bridge will be a bike and pedestrian pathway that connects Laurel Street to the ASB pond, further connecting the Waterfront District to Bellingham's Downtown.

# MILLWORKS CONNECTION



Existing site conditions identified limited accessibility for pedestrians and no connected path for bikes. The proposed bike and pedestrian bridge navigates people from E Maple St to Millwork and Sub-Area Plan Park area allowing a flow of continuous movement. In addition, bike riders and pedestrian may have a great view of waterfront from the bridge.

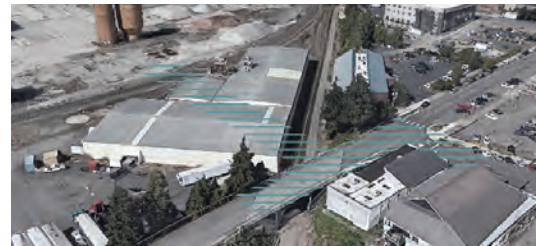
## CONSTRAINTS AND OPPORTUNITIES



# ELEVATED BIKE AND PEDESTRIAN BRIDGE



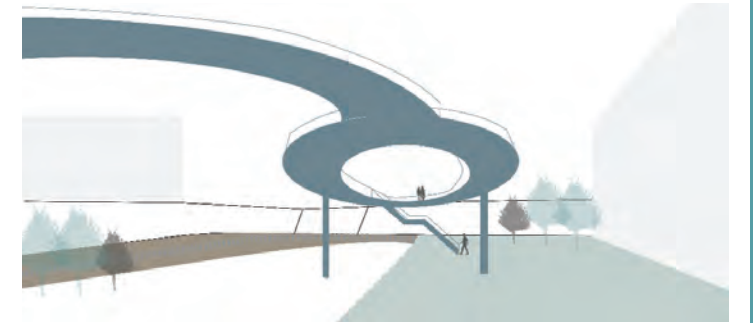
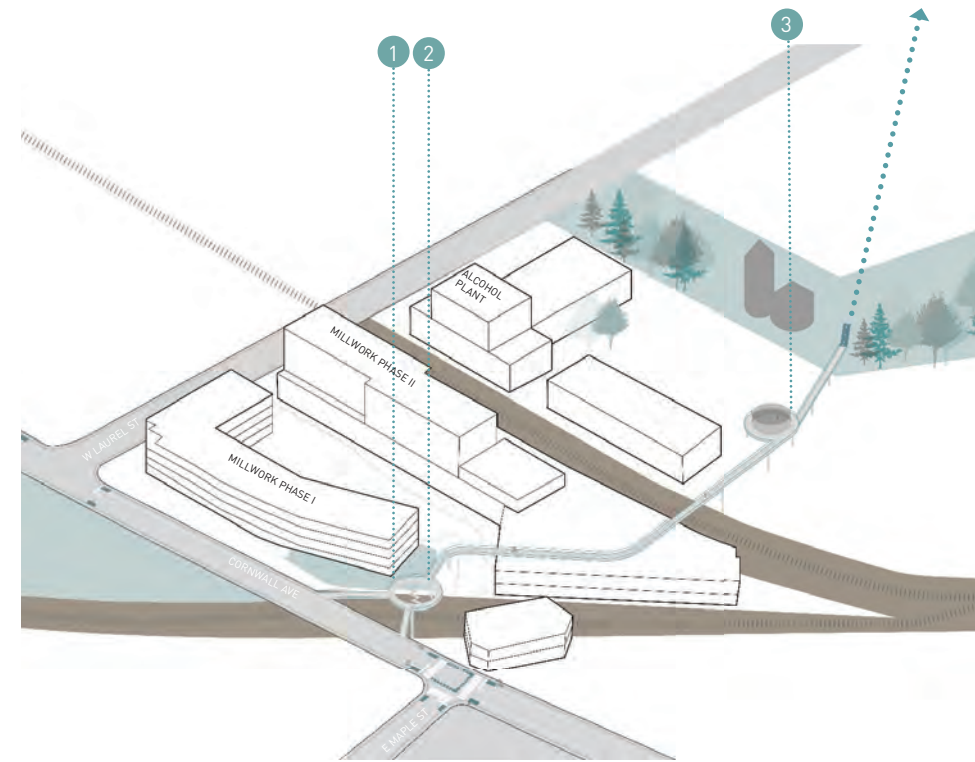
1. NO PEDESTRIAN ACCESS



2. POTENTIAL ACCESS FROM E MAPLE ST



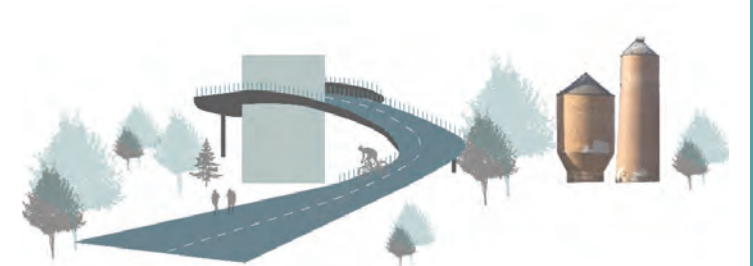
3. NO ADA ACCESS FOR SLOPE CHANGE



1. ACCESS BETWEEN MILLWORKS AND CORNWALL AVE



2. VIEW TOWARD CERAMIC TOWERS AND WATERFRONT



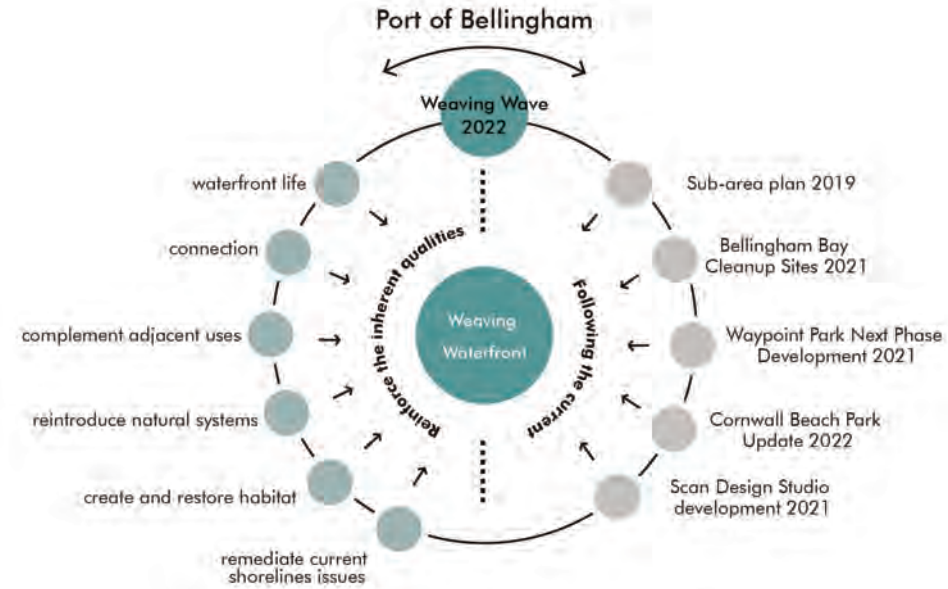
3. ADA ACCESSIBLE ELEVATOR AND BIKE BRIDGE



# WATER CONNECTION

## VISION

The proposed design aims to create a vibrant and sustainable recreational and habitat space by extending Waypoint Park, constructing a new wharf, and developing the log pond. We are building on the ongoing efforts of the Port of Bellingham, with a focus on environmental, social, and economic benefits. Our design includes creating new recreational opportunities, promoting habitat restoration and preservation, and creating ecologically and economically sustainable features.



### environmental benefits



habitat restoration      flooding mitigation      reshaping shorelines

### social benefits



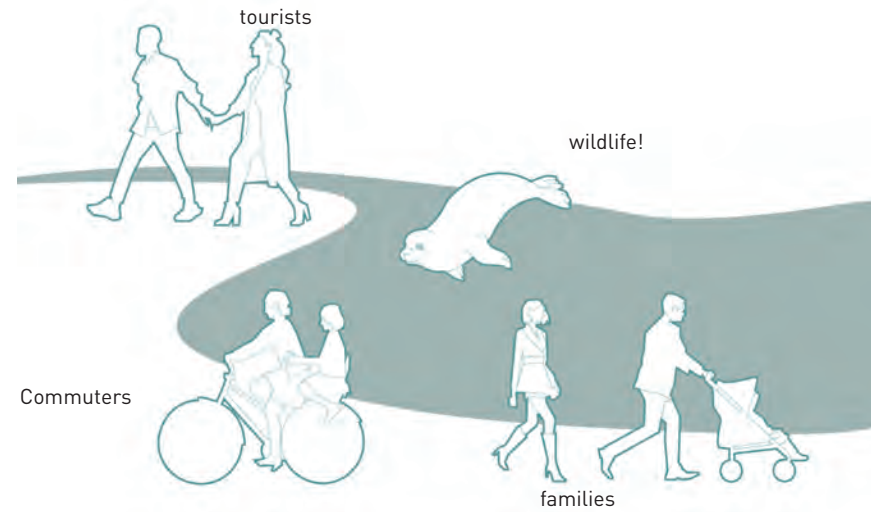
health & well-being      recreation & access

### economic benefits



property value & income

## WHO IS THE END USER?



## SEA LEVEL RISE FLOODING EXTENT



## 10/50 YRS EVENT FLOODING EXTENT



## ISSUES & INTERVENTIONS

The impact of sea level rise and potential 10/50-year events are significant concerns for the waterfront edge. As such, our design has prioritized addressing these issues through four distinct interventions as the first phase.

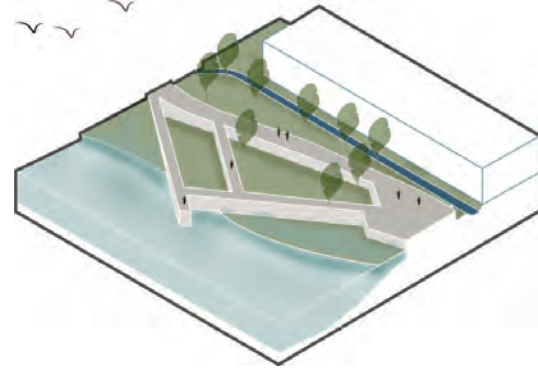




## WAYPOINT PARK EXTENSION

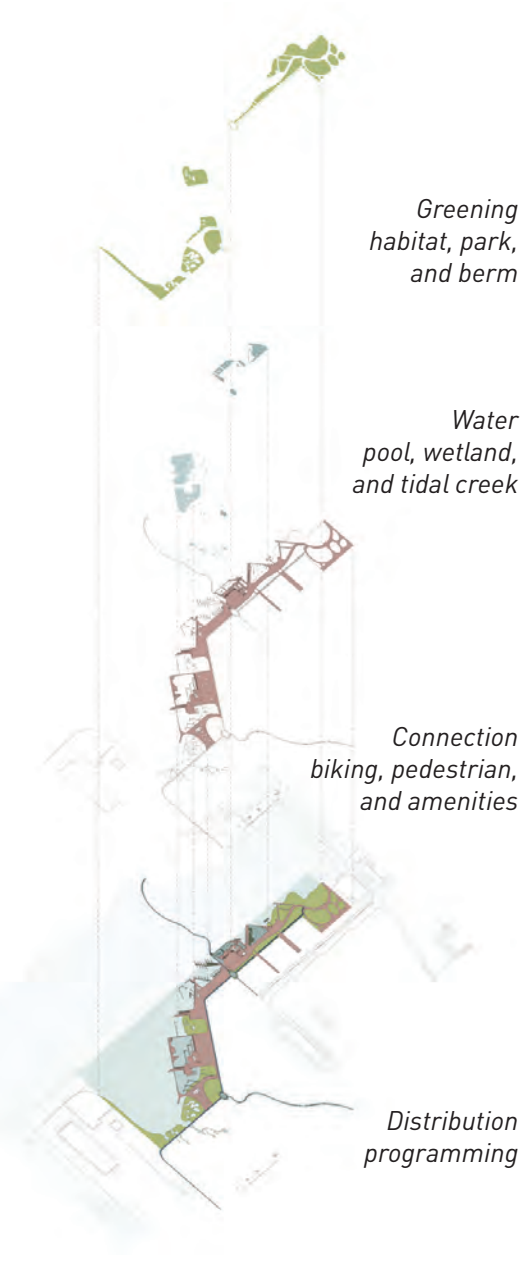


A more welcoming and pedestrian-friendly space along the waterfront uses design to ease potential conflicts between bikers and pedestrians. Shorelines are softened, establishing a more friendly space for both wildlife and people. A structural walkway provides a safe and comfortable space for people to enjoy the water's edge, regardless of tidal movement.



- legend
- 1. vista
  - 2. kayak
  - 3. pedestrian
  - 4. bike lane
  - 5. condo
  - 6. Waypoint park
  - 7. softening edge

PLAN VIEW OF WAYPOINT PARK EXTENSION



*Greening habitat, park, and berm*

*Water pool, wetland, and tidal creek*

*Connection biking, pedestrian, and amenities*

*Distribution programming*

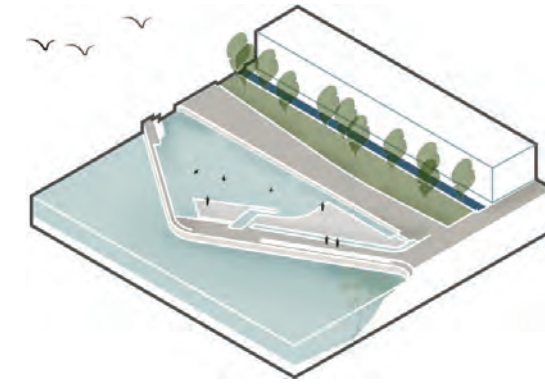
WATERFRONT PROGRAMMING

## RECREATIONAL WATERFRONT

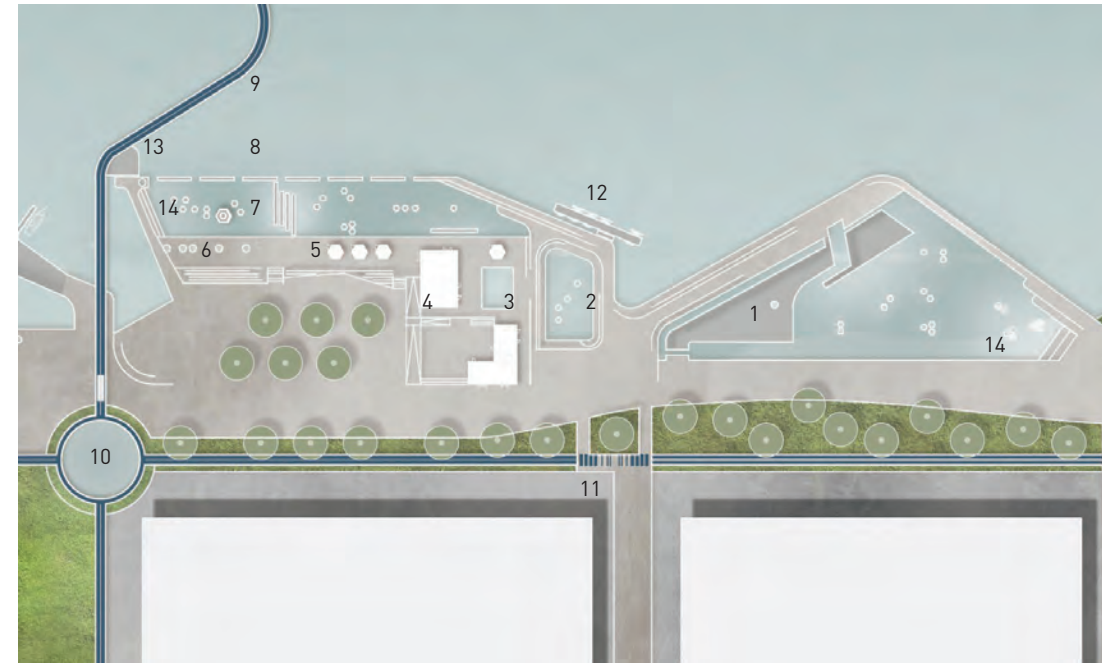


The design proposal includes replacing the existing wharf with a new recreational, accessible, and flexible waterfront edge. This is achieved through several major interventions, including the construction of a fixed-board walkway and floating raft.

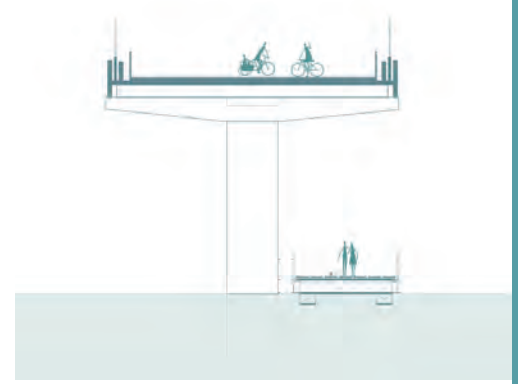
We also aim to enhance the area by incorporating a range of programming, including facilities for a sauna and hot tub, all of which will be integrated with a district energy system.



SWMMING POOL



PLAN VIEW OF RECREATIONAL WATERFRONT



BIKE BRIDGE



FLOATING WALKWAY

- legend
- 1. raft platform
  - 2. kids pool
  - 3. pets pool
  - 4. mixuse facilities
  - 5. sauna
  - 6. hot tub
  - 7. swimming
  - 8. protection
  - 9. bike bridge
  - 10. fountain
  - 11. Intersection
  - 12. kayak
  - 13. floating walkway
  - 14. floating structure



## RECREATIONAL WATERFRONT

Pedestrian and recreational areas are graded to create smooth transitions between spaces. This approach ensures that the pedestrian and recreational areas well-defined. The recreational area features a hot tub, sauna, and facilities providing relaxation and enjoyment of the

VIEW OF THE SWIMMING AREA, HOT TUB, FLOATING WALKWAY, AND BIKE BRIDGE

waterfront views. To create a safer and more accessible connection to the ASB pound, a bike bridge allows commuters to easily cross the waterway. Users can enjoy activities such as jumping into the water, relaxing on the beach, and watching the sunset during a sauna

session. The proposed design will provide a functional, beautiful, and accessible waterfront space that meets the needs of a diverse range of users.

## THE NEW WHARF



The proposed design involves replacing the existing coverage of the GP wharf with new overwater structures. The depths along the existing wharf face range from -10 feet to -22 feet, which are lower than the low water mark (MLLW).

To accommodate the tidal dynamics of the Whatcom Waterway, which is generally 400+ feet wide with maximum channel depths ranging from -30 feet to -20 feet MLLW, the proposed design incorporates fixed-structure and floating structure. The design also includes visitor moorage that aligns with public access to the downtown area, parks, streets, and trails, and can accommodate sailboats and kayaks.



PLAN VIEW OF NEW WHARF WITH SAIL BOAT & KAYAK RENTALS



WETLAND & EDUCATIONAL AREAS

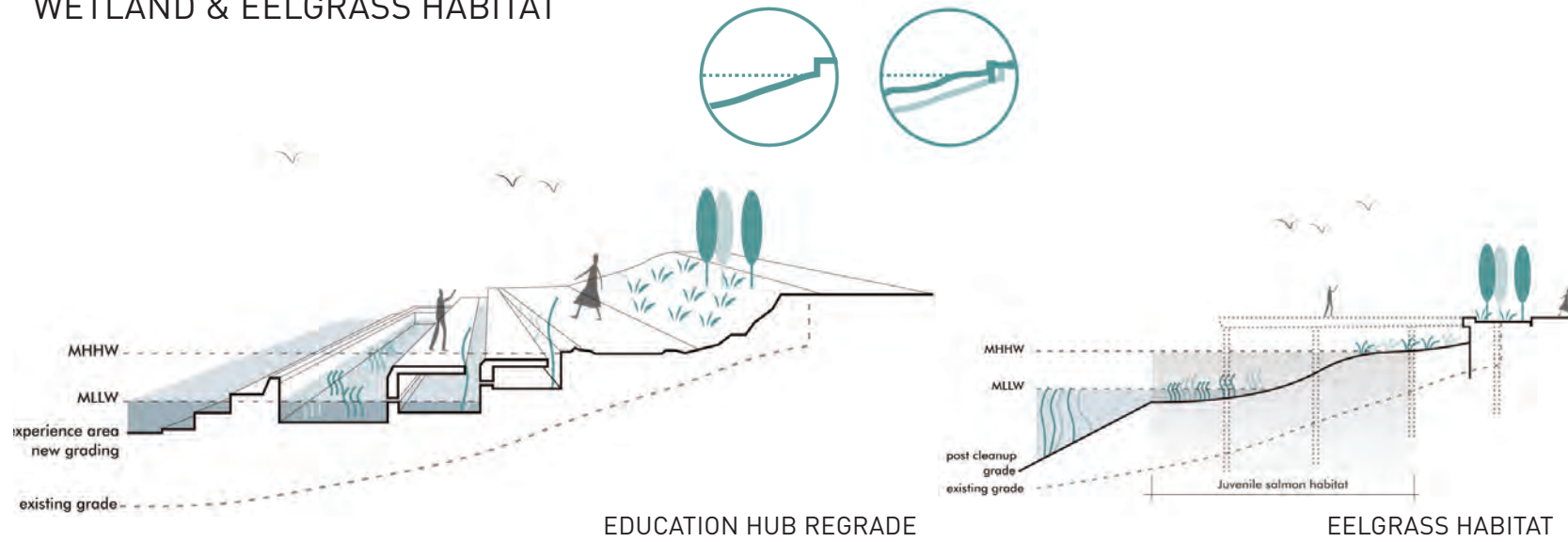
## WETLAND & EELGRASS HABITAT



The log pond area serves as an ideal location for both flood mitigation and habitat preservation. The proposed design will consider a more shallow topography to mitigate the potential impact of water disasters. As the tide moves, the area will reveal various environments such as tidal creeks and wetlands.

This restored wetland and eelgrass habitat also aims to contribute to the ecological health of wildlife such as seals and juvenile salmon.

## WETLAND & EELGRASS HABITAT



EDUCATION HUB REGRADE

EELGRASS HABITAT



EDUCATIONAL HUB & TIDAL CREEK

- 1. experience
- 2. educational HUB
- 3. gathering area
- 4. tidal creek & wetland
- 5. flooding mitigation
- 6. berm area

### EDUCATION HUB



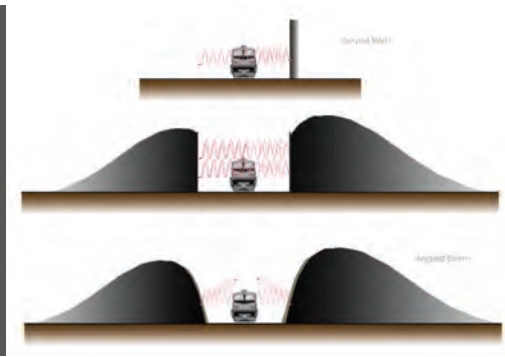
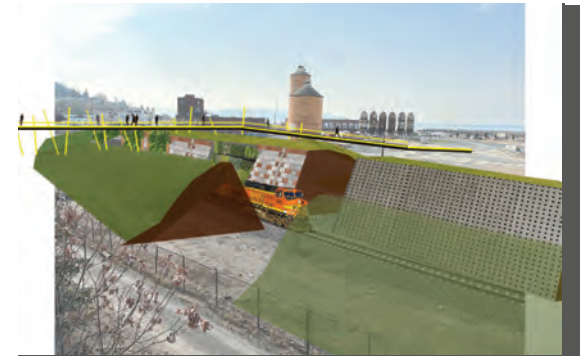
An educational hub will be located at the artificial boardwalk area, providing easy access to the shallow pond and creating different experiences for visitors during high and low tides. Additionally, small pools serve as opportunities for children to access and engage with the water. This will provide educational opportunities for future generations and attract different users to the waterfront.



VIEW FROM THE EDUCATION HUB

The proposed design for the education hub aims to blur the line between interior and exterior spaces, creating a sense of transparency and visual connection. The use of natural lighting during the day will minimize energy consumption, contributing to the overall sustainability of the project.

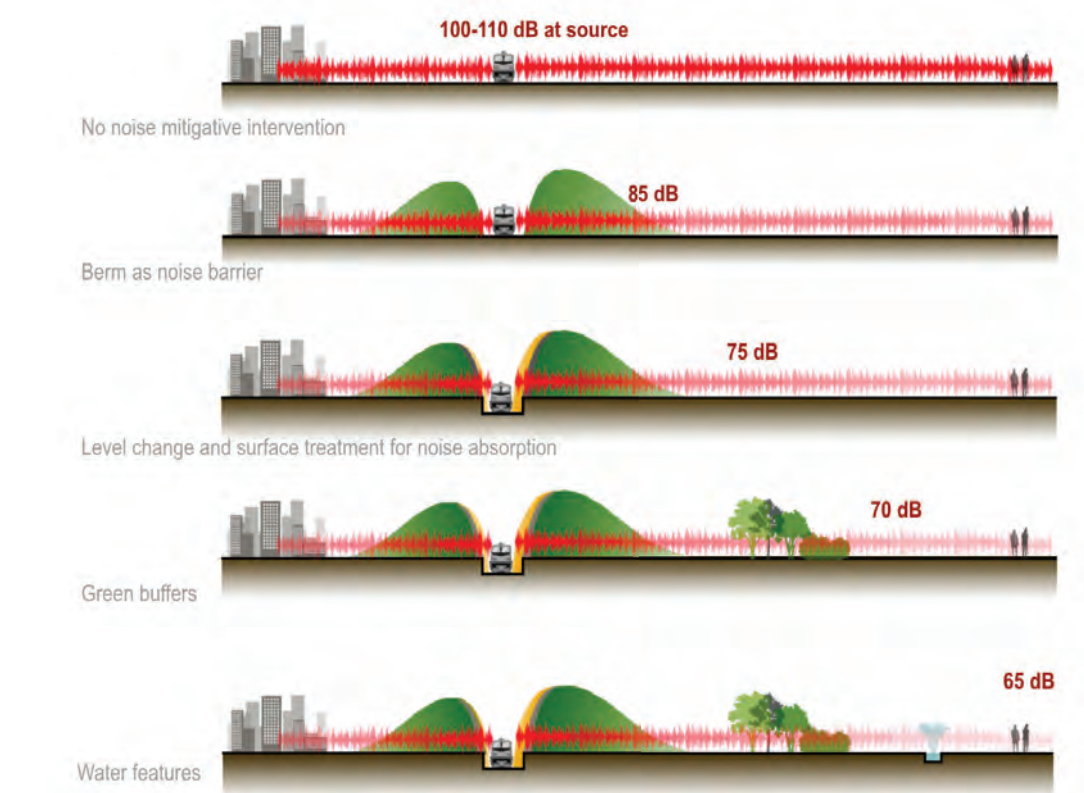
In addition to creating a new look for the area, the design takes into account the importance of environmental preservation, providing habitats for wildlife and educational opportunities for future generations.



### BERMS

During the third plan of the phase the train on the site and the noise arising from it is addressed by the way of building a berm through the length of the north edge of the site. While this is meant to play a big role in noise mitigative intervention, it is also an element of connection, a path and a space for public activity.

The noise is expected to be reduced considerably by using layered noise mitigation strategies. The berm itself is should reduce the noise level by about 10 decibels. While this might not seem much, it really means it reduces the impact of the train noise by almost half. Additional steps such as surface treating the berm with sound absorptive materials (acoustic blankets, panels and green walls), using green buffers and water features all help in either reducing the noise further or masking it, therefore providing aural relief.



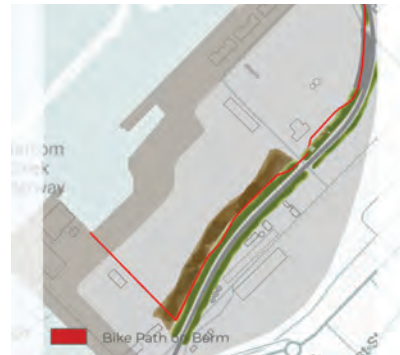
NOISE MITIGATION STRATEGIES

# BERMS

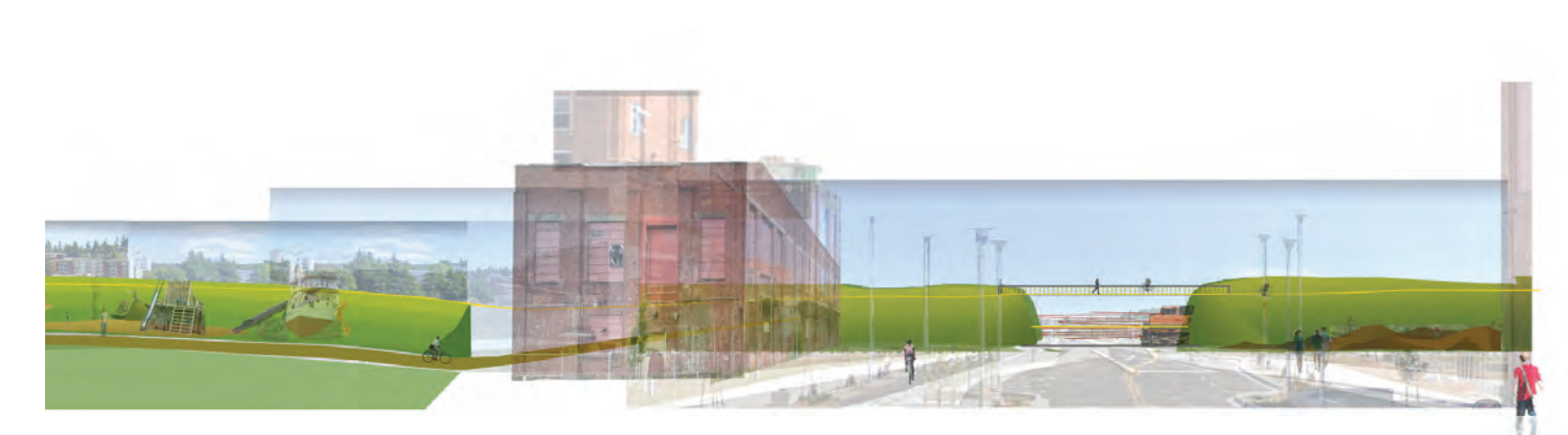
## PUBLIC LIFE

The berm is the connecting tissue between the north edge of the site and the Greater Bellingham area. It is envisioned as a vibrant destination in itself as well as a path to traverse the site, providing a trail connecting parks and the various public spaces on site.

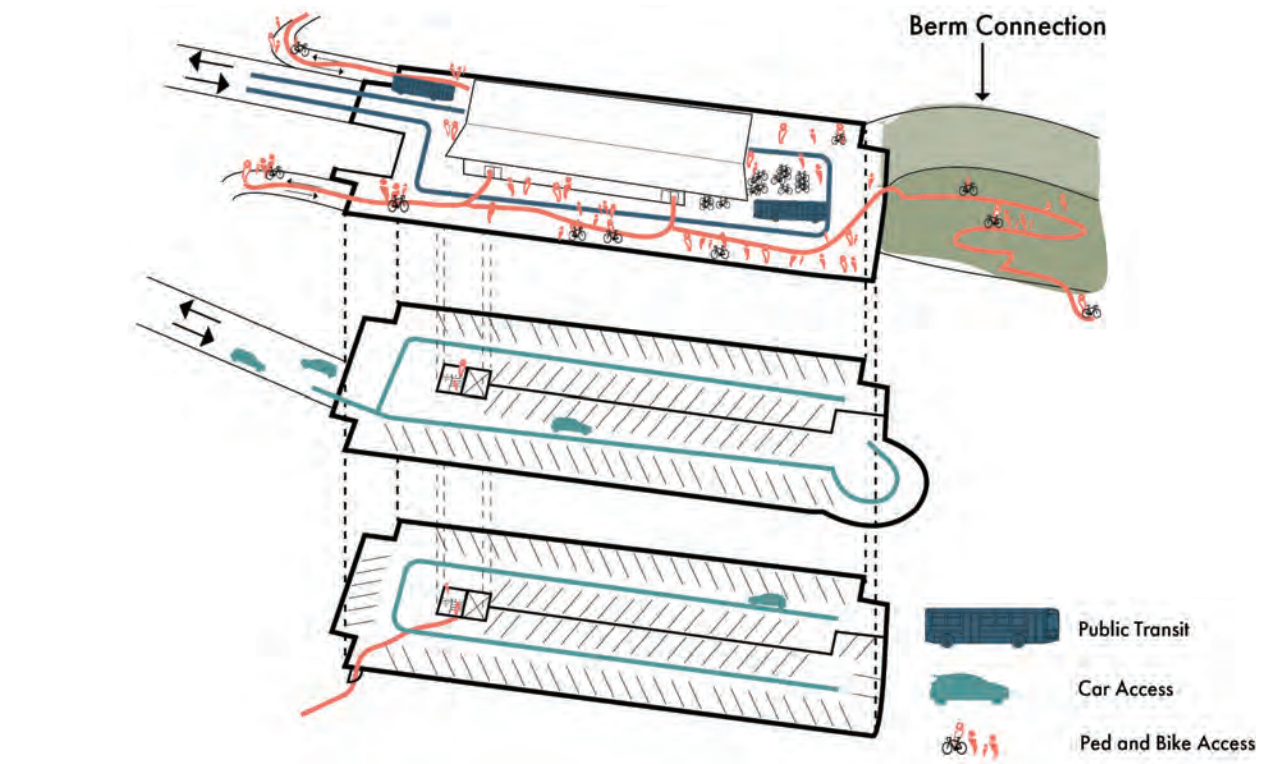
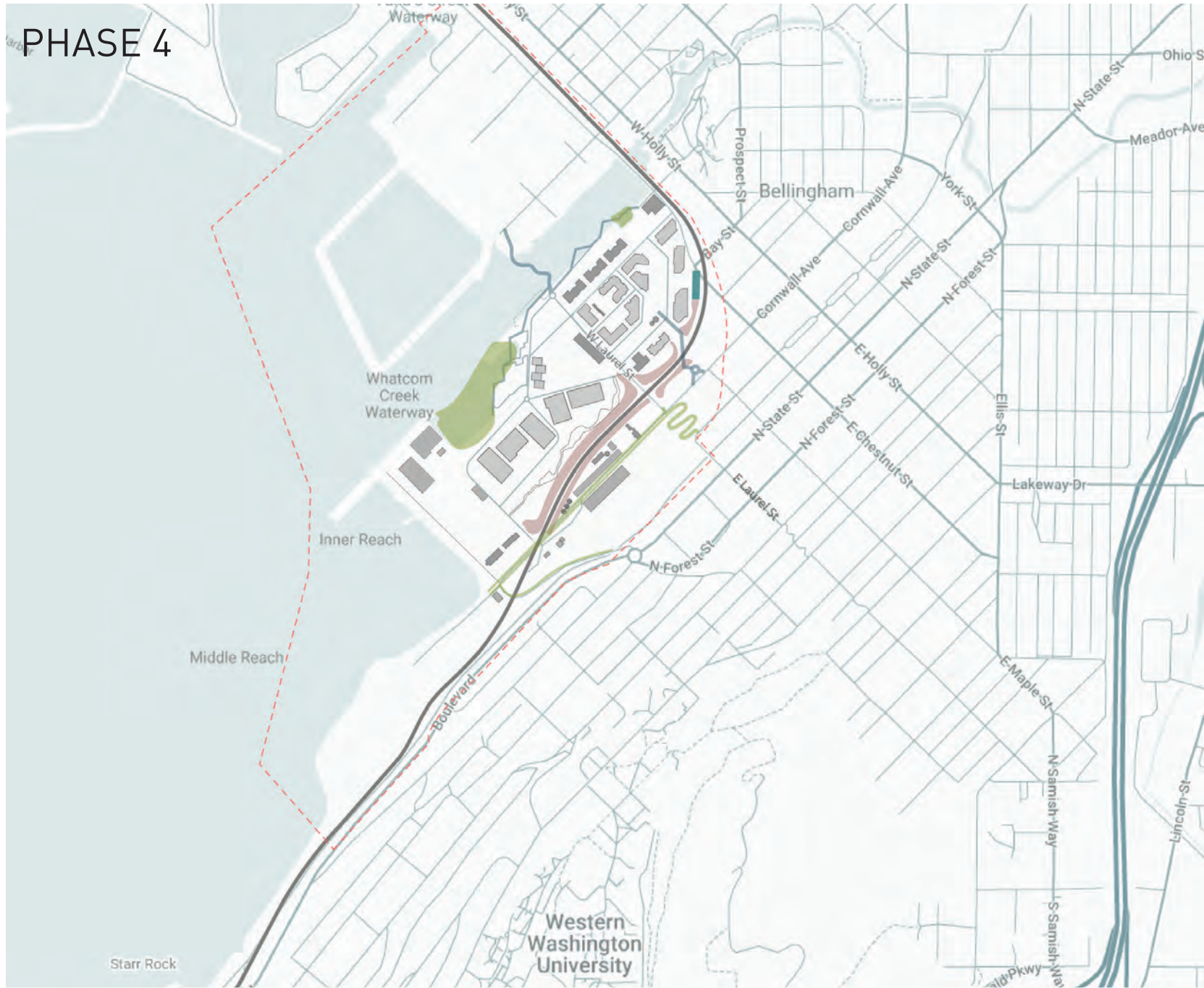
The berm is dotted with spaces for public interaction, sitting and gathering. There is a children's play area and a pump track that extends from the berm.



The pedestrian and bike paths provided along the berm help people move through and access the site. The parking space integrated into the berm, facilitates access onto the berm paths. The pedestrian path runs along the top of the berm and the bike trail is an undulating path. This converges with the pedestrian path at the bridge across the berms at the Laurel street intersection.



# PHASE 4

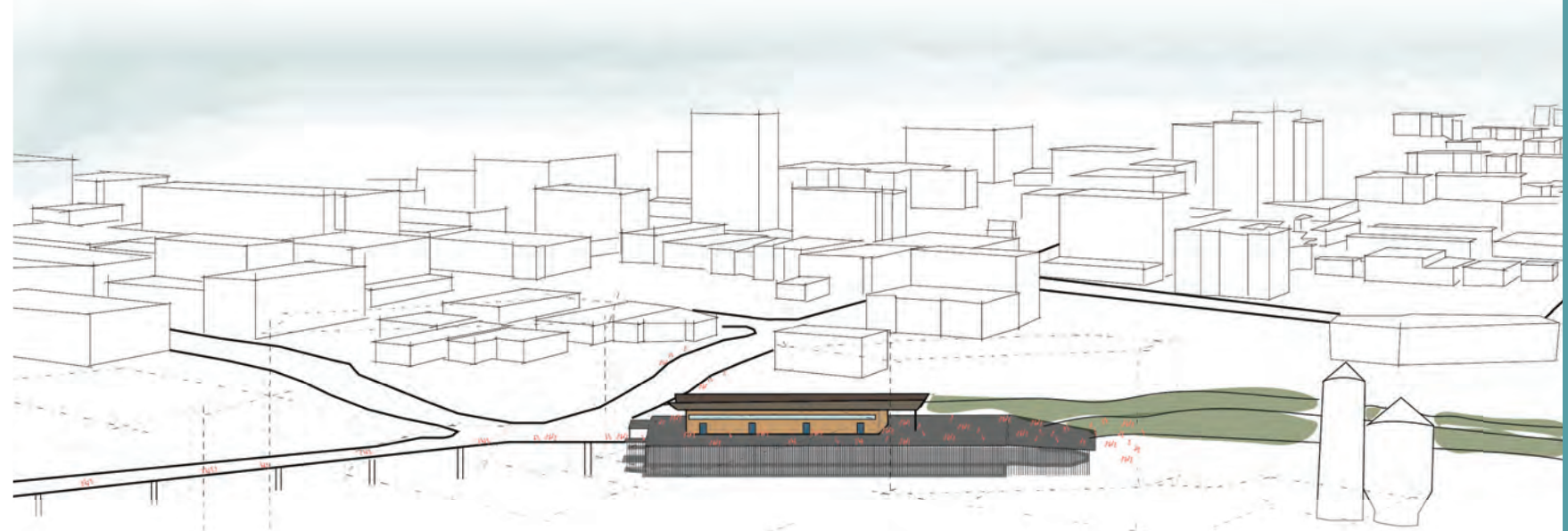


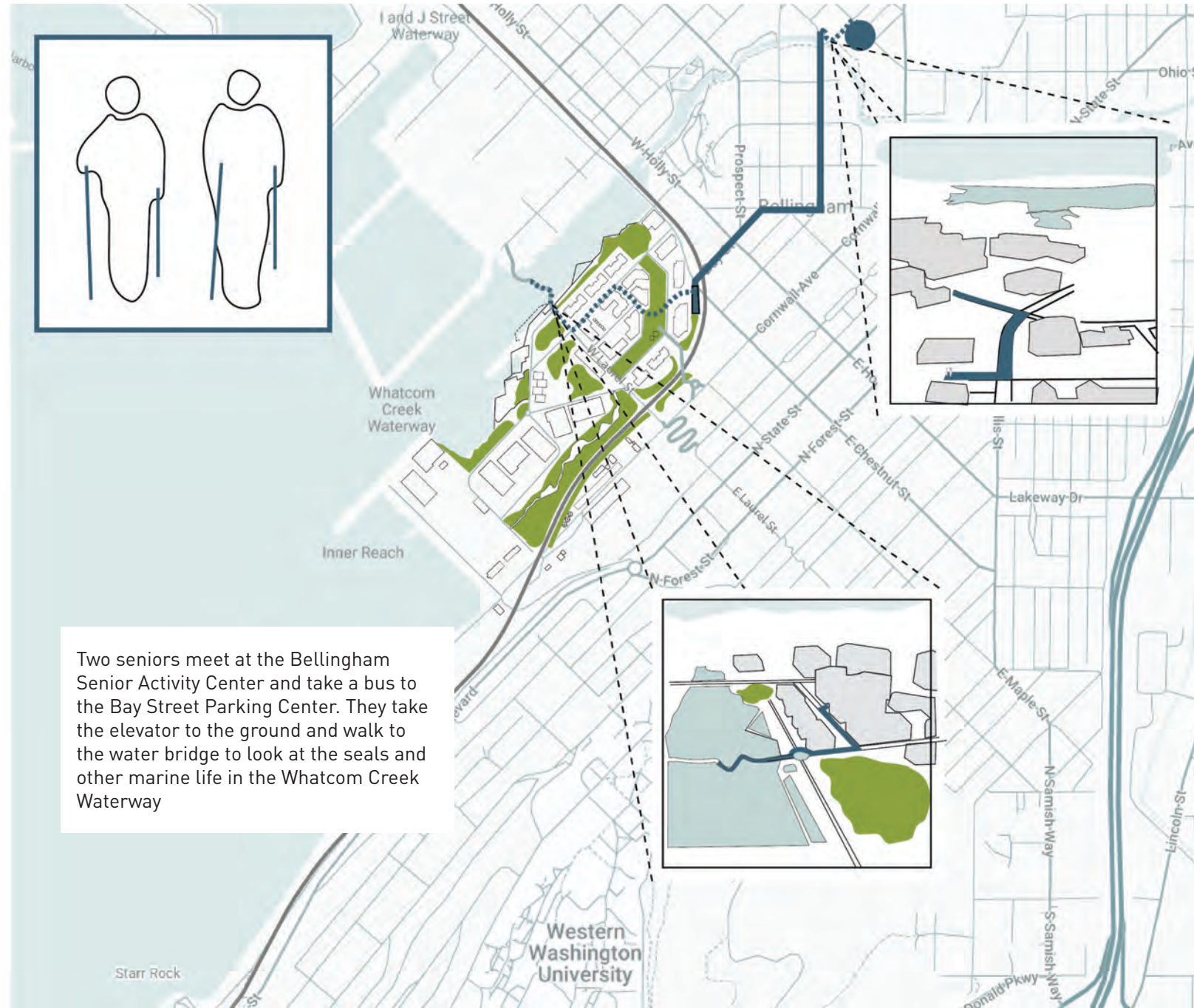
## BAY STREET PARKING

The Bay Street Parking Center connects public transit, bike parking, and car parking. This allows people to move from one mode of transportation to the other easily.

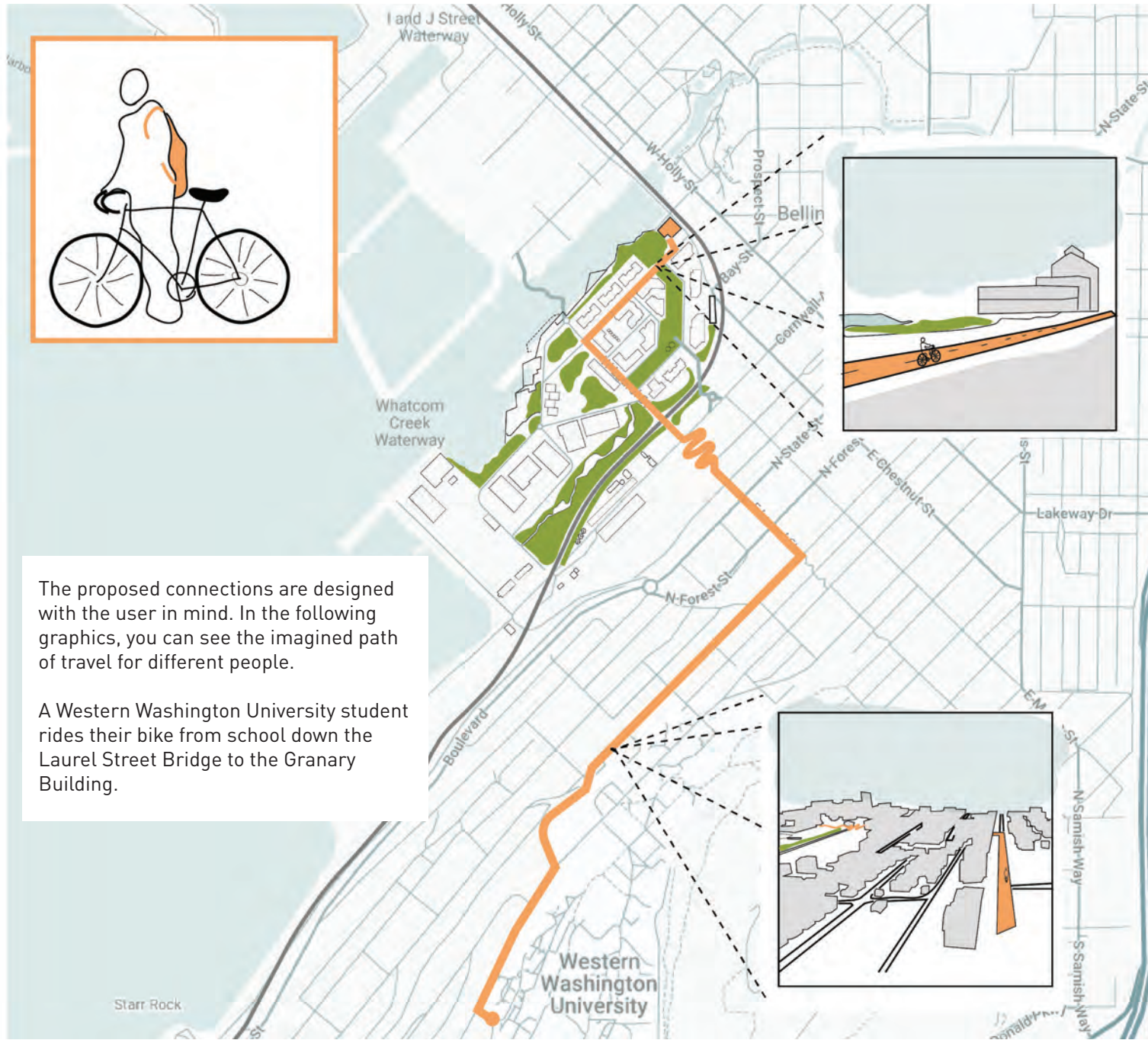
The core elevator provides ADA access for people to move from Bay Street to the rest of the Waterfront District.

The top of the parking garage connects to the proposed berms allowing bike and pedestrians to move directly to the site in a unique way.



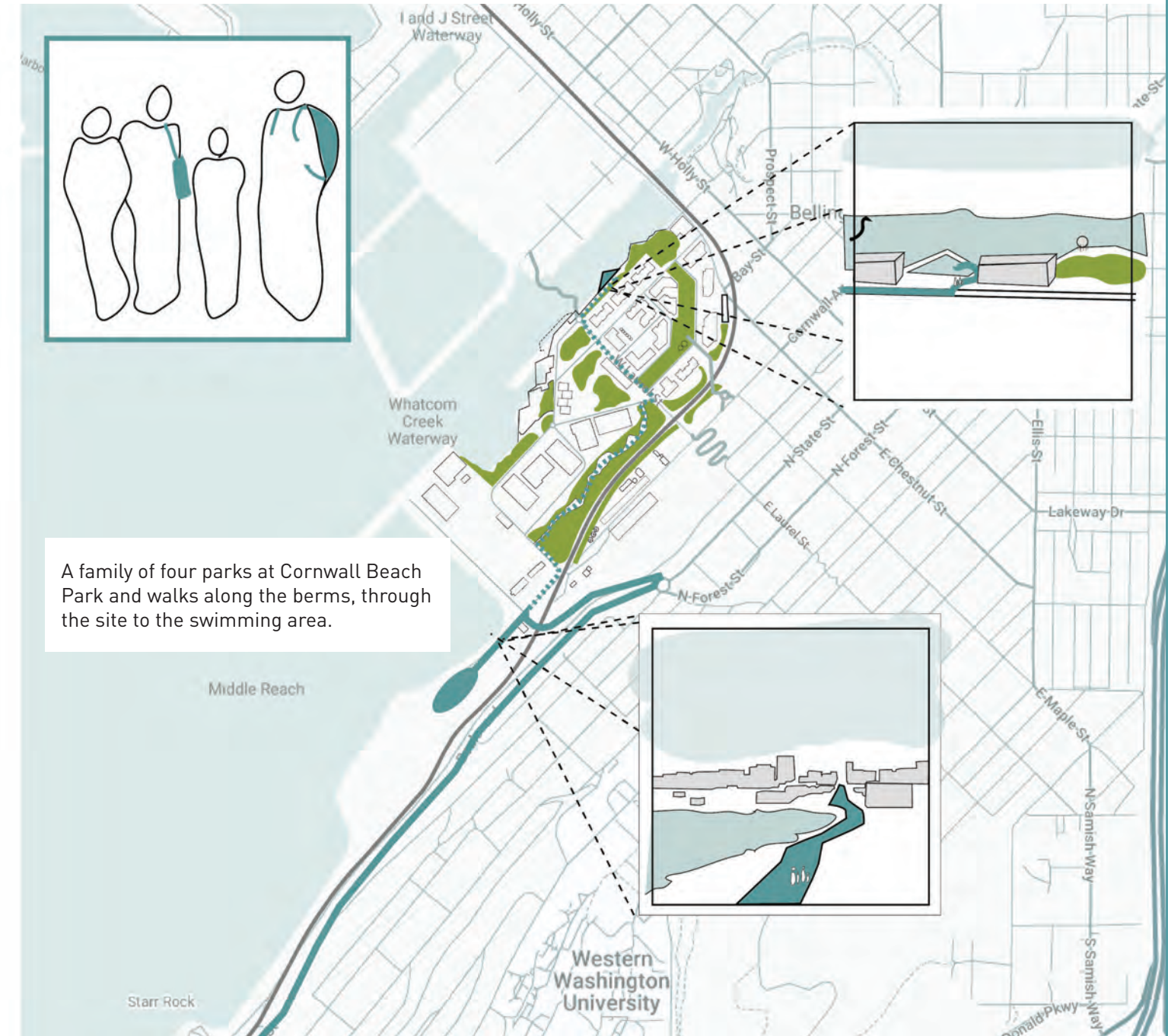
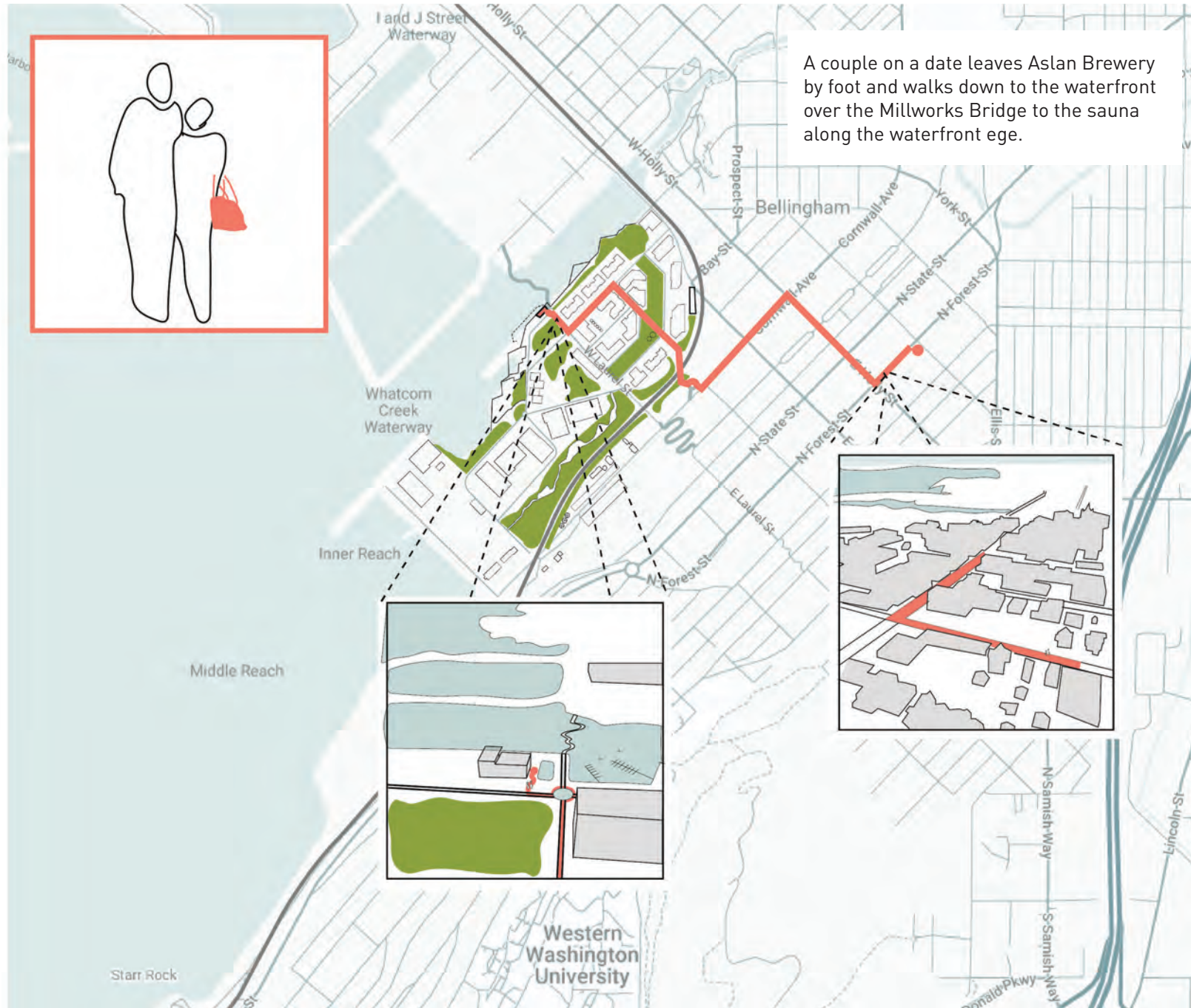


Two seniors meet at the Bellingham Senior Activity Center and take a bus to the Bay Street Parking Center. They take the elevator to the ground and walk to the water bridge to look at the seals and other marine life in the Whatcom Creek Waterway



The proposed connections are designed with the user in mind. In the following graphics, you can see the imagined path of travel for different people.

A Western Washington University student rides their bike from school down the Laurel Street Bridge to the Granary Building.







## (RE)WORKING WATERFRONT: COALESCING THE URBAN FABRICS

Dominique DeGracia + Kat Golladay + Bri Weekes + Alec Finewood



## WATERFRONT PATCHWORK

Our (Re)worked waterfront patchwork is an integrated marine working district that is walkable and offers education, employment, sustainable industry, play space for families, as well as passive and active recreation in nature.

Through our proposed urban design and planning interventions, we aim to use the existing fabric of the Central Waterfront Site to create a (Re)working Waterfront district for Bellingham. A district that is climate-focused, accessible, functional, and sustainable for humans and the more than human world.

“Patchwork is a technique of sewing small pieces of shaped fabrics, of mixed patterns, colors and texture, all together to create larger, more elaborate designs, traditionally used to create the patchwork quilt.”

Patches represent nexuses of social and environmental opportunity. The threads represent the physical and intangible connections between patch components such as routes for pedestrians and wildlife, or flows of materials, economics, and relationships. They come together to form a patchwork of programming, services, and intertwined stories.

# CONTEXT

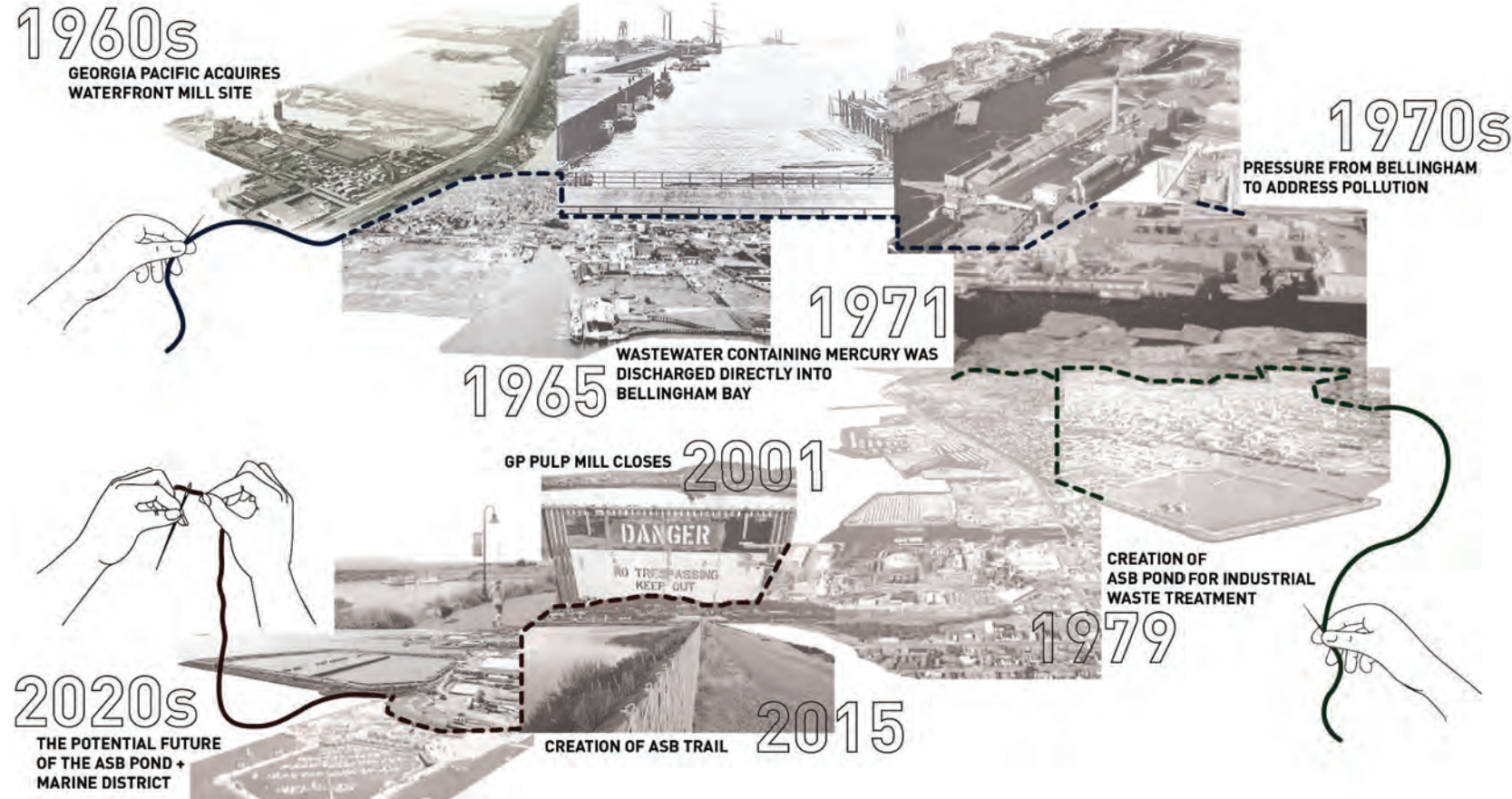
(Re)working Waterfront looks at Bellingham's Aeration Stabilization Basin (ASB) Pond and adjacent waterfront site.

## HISTORY

Georgia Pacific (GP) acquired the Waterfront Mill site in the 1960s and was largely unregulated, dumping various waste products directly into the bay. Mercury was one of the pollutants released in the bay by the Chlor-alkali

plant that produced chlorine and sodium hydroxide by bleaching wood fibers (WSDOE, n.d.). Pressure was put on GP to address the pollution being discharged into the bay. In 1972 the United States passed the Clean Water Act (CWA), which allowed the EPA to regulate pollutant discharges (EPA, n.d.). This led to the creation of the The Aeration Stabilization Basin (ASB), a 28-acre wastewater treatment lagoon in Bellingham Bay,

in 1979. In 2001, the pulp mill closed down after years of cutbacks due to the economy and officially stopped all production in 2007 (POB, 2018). In 2005, the Port of Bellingham (POB) acquired the former GP property, including the ASB site (POB, n.d.). Today, the ASB is still used to treat stormwater from the Downtown Waterfront, Log Pond, and Marine Trades area (POB, 2018).

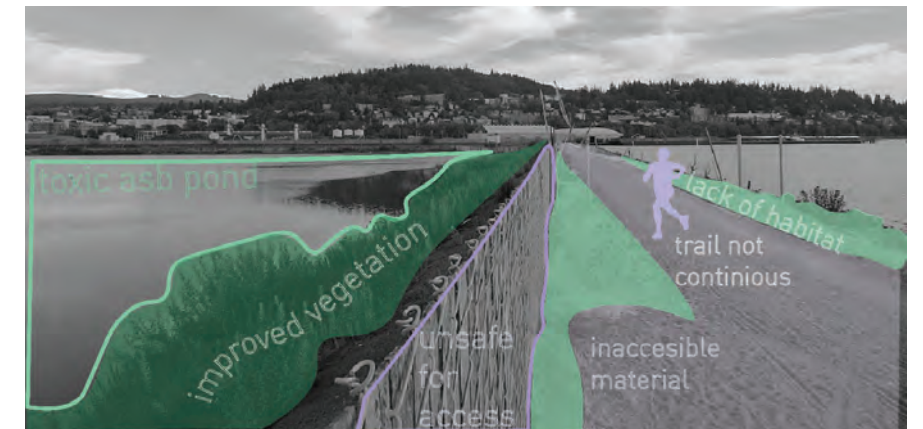


# EXISTING CONDITIONS

The Bellingham waterfront is in a state of industrial flux- the Central Waterfront Site and the ASB pond have been home to industry for decades. Buildings and other industrial infrastructure make up the fabric of the site. The relationships between people, place, and habitat alongside industry create complex interactions. Waterfront districts provide compelling connections but often industrial economy drives decision making instead of aiming to meet holistic needs.

We completed existing conditions analyses of our site to determine the needs of envisioned users. Common themes were a lack of protection from the elements and wildlife habitat, as well as a lack of climate considerations. The existing spaces are car centric for delivery and other functions of industry, and leave little room for public life to interweave. We observed opportunities to develop walkable and accessible streets, pathways for non human users, as well as opportunities to highlight scenic views.

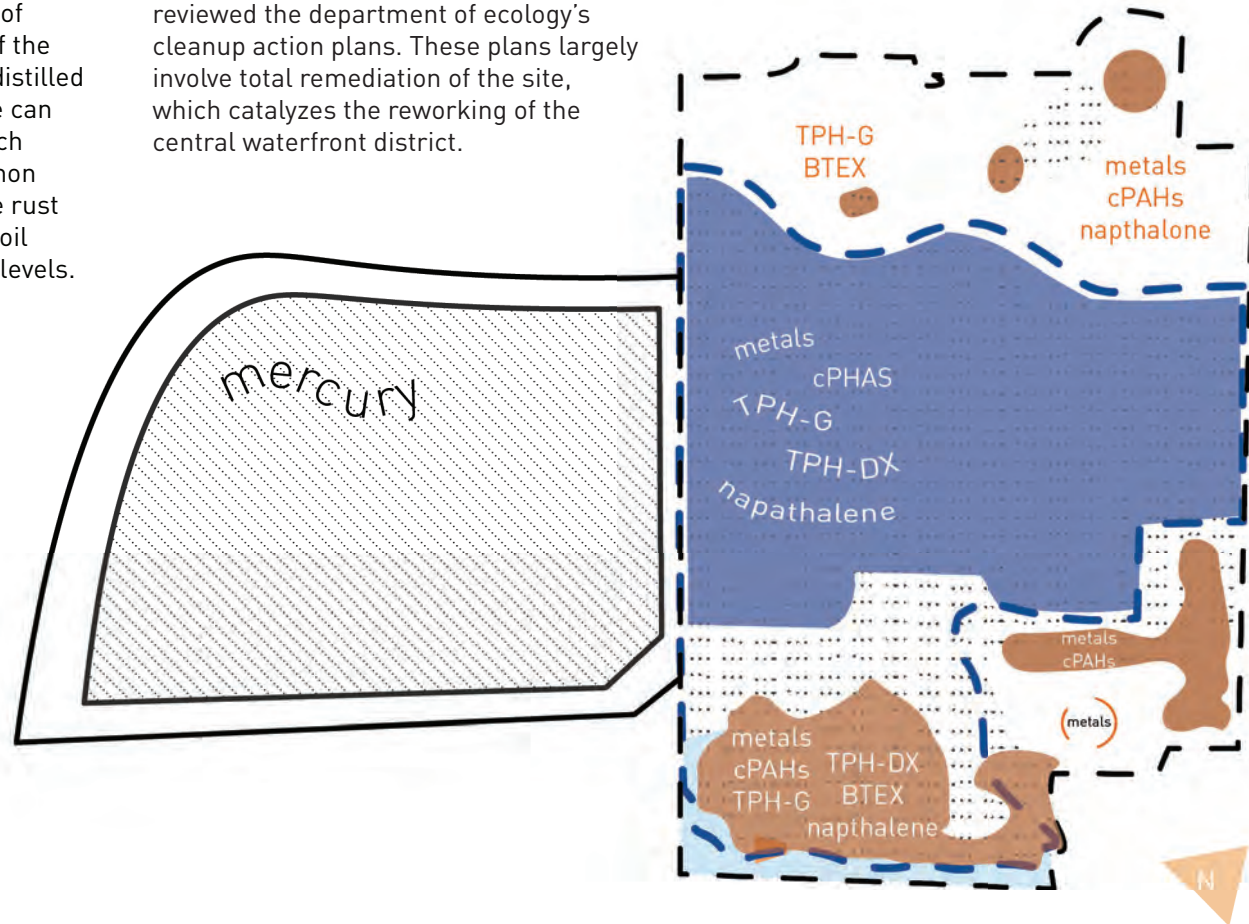
The ASB pond was a main point of inspiration in our analyses. The current ASB trail is not a continuous loop, which detracts from the experience and creates accessibility barriers for users. Currently the ASB pond is heavily contaminated and fenced off. The fencing, while currently necessary, severs the continuity of the landscape. With this in mind, we aimed to create flows through space that support humans, industry, and habitat.



## CONTAMINATION AND CLEANUP

Industry has had a significant impact on the health of ecosystems. We examined Washington State's Department of Ecology's contamination maps of the site. This information has been distilled into a bubble diagram, where we can see that metals and cPHAS, which can be carcinogenic, are a common contaminant across the site. The rust shapes represent the extent of soil concentrations above screening levels.

To understand how remediation has been considered and planned for this area, we reviewed the department of ecology's cleanup action plans. These plans largely involve total remediation of the site, which catalyzes the reworking of the central waterfront district.



### Areas of Contamination

- Former Aerated Stabilization Pond
- Central Waterfront Site Boundary

### Existing Toxin Conditions

- Extent of Groundwater and Poreater Concentrations Above Screening Levels
- Extent of Soil Concentrations Above Screening Levels
- Extent of Landfill Refuse

### Proposed Remediation Strategy

- Soil/Refuse Cap
- Whatcom Waterway Sediment Removal and Capping
- Hot Spot Removal

## TRAIL CONNECTIONS

An existing system multi-use paths exists in Bellingham, but it is largely disjointed and unconnected. We propose filling the gaps to create a true network of separated multi-use paths to better

facilitate active transportation methods like biking and walking. This strategy has the potential to reduce traffic, air pollution, and carbon emissions, while improving Bellingham resident's

access to green-space, minimizing car-dependency, and creating a more equitable and safe community that is human-scaled.

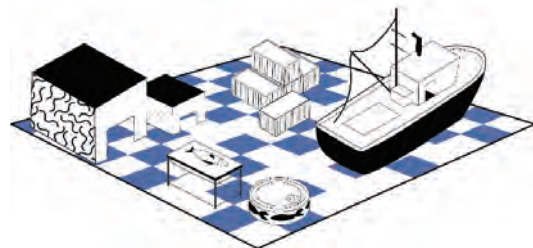


# FOCUS AREAS

(Re)working Waterfront redefines how a modern waterfront operates. This strategy employs three focus areas to work towards the future of a climate focused district. The three focus areas are *evolving industry*, *people places*, and *healthy habitat*. (Re)working waterfront changes the roles and relationships

between these seemingly siloed focus areas, through phasing, to achieve a waterfront where these parts are inseparable from another. This creates a place where marine trade workers, researchers, students, visitors, animals, and plant species are all able to thrive. The resulting patchwork becomes a

district where marine industry, research, living, commercial activity, and recreation are all possible while reducing environmental impacts.



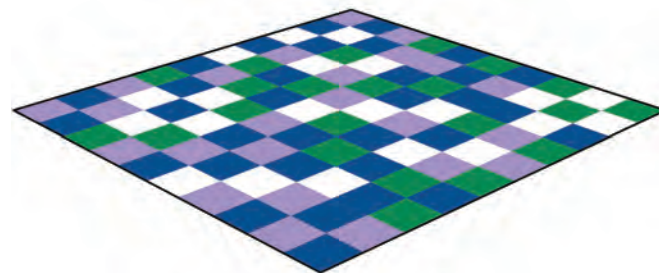
EVOLVING INDUSTRY



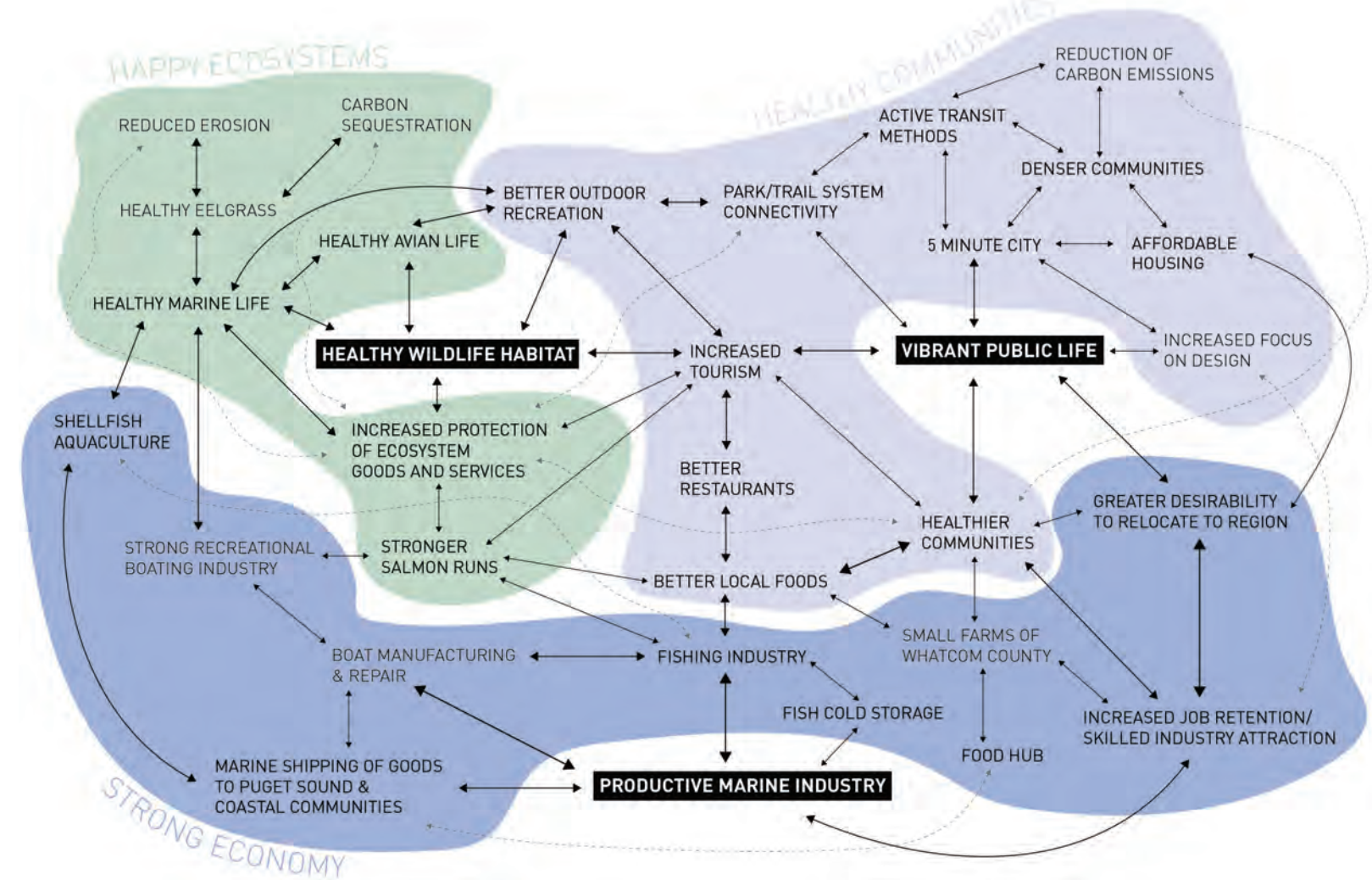
PEOPLE PLACES



HEALTHY HABITAT



PATCHWORK DISTRICT



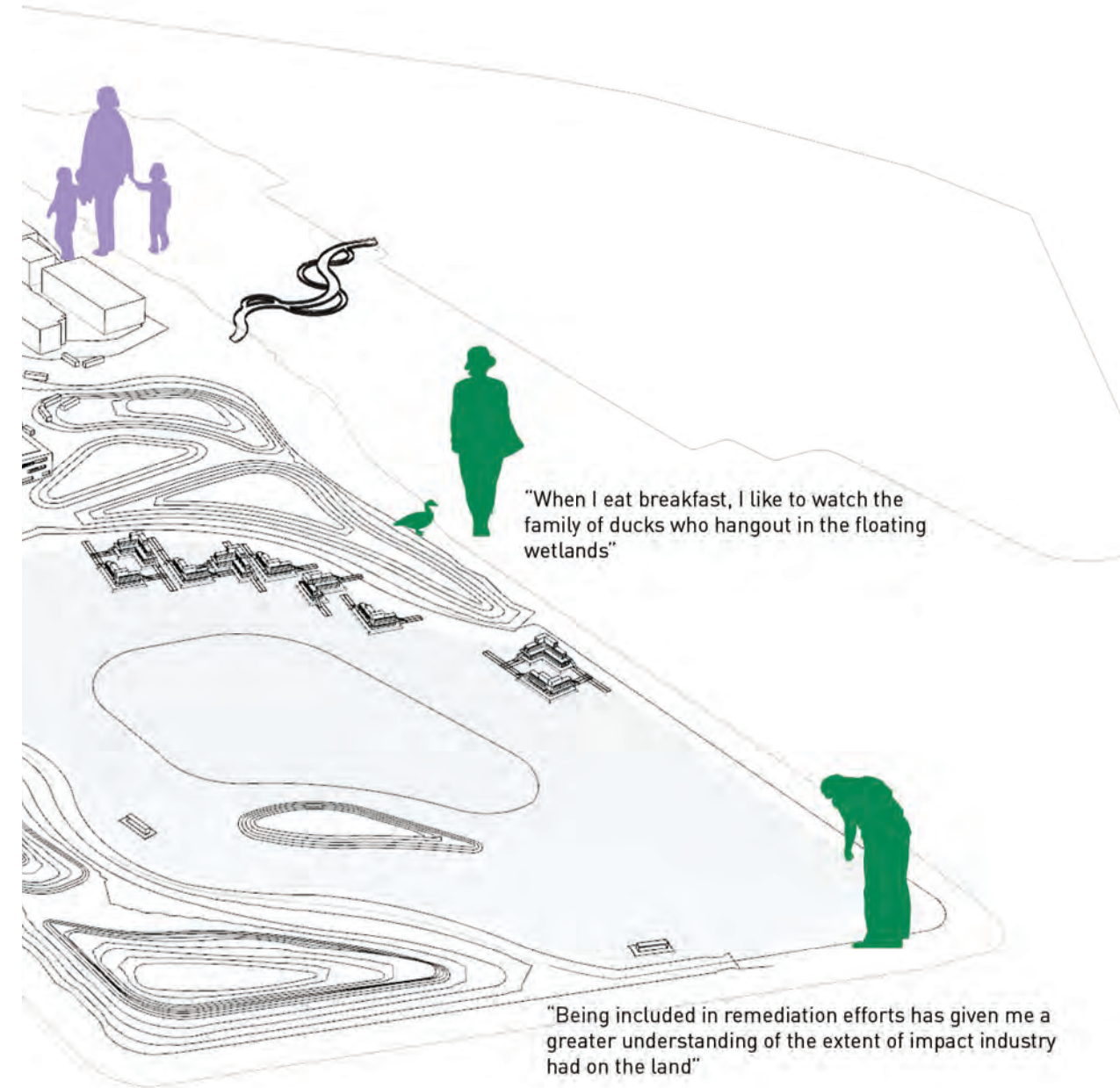
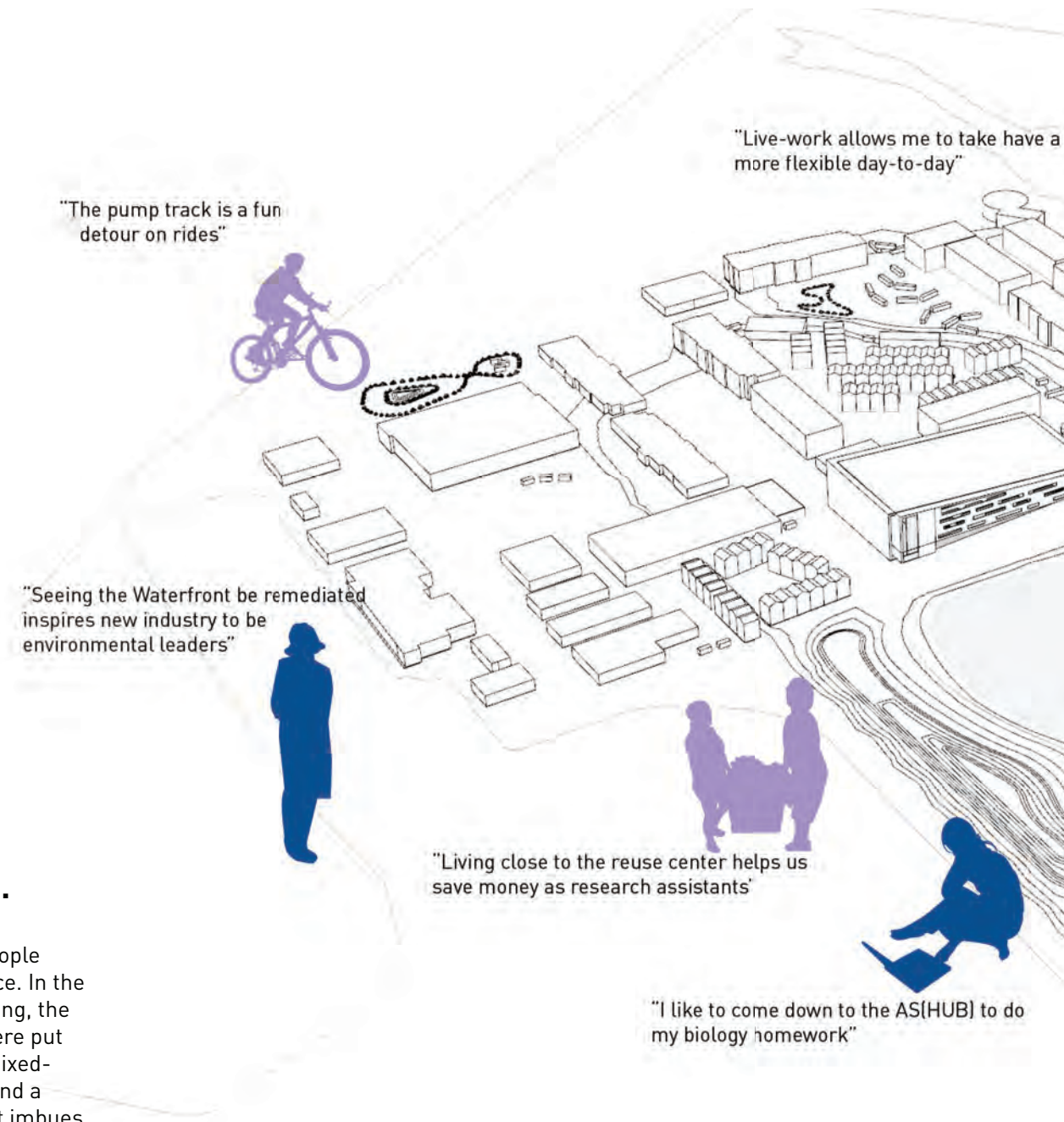
## ECONOMIC AND SOCIAL DRIVERS

When thinking about the economic and social drivers in Bellingham it is clear that three main values rise to the top: a productive marine industry, healthy wildlife habitat, and vibrant public life.

These values were used to inform the design decisions made on the ASB site and are entirely interconnected and reliant on one another for maximizing success in the community.

## A WATERFRONT FOR...

(RE)WORKING WATERFRONT is intended to be a place where people from many backgrounds coalesce. In the creation of the site's programming, the potential users of the district were put at the forefront. Eco-industry, mixed-use attractions, temporal use, and a vibrant habitat create space that imbues dynamic public life.



## A WORKING WATERFRONT

We see a working waterfront as one that seamlessly integrates commercial, industrial, and governmental entities while maintaining and sustaining relationships with people and habitat.

Waterfronts are spaces that are highly desired and sought after, though, the industries that require a waterfront to survive don't typically include spaces for people and habitat to thrive. Our design creates a unified district for the public, innovators, industry workers, and the more than human world to live, move, work, play, learn, and more.



QUALITY WILDLIFE HABITAT



SUSTAINABLE MARINE INDUSTRY



VIBRANT PUBLIC LIFE



SCALE: 1" = 400'

## TEMPORALITY AND TRANSITION

This phase emphasizes regrading of the site to allow for remediation of the ASB pond and site contaminants. We anticipate dredging the ASB pond and remediating on site. During this time there we will be a transitioning of the maritime industry to an established core. The northern portion of this site will continue to house All American Marine and Bornstein Seafoods, and make room for new and evolving industries to phase in.

## TRANSITIONING TO NEW

This phase moves tenants into the maritime/marine core, already highly utilized and seen by the industry, making it a prime location for growth and adapting industries. We anticipate this phase bringing public interest, with the addition of mixed use buildings and a pedestrian bridge connecting the two waterfront sites. As the central area of the site continues through remediation processes, the creation of a bridge allows the introduction of temporal activation such as pump tracks and a container

village; spaces that currently exist on the other side of the waterfront as temporary programs and are already loved by the community. This phase includes the addition of our Tech Hub. This hub brings students, researchers and industry workers to a unifying space that allows for incubation of ideas and growth in technologies. This facility will allow students from Bellingham Technical College, Western Washington University, and the Northwest Indian College to learn, research, test, and monitor all in one location.

## NEW AND EVOLVING WATERFRONT

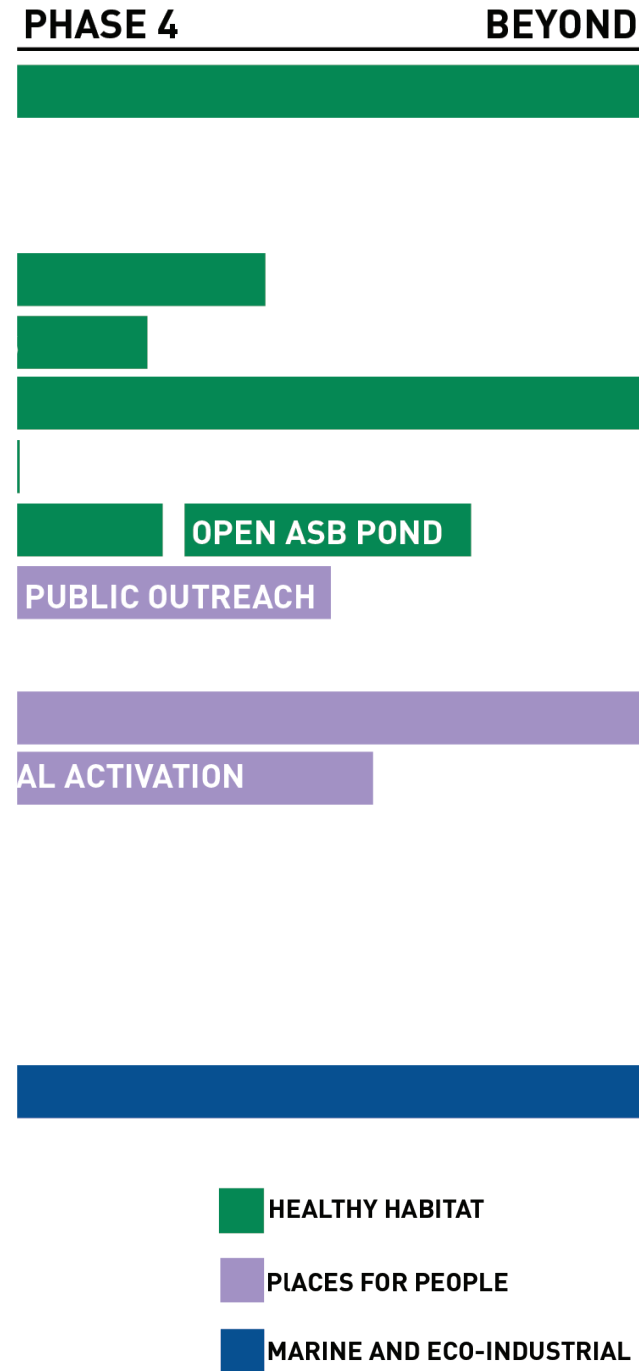
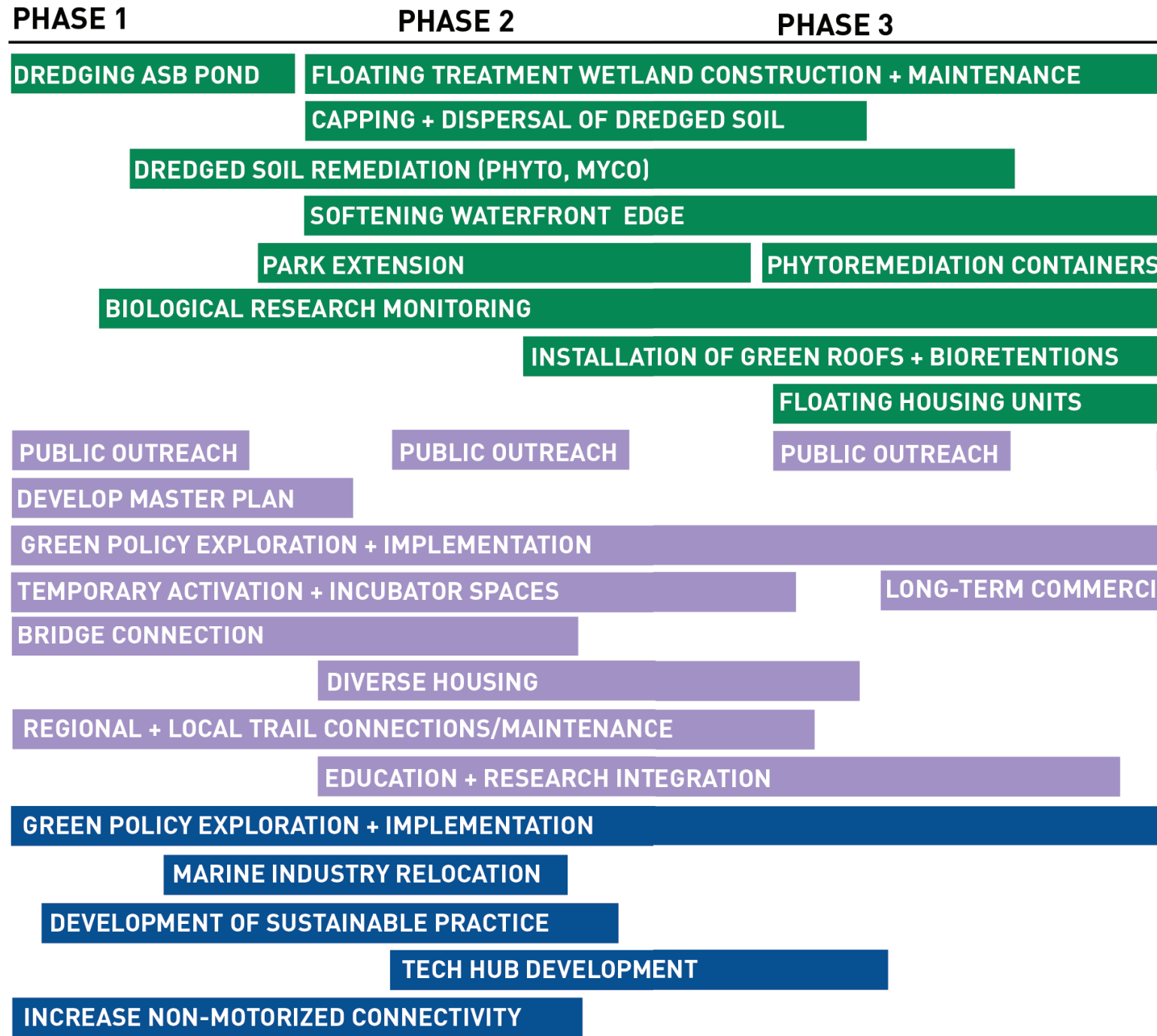
This phase envisions the site becoming a clean and desirable district, with housing and mixed use programming being added, as well as amenity spaces for residents and people of Bellingham. The addition of these spaces brings a neighborly and accessible environment to the district. This phase will introduce floating structures into the ASB pond that are adaptive and provide healthy habitat for the more-than-human world.

## (RE)WORKED

Looking at the continued potential of this site, we would eventually like to see the ASB pond opened up, once remediation is completed and we see consistent positive impacts from our interventions. Opening up the ASB pond will allow for migrating salmon and other species to move through and rest. Just outside of the ASB pond is the areas largest eelgrass bed, critical habitat for salmon. Opening up the ASB pond will bring new life to the area and enhance research

for those in the Tech Hub. This type of programming would allow for our district and Tech Hub to be defining pieces of the waterfront. With public docks, and direct connections to both residential and commercial areas we see our (Re)worked waterfront being a key Bellingham destination for industry workers, students, researcher, families, tourists and more.





**PHASING**

This phasing graph shows three main things:

1. There is a lot to think about on this site because there is a lot to work with. We wanted to emphasize that although we have four distinct phases to define sections of time, they are blended and the initiatives are staggered; often starting and stopping between phases, with many of them happening at the same time. Some things must happen before others. For example, the floating housing and wetlands must come before the opening of the ASB pond to ensure salmon habitat is established.
2. We are proposing remediation early on and for many years.
3. Our designs and vision are aspirational, and we feel there is great potential beyond our interventions to improve this space even more for people, plants, and wildlife.

**METRICS**

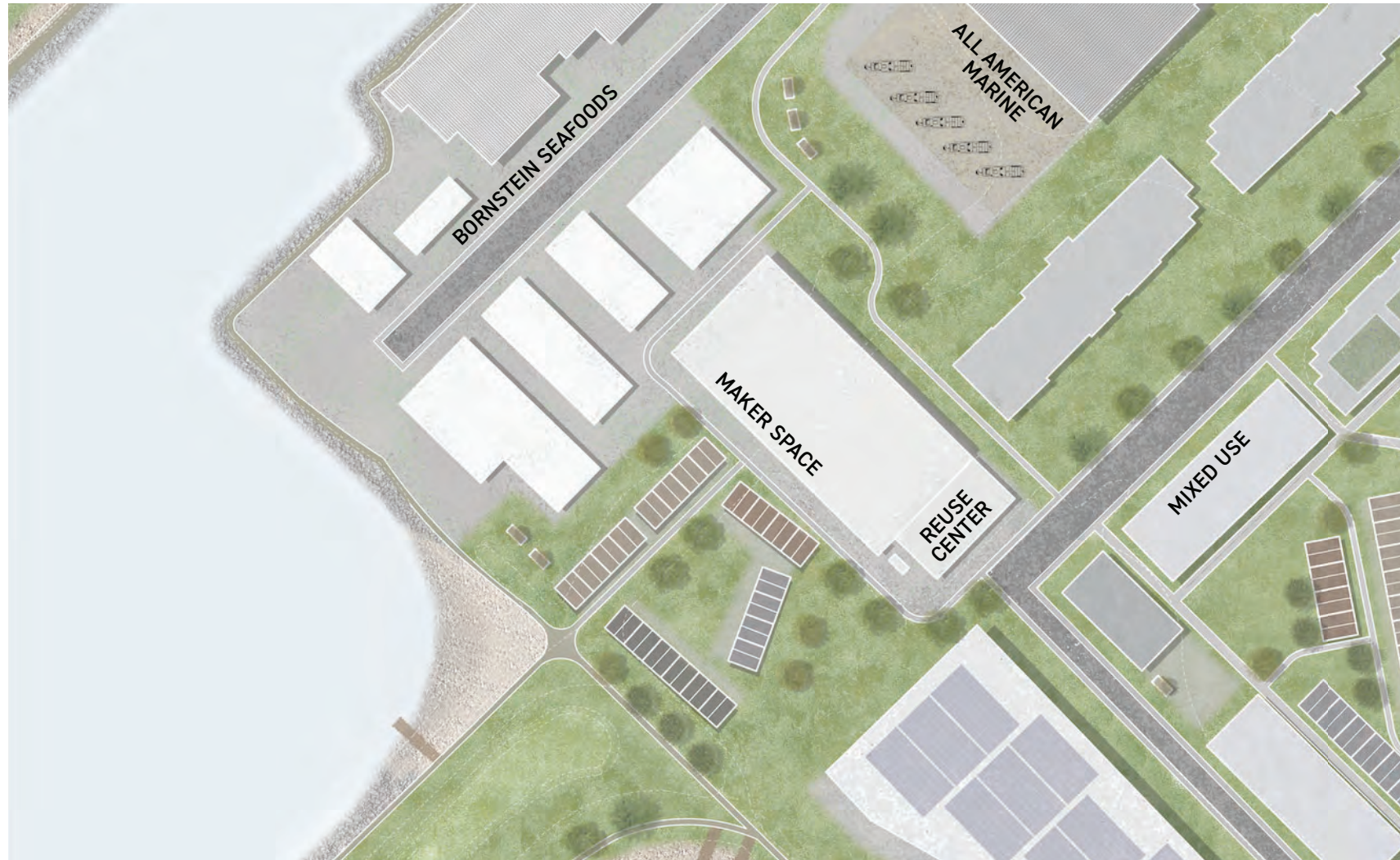
To ensure that master planning and design interventions are performing, metrics modeled after the Landscape Performance Series would be tracked. These metrics can start being evaluated at different stages of the phasing and can be adapted to meet site, planning, and adaptation needs. The following chart outlines these metrics of evaluation.



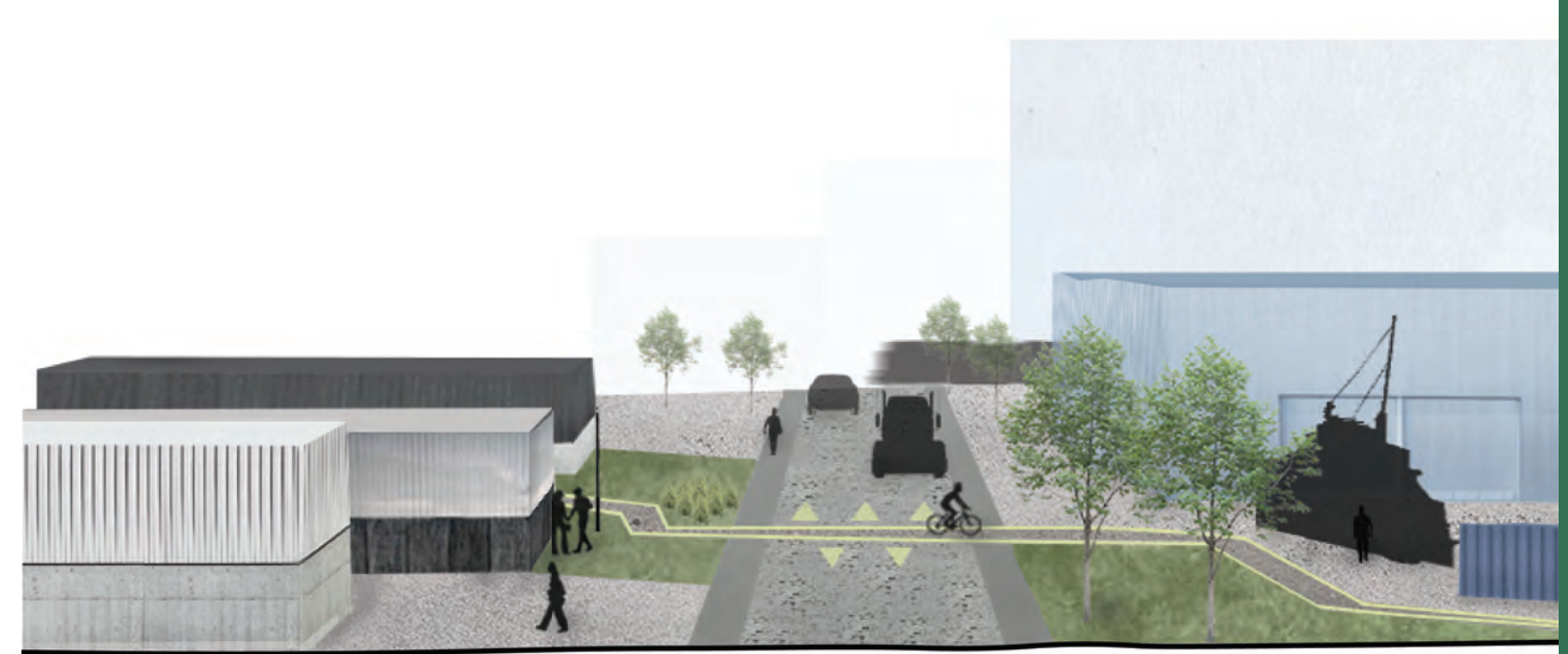
FOCUS AREA	SHORT NAME	MEASUREMENT
ENVIRONMENT	Soil Remediation	Total soil remediated on site
ENVIRONMENT	Improvement in Soil Health	Change in soil samples' pH levels
ENVIRONMENT	Waste Saved in Building Construction	Amount of material reused in new buildings
ENVIRONMENT	Remediation from Floating Wetlands	Lb of nitrogen captured per floating wetland
ENVIRONMENT	Phyto Containers	Soil remediated via popular trees in shipping containers
ENVIRONMENT	Aquatic Species Health	Presence and health of species in aquatic ecosystem
ENVIRONMENT	Runoff Retention on Site	Amount of stormwater retained in site
ENVIRONMENT	Green Roofs	Green roofs on site
SOCIAL INFRASTRUCTURE	Educational Value	Attendance of educational events or extent of use
SOCIAL INFRASTRUCTURE	Cultural Spaces	Area of culturally relevant elements
SOCIAL INFRASTRUCTURE	Street Speeds	Reduction in speed on roads where grid is maintained
SOCIAL INFRASTRUCTURE	Opportunity for Communal Behavior	Amount of communal space
SOCIAL INFRASTRUCTURE	Food Production	Amount of food produced
SOCIAL INFRASTRUCTURE	VMT Reduction	Censors quantifying speed of movement in places to determine walking, rolling, or car usage
ECONOMIC	Workplace Walkshed	People's activities of walking and rolling to work from site
ECONOMIC	Eco-Industry	Industry + maritime businesses onsite that employ sustainable practice
ECONOMIC	Job Creation in Environmental Workforce	Temporary- Jobs Created in Design, Remediation, Construction of Space Pernament- Lasting Eco-Friendly Jobs on Site

UNIT OF ANALYSIS	EMISSION REDUCTION POTENTIAL	IMPLEMENTATION STAGE
Volume/ Site	III	I
pH/ time	II	I-III
Lbs of Material Reused	II	I-II
Lb of Nitrogen Absorbed per Floating Wetland	II	I-III
Volume of Soil Remediated over x amount of time per container	I	I-III
Habitat Conditions for Indicator Speciese	I	I-III
Volume/ % of Total	I	I-III
Area of roofs with green space/roof cover of site	II	III-III
# of participants who attend, live in site or visitor or how often are spaces used	I	II-III
Sq/f of cutlural spaces/ site	I	II-III
MPH/ feet compared	II	II-III
Sq/f of communal space on site/ acreage	I	II-III
Lb	I	III
Speed/ sq ft	II	III-III
Residents who walk and roll to work	II	III-III
Amount of Sustainable Industrial Businesses/ Total of Industrial Busiensses on Site	III	I-III
Amount of employees on site in environmental workforce/ total workforce contribution to site	II	I-III

## EVOLVING INDUSTRY



MARITIME/MARINE CORE: Industry remains a critical use on the site, and is integrated into an evolving patchwork of uses.



EVOLVING INDUSTRY AND RECREATION: The district envisions spaces for active transportation alongside freight and industrial activity.

(Re)working Waterfront proposes Maritime and Marine industry remnants to not only be preserved, but also evolved when feasible. Industry presence is a key historical fixture in the city of Bellingham. With these deep roots in mind, we felt it necessary to keep the bones of it, while facilitating adaptation, enhancement, and evolution.

While our remediation efforts will alter a majority of the site, it is critical that we allow for industry stakeholders to remain on site in order to avoid economic fallout. Already existing companies that hold great value to Bellingham, All American Marine and Bornstein Seafoods, will be the pioneers of our new Maritime and Marine Core.

We are also proposing the addition of a new technology innovation center, the AS(HUB). This will be a center for students and researchers interested in marine technology to explore and test new ideas in a fully immersed environment.

## EVOLVING INDUSTRY

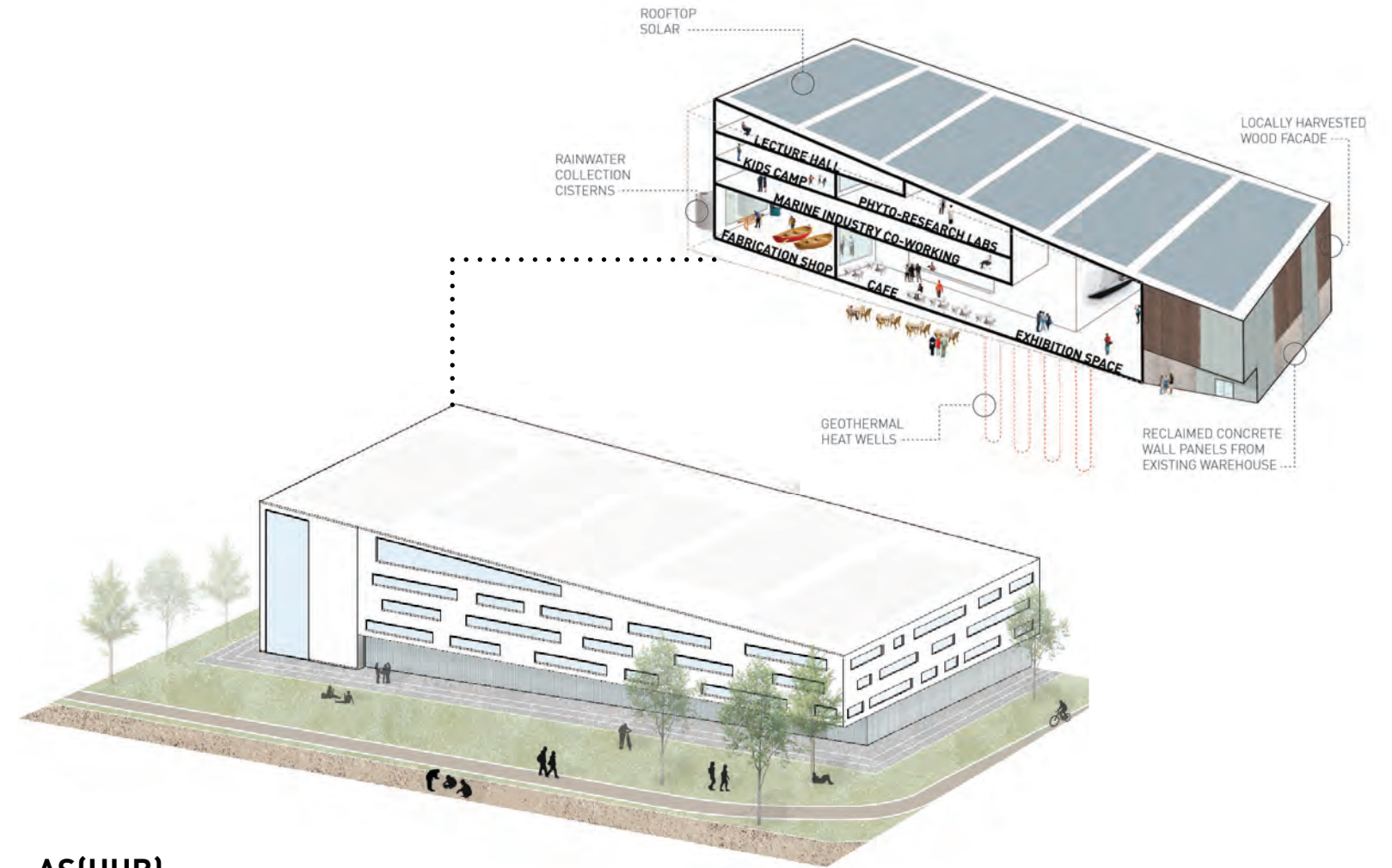
Industrial forms are prevalent through the existing site and are enhanced through a densified core. The innovative and well known boat manufacturer, All American Marine, along with local Bornstein Seafoods, will remain on site during the space's transition. They will remain the heart of the marine core, and will maintain the current industrial culture.

As a climate district, we envision that industry will be required to perform to sustainable benchmarks, lessening its negative impact on the environment. In our (Re)working Waterfront, industry remains in tandem with the creation of spaces for people. We imagine that visitors or residents of the space would

be able to observe boat building and other activities. There is opportunity for recreation and rest throughout the site, while maintaining space for industry to function.



ACTIVE RECREATION ALONG A SOFTENED SHORE: Industrial activity could complement public space activation by bringing workers, visitors and residents together.



### AS(HUB)

Our proposed marine technology hub will be a pivotal location in melding industry and environmental research, and serves as the point of connection for a new greenway of industry. The AS(HUB) will be a space for students of Bellingham Technical College, Western Washington

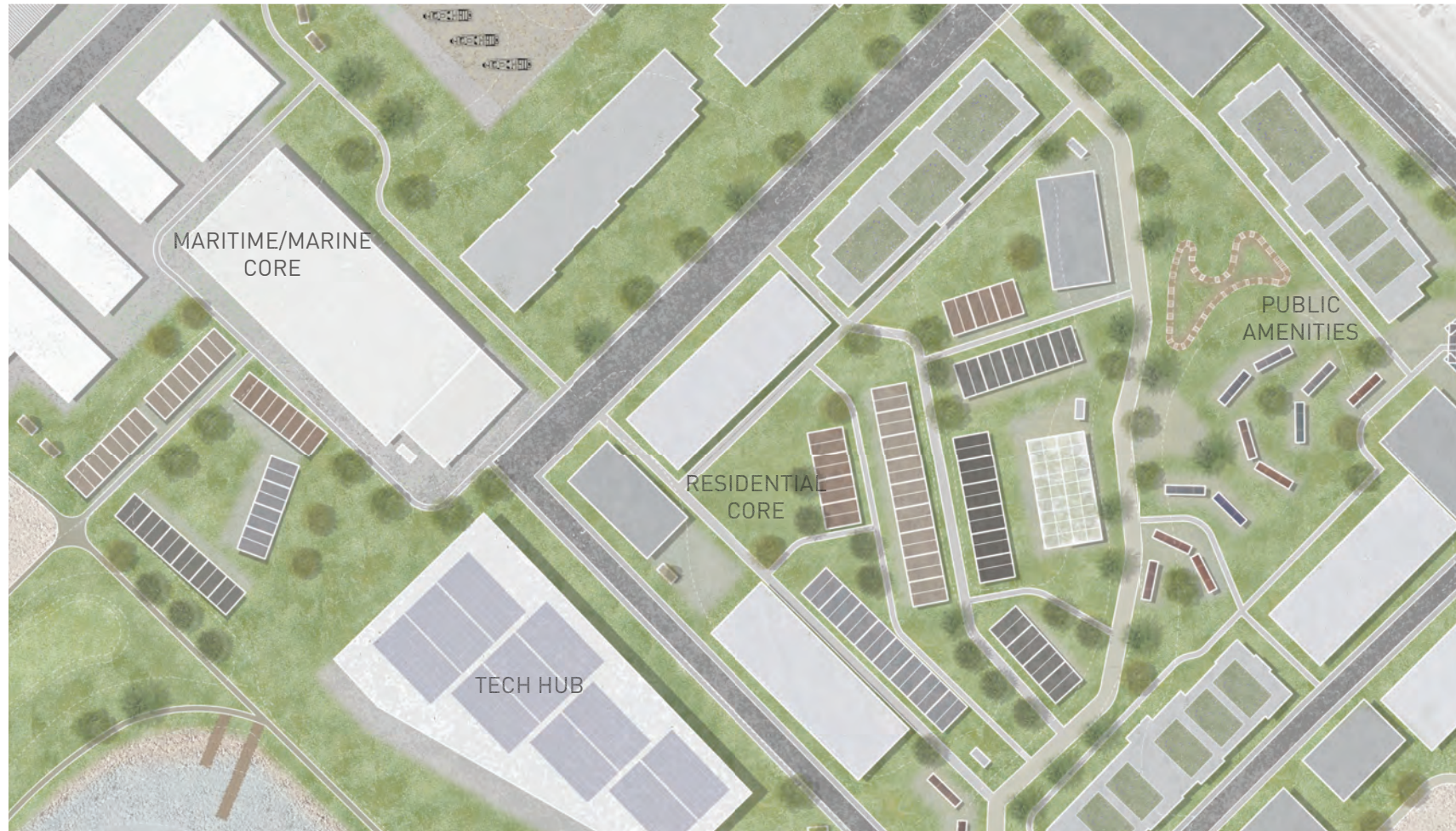
University, and the Northwest Indian College, as well as marine researchers and industry workers to innovate and grow within this field.

Since it neighbors the ASB Pond, which will transitionally work as a stormwater treatment area, it allows for

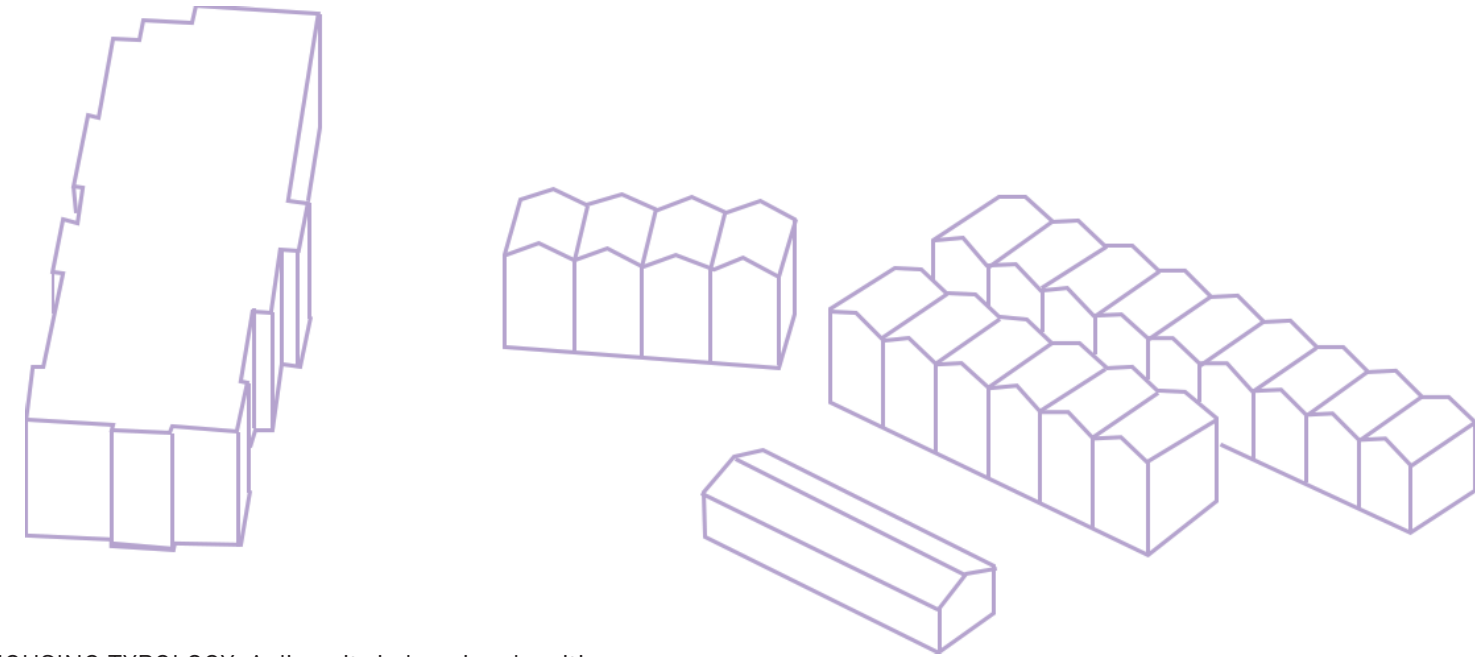
an immersive experience of research, testing, and monitoring all on site. It also includes an exhibition space, gathering spaces, research labs, fabrication and warehouse spaces, and a cafe.

The AS(HUB) is not only a place of academia, but of wonder and rest.

# PEOPLE PLACES



SITE DETAIL OF THE HOUSING AND MIXED USE DISTRICT



HOUSING TYPOLOGY: A diversity in housing densities, from townhomes, live-work units, to apartments, makes the mixed-use core a vibrant space.

Our design includes the addition of various built forms, many of which include residential in the form of live work townhomes, apartment buildings and mixed use, focused within our residential core.

These spaces include various public and semi private amenity spaces like a greenhouse, bike kitchen, workshop and reuse center. Some of the mixed use buildings include accessible green roofs, with street level commercial activation.

The surrounding open spaces include a small pump track, container village, and a large pedestrian greenway for residents and commuters to easily travel through the space.

## PEOPLE PLACES

Creating opportunities for connection in people places was the priority of the residential development. Public and semi-public spaces provide community amenities for residents of this district, as well as all of Bellingham. These spaces allow for the district to become a destination for a variety of people.

Townhomes are programmed to be live-work, creating climate protection through reduced transportation emissions and opportunity for activation throughout the ground floor. The site as a whole focuses on life at human scale. This district acts to create community and inspire residents and visitors by the industrial use and history of the site.

As one moves through this residential core, they could bike through and by the bike kitchen, townhomes, pump tracks, container village, greenhouse, and mixed use spaces before crossing the bridge, or continuing on to the variety of ASB and AS(HUB) connections.



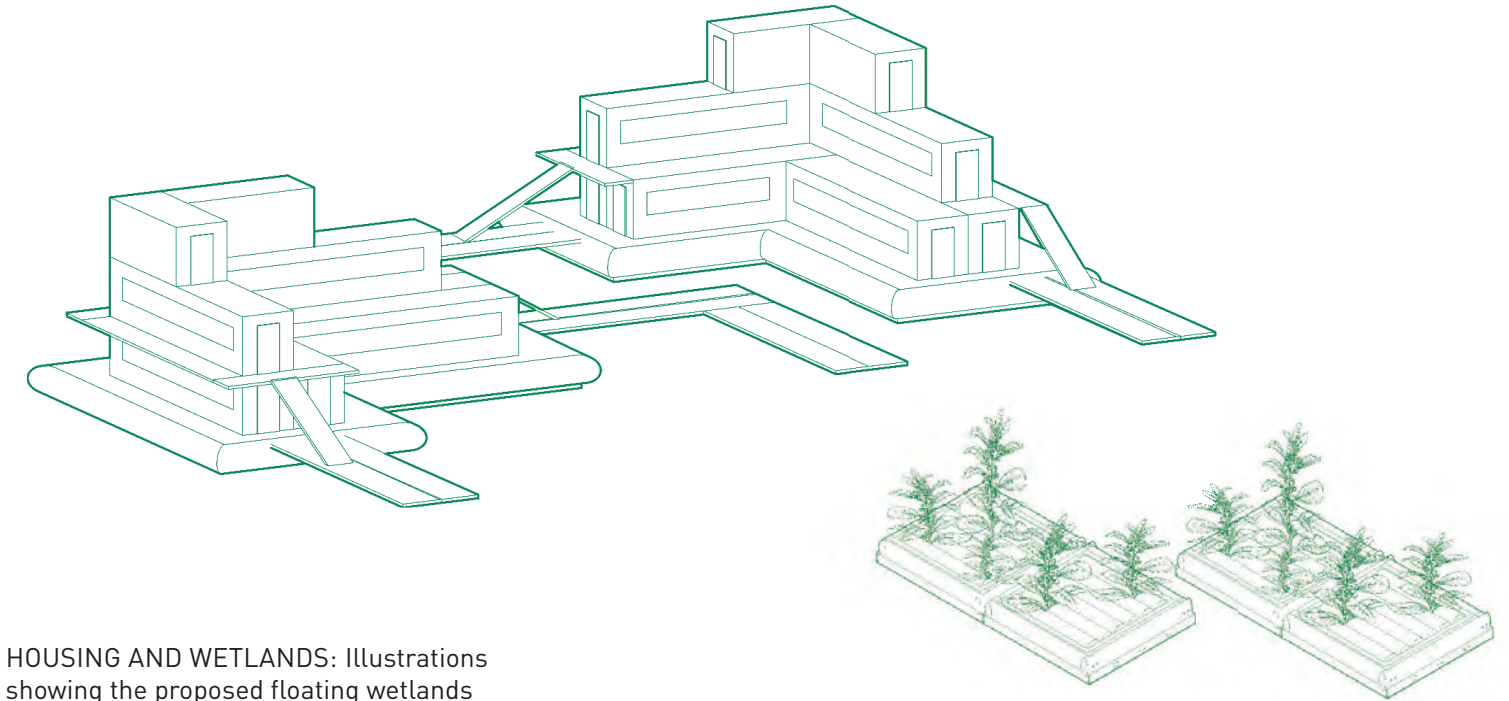
LIVING ON THE WATER: Renderings of the mixed-use waterfront district.



## HEALTHY HABITAT



ASB POND: A site plan showing a thriving ecosystem on the site occupied by the current ASB pond.



HOUSING AND WETLANDS: Illustrations showing the proposed floating wetlands and housing that would inhabit the ASB pond.

Our design considers the environmental effects of sea level rise and the importance of local flora and fauna.

We are proposing floating treatment wetlands and floating housing as parts of our Healthy Habitat interventions on site. These systems are innovative and multi

purpose. Floating wetlands are able to filter water, sequester carbon, and provide habitat for terrestrial and aquatic wildlife alike.

With the continued aim of reconnecting the existing fabric of the site, we envision how we might bring the ASB back to

life in a functional way that is also appealing for humans to observe and live next to. Floating housing made from repurposed shipping containers allows for less space on land to be taken up by housing. These floating systems provide opportunities for research, education and recreation.

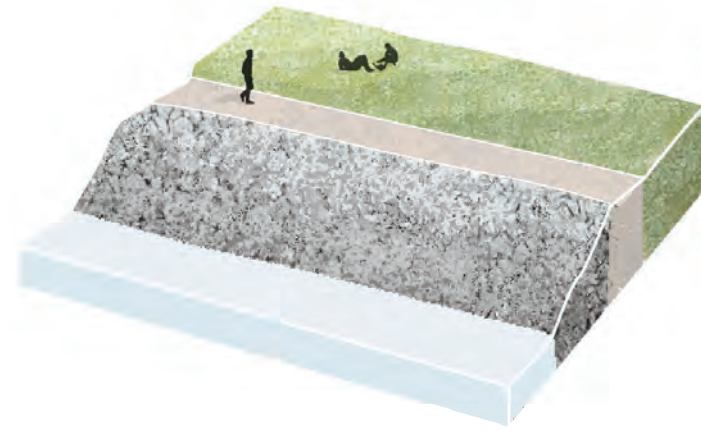
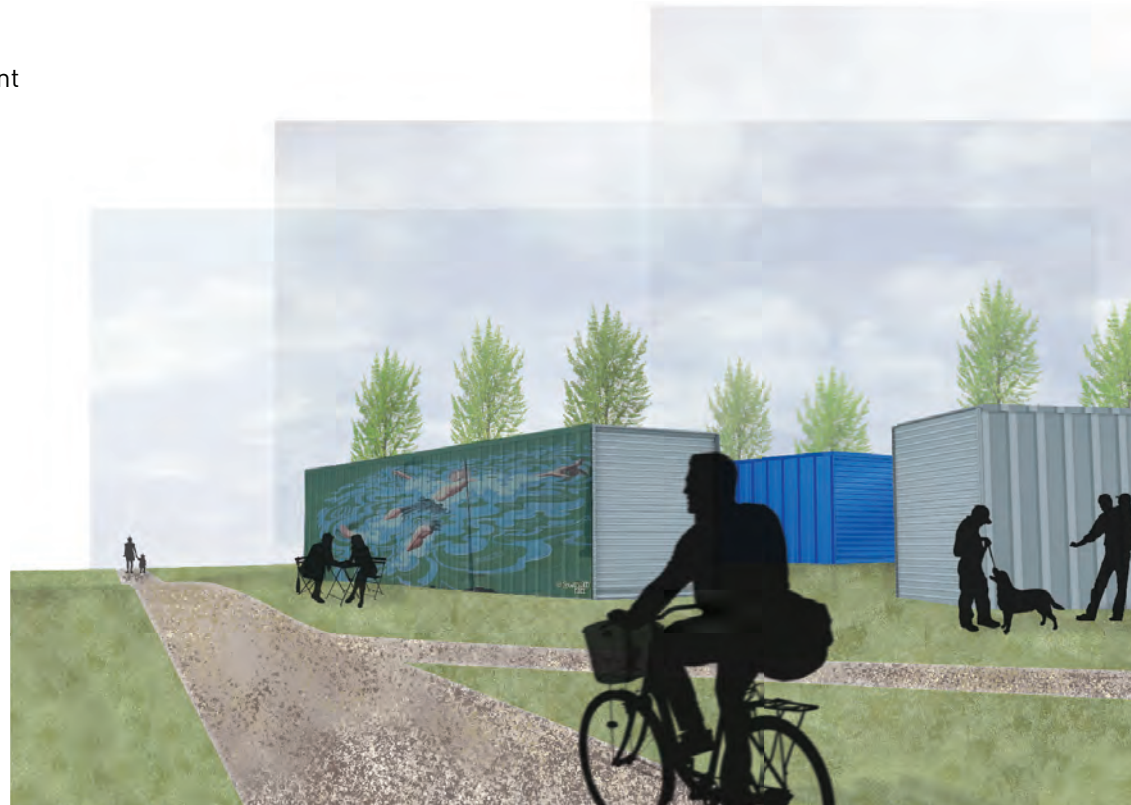
## HEALTHY HABITAT

Bellingham has several temporary space activations using community art. We envision the Central Waterfront Site to have similar opportunities for temporary activation, continuing the motif of local artists leaving their mark in these spaces.

We propose to explore phytoremediation driven by poplar trees in repurposed shipping containers across the site. Remediation occurring alongside public space such as this park, is an intentional move that we hope entices visitors to reflect on land connections and human use. It is meant to be a negotiation of space with opportunities to learn and exist alongside healing of the environment. It is a testament to the fact that addressing contamination can be a beautiful, healing experience for humans too.

This type of space activation will continue throughout our main paths and trail systems, creating unique wayfinding moments within our site.

**INTERACTIVE ECOLOGY:** Section-cut and rendering of the ASB pond trail and interactive remediation elements.



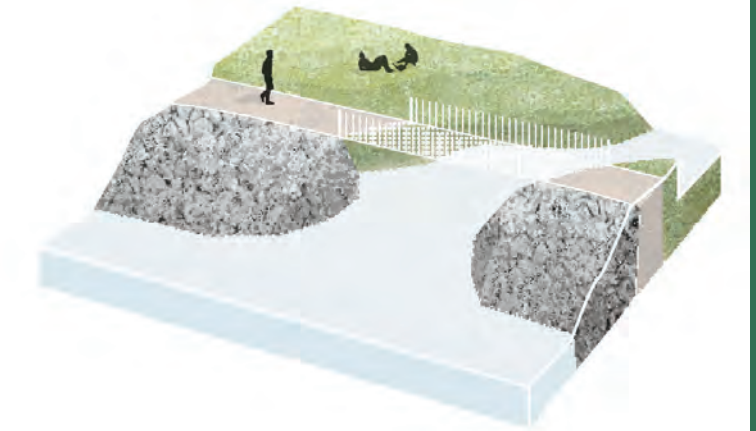
Part of healthy human habitat is the ability to spend time in nature and recreate in ways that are suitable for a variety of users. We wanted to have spaces in the ASB Pond that were not heavily programmed in order to allow for flexible and dynamic use. With the addition of floating recreation structures, made from repurposed shipping containers, we imagine users spending time here in diverse ways.

In order for the ASB Trail to have continued use after the aspirational move of opening the pond, we propose bridges to thread foot traffic along the trail. These bridges will be made of light penetrating surfaces, which is more ideal for wildlife to pass under. The materiality of the bridges along the ASB Trail will match that of the Whatcom Waterway pedestrian bridge, creating continuity along the waterfront.

**ACTIVATING THE EDGE:** A restored ecology would bring residents and visitors to a new waterfront edge.



**CONNECTIVITY:** A visualization of the continuous ASB trail that encircles the site.



## HEALTHY HABITAT

### FLOATING WETLANDS

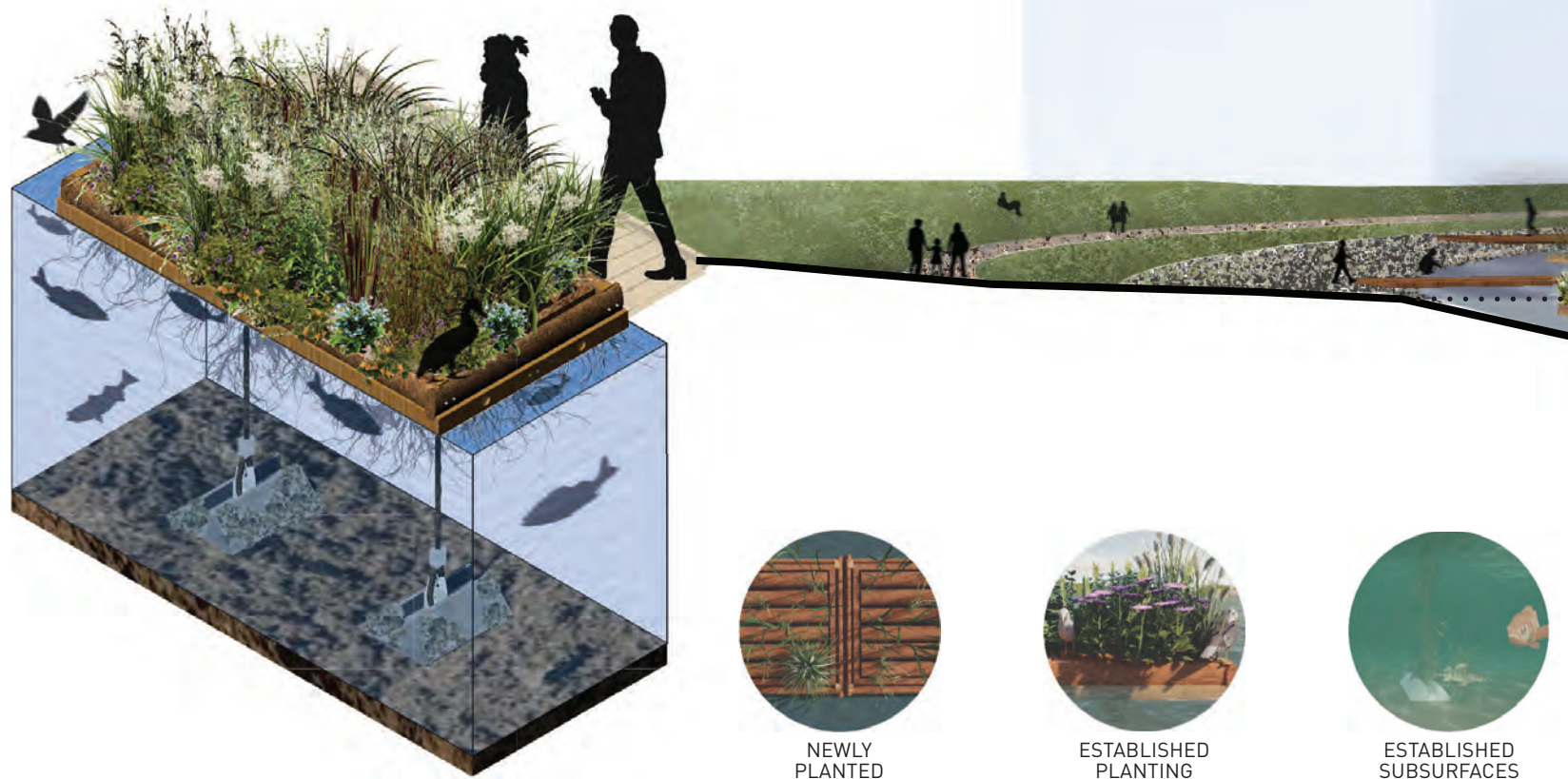
The addition of floating wetlands in Phase 1 of the design, to aid in ASB remediation, will continue to support mitigation of stormwater runoff through their plant-bacteria synergies.

Floating wetlands bring many functions to the site. They support life through nursery habitat for fish as well as nesting and resting space for birds.

A study done in Scotland concluded that residing within 700 meters of, or frequently visiting/recreating in, a waterway regenerated with constructed wetlands was correlated with a lower chance of developing chronic illness or disease. Specifically, blue and green infrastructure was associated with a 15% reduction in cardiovascular disease, hypertension, and stroke as well as a 12% decrease in likeliness to

develop diabetes, and a 10% lower risk of incident obesity (Glasgow Caledonian University, 2018).

With proper maintenance and species selection, a 100 sqft constructed wetland system can remove up to 10 pounds of phosphorus and 100 pounds of nitrogen annually (KCI technologies). Over time, Ecrete blocks promote and support various



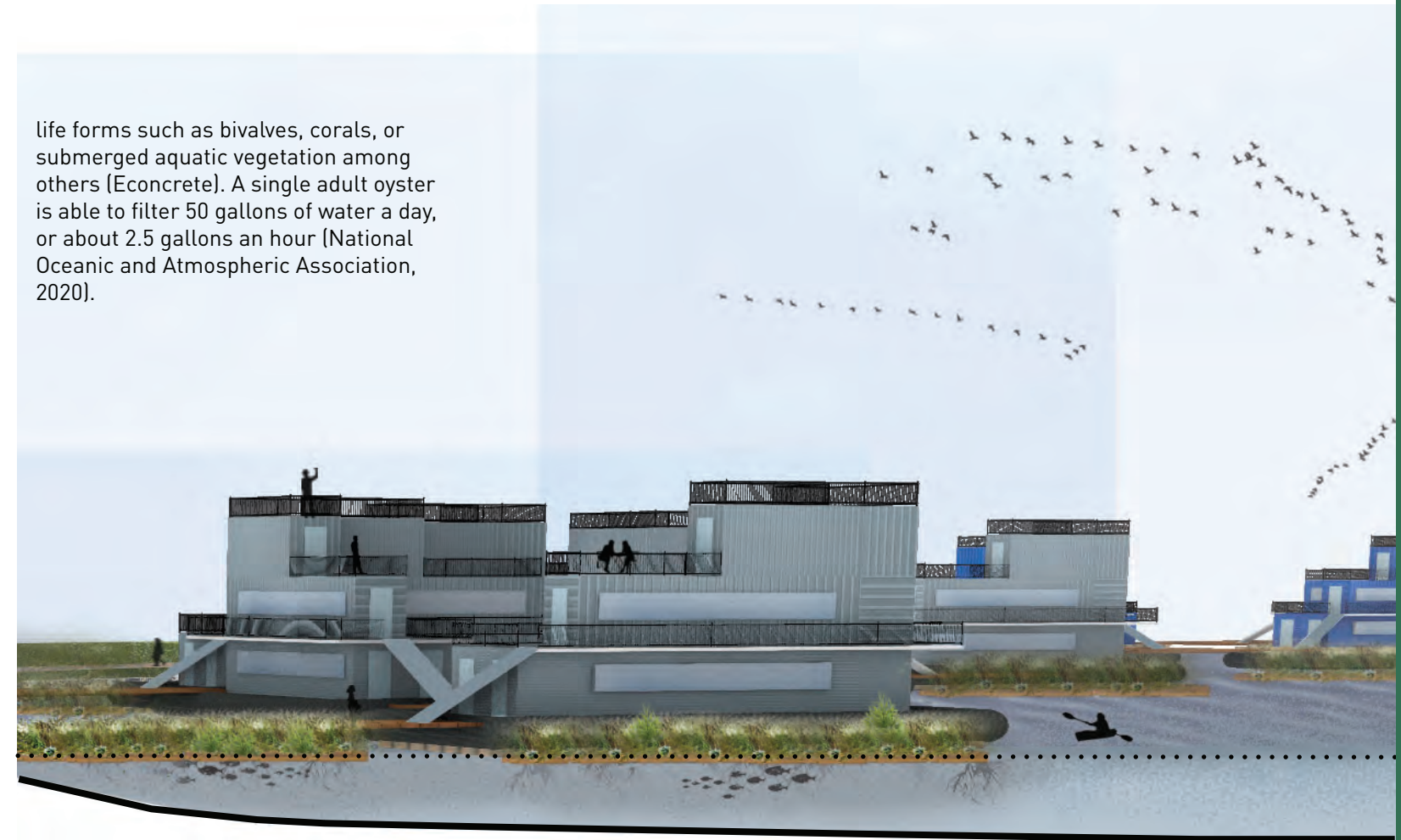
NEWLY PLANTED



ESTABLISHED PLANTING



ESTABLISHED SUBSURFACES

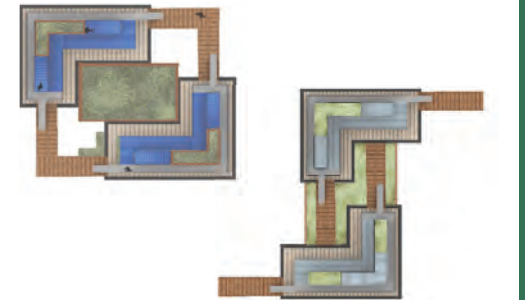


life forms such as bivalves, corals, or submerged aquatic vegetation among others (Ecrete). A single adult oyster is able to filter 50 gallons of water a day, or about 2.5 gallons an hour (National Oceanic and Atmospheric Association, 2020).

### FLOATING HOMES

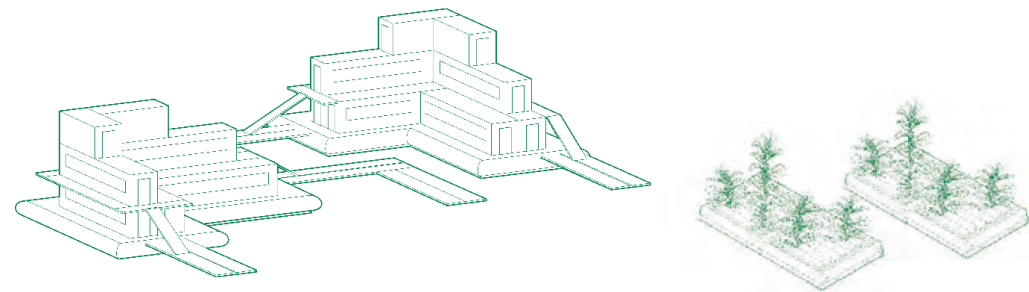
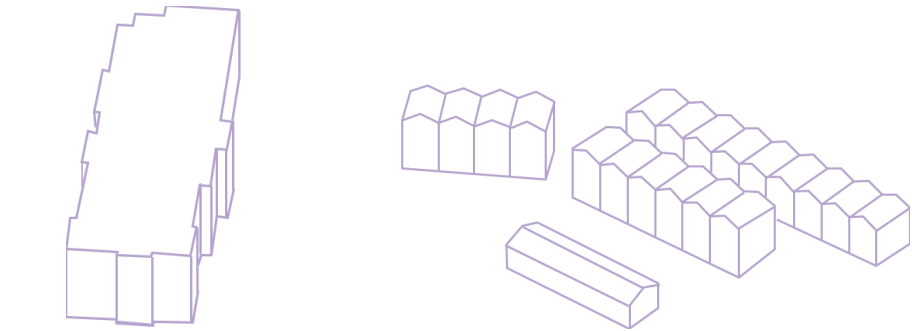
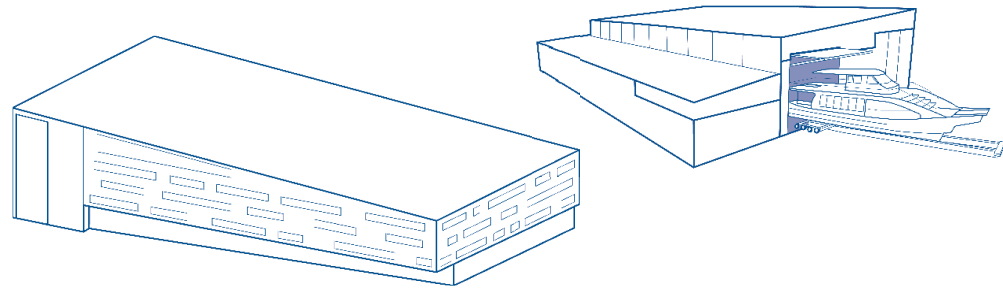
Units can feature green roofs, solar panels, rain barrels, and living walls. They are flexible and can be arranged in many formations. First and foremost these housing units are a response and strategy to the threat of sea level rise that will impact the site. These units are

able to adjust to the rising water levels because as the water rises, they will rise with it. The images below the section are call outs to the floating wetlands we imagine along the housing. This softening of the housing structure's edges allow for the cohabitation of arthropods, bivalves, aquatic and terrestrial vertebrates, as well as plants.





# (RE)WORKING WATERFRONT



## EVOLVING INDUSTRY

A designated industry core and creation of a Marine Tech Hub. This adapted built environment framework provides opportunity for new connections between workers, researchers, and visitors creating an eco-industry district.

## PEOPLE PLACES

Creating people places with various forms of housing, including townhomes, live/work, and mixed use. Providing public and semi-private amenities: greenhouse, bike kitchen, workshop, etc.

## HEALTHY HABITAT

Remediating toxins on site and paving the way for new research technologies to continue and monitor. Creating healthy habitats through floating wetlands, expanded green spaces, and more.





A business-as-usual approach is not how the global community will achieve the UN's ambitions to reduce global carbon emissions. This will take radical change – and brand-new original solutions, which must be included in process planning from the first link of the value chain.

*Lene Dammand Lund, Royal Danish Academy, in Climate*