2012

Nature and Architecture: a Holistic Response

Jarrod Martin
Roger Williams University, Jcmsoccer21@aol.com

Nature and Architecture:

A Holistic Response

Jarrod Martin

Independent Project submitted to:

Roger Williams University
School of Architecture, Art, and Historic Preservation

In fulfillment of the requirements of the M.Arch Degree in Architecture
In January 2012.

By _____
Jarrod Martin
Class of 2012

_____
Stephen White, AIA
Dean of SAAHP

_____
Andrew Cohen, AIA
Advisor, Professor of Architecture

_____
Edgar Adams
Advisor, Professor of Architecture

In today's modern aesthetic, architecture has become irresponsible to its site and context, even damaging the site permanently and creating an imbalance among man and nature. Architecture must serve as the vessel to unite man and nature and restore the balance, improving the sustainable character of the project. Architecture can heal the natural processes destroyed by man as nature has healed man for centuries, and with the development of natural healing, man can live better with nature and restore the imbalance to sustain the planet for the centuries to come.

table of contents

Nature and Architecture:
A Holistic Place

A Natural Healing and Research Park

table of contents

1 Writings

a manifesto | ecological architecture

Architecture is defined as the art or science of designing and building structures and especially habitable ones.[1] For centuries, mankind was able to respond to climactic conditions with architectural solutions that created a habitable environment. It has only been in the past century that habitable needs shifted to the reliance of mechanical inventions rather than on sustainable architectural solutions. Mechanical systems have only just begun to be environmentally friendly, but architecture should not be relying on these systems as nature can still perform more efficiently and sustainably than any man-made machine. This ecological design needs to become the architecture of today, not just the architecture of the past, in order for balance to be restored on Earth.

Ecological architecture is more than being sustainable as it is architecture that responds to the given site conditions, including historical, economical, social, cultural, and climactic factors. Sustainable architecture for most, is architecture that engages energy efficiency as to reduce building costs, while using nature as an aesthetic element primarily. As sustainable architecture can still be damaging to the environment, and is still reliant on economic decisions, it should not be considered as an ecological design choice. Sustainability in architecture can and must be enhanced to become less damaging and less invasive to the location of the building or project. Such architecture has termed proper sustainable measures as “low-tech” rather than give recognition to ecological design principles. If the architectural solution is approached as an ecological response to the site and climate, as a passive system, the architecture can remain minimally invasive, requiring little energy to maintain a habitable level on the interior. Ecological architecture is a systematic response to the given conditions of the project dictated by the location. Proper site response is required of architecture. Nature can teach us about how to respond properly to site context while remaining neutral or even beneficial to Earth’s environment.

“Nature is the flow of change within which humans exist. Evolution is its history. Ecology is our understanding of its present phase.[2]” Man has struggled to understand nature, always creating a style for a certain time period that coneys our attitude toward nature and culture at that time. Nature was formalized into rigid geometry and then made to look as if man had no part in it with the picturesque. The contemporary landscape is a product of human and natural processes and thus the representation of nature is always changing. As our understanding of nature has increased, architecture has begun to embrace nature in contemporary design. Modern architecture needs to not settle simply for what has been learned, but strive to learn more. Nature has been perfecting its strategies for nearly 4 billion years while humans have been adapting nature for only a few million. If nature has survived this long, architecture must learn from nature in order to provide the spaces for human life.

In responding to nature, architecture must accept every part of nature into all aspects of design. Fully integrating nature into a project can be the only successful way to express sustainability in a project. Adding nature on at the end is not a solution, but simply an aesthetic choice. If fully integrated early, the nature and architecture become cohesive in one project. A fully integrated project uses nature in all aspects of the project, from a concept to the realization of mechanical systems.

Nature is constantly changing as it adapts to current conditions of the planet caused by humans. If we continue to threaten the planet, Nature can only respond with life threatening acts as well. As humans have caused much of the change, it can only be our response to nature that restores the balance needed to prolong the life expectancy of the planet. Architecture in this way needs to respond also, enhancing connection and coexistence nature.

Only when architecture can create a symbiotic relationship between humans and nature, can the two exist cohesively.

problem statement | urban nature

In today's society, three words are used interchangeably to describe the attempt to create architecture responsive to nature. Sustainable, ecological, and green architecture are terms used in a variety of practices but none seem to describe the relationship of architecture and nature as an integral strategy for the development of place in society. All three try to establish a connection of nature and architecture but only ecological architecture seeks to restore the balance between nature and the built environment.

Ecological architecture can be looked at in three themes: tradition, technology, and urbanism[3]. Considering where architecture began shows the basic understanding of man responding to nature in the most minimally invasive way. Man only took what he needed and then tried to give it back in some form, whether it be planting a new tree for the one cut or using everything from a killed animal, meat, skin, and bone. Architecture today needs to do the same, only using the part of the site it needs and giving the rest back to the community, whether it be an urban plaza or landscaped park space. Healing the site, especially an urban site should be the focus for all development.

Horizontal expansion is no longer a viable option as the Earth cannot support sprawl. Urban development can help bring nature back to the city and make sprawl less desirable. Re-establishing the natural presence can help heal the city, from improving air quality to creating better quality space. Architecture can and must respond and respect the natural world as we become increasingly aware of how rapid development of the country has diminished it. Today is the start of a new generation that is committed to repairing what our forefathers have destroyed.

technology **architecture** education

nature **landscape** health

holistic **research** biodiversity

mankind **sustainability** medicine

project statement | healing architecture

Architecture can relate humans and nature, just as much as it separates the two. As first intended, architecture created shelter from nature but as we have learned, some of this shelter has become destructive to the earth. Humans have begun to realize that nature is important and provides everything we need for longevity. Architects have begun to respond immediately to sustainability and continue to push the envelope of what sustainability can mean in design today. Some use sustainability as a way to ventilate a building with fresh air while others may use it to showcase a vertically integrated garden on the facade. Sustainability for a project needs to be considered in all design decisions, from concept to realization. Only then does the architecture have a cohesive or integral relationship with nature.

Understanding and emulating nature is ideal for an everyday teaching tool in all professional practices, especially architecture and medicine. Images of nature has been proven to heal the sick faster and help with the prevention of human diseases. If images can quicken recovery, the physical presence of nature should have profound effects. As sustainability is an immediate response to the climactic problems society is facing today, ibuprofen is the solution for medicine. The basic question we have to ask ourselves is how will the effect us short-term or long-term, and this question needs to be asked for everything in life, from health, architecture, love, business and everything else. For medicine, seeking alternative or holistic treatment is proving to solve health problems with long-term results. Architecture needs to respond in the same way, creating long-term effects that are beneficial to the environment and surrounding cultures. Ecological architecture is the needed long-term response, not just sustainable architectural solutions. Understanding the effects of nature on humans is an integral part of our evolution as a society for our own betterment and for the health of our environment. This understanding will create the balance needed to prolong human and nature's coexistence on Earth.

Healing humans and healing nature need to become integrated elements, just as architecture and nature need to be cohesive. This project is based on the underlying principle that nature, humans, and architecture can evolve together as we learn more about each separately and jointly. As our knowledge of nature advances, medicine and architecture advance. This advancement enables humans to understand nature more, furthering the developments of nature within today's society. The three - nature, man, and architecture - are involved in a never-ending cycle. This project seeks to provide three projects to further the cycle: a place for natural healing and contemplation, a research facility for holistic healing, and alternative living facilities for patients and researchers.

Titled as a Natural Healing and Research Park, the project will strive to showcase how ecological architecture can create a place for humans and nature to engage and better each other for the advancement of all species and the planet. No longer will a building need to require a sterile, impervious building envelope that keeps nature subdued for comfortable living inside, but allow nature to flow in and out to create a balanced environment.

Inspirational Architectural Manifestos

In researching the place of nature within architecture, several manifestos were found that showcase the two as one. Architecture needs to be related to nature and as man has gone against this understanding in recent centuries, a new architectural solution is being understood in the offices around the world.

One of the essays found, was Tadao Ando's Toward New Horizons in Architecture.[3] Some of the most striking thoughts from the essay describe how architecture should not change the landscape at all and can even reintroduce a new landscape with the project.

"I came to realize the vital importance of establishing an architecture that didn't mar the grandeur of the existing landscape. Therefore, I focused on architecture's power to introduce a new landscape.

Architectural pursuit implies a responsibility to find and draw out a site's formal characteristics.

Contemporary architecture has a role to play in providing people with architectural places that make them feel the presence of nature."- Ando

This understanding of a new landscape that architecture does not necessarily mean inventing something new as it does providing something new. A new landscape can be the recreation of what was before, providing the natural habitat that will diversify the site again with flora and fauna. Architecture can be used as the catalyst for humans to understand nature and the site, whether it be integrated with nature or blur the lines of natural and man-made. Which ever solution fits, the project needs to engage the nature of the site in its formal strategies.

1

Published in 2010, Diana Balmori's A Landscape Manifesto[4] provides an understanding of landscape as a design solution for a variety of time periods and site locations. Each segment is summarized into a larger idea and then described in detail, with precedents cited continuously. The result is a listed manifesto addressing how landscape and architecture are become one and not separated fields anymore. All projects must invest in site understanding in order to create a stronger bond between humans and nature. Much of Ando's main points are addressed in a similar fashion by Balmori.

"All things in nature are constantly changing. Landscape artists need to design to allow for change, while seeking a new course that enhances the coexistence of humans and the rest of nature."

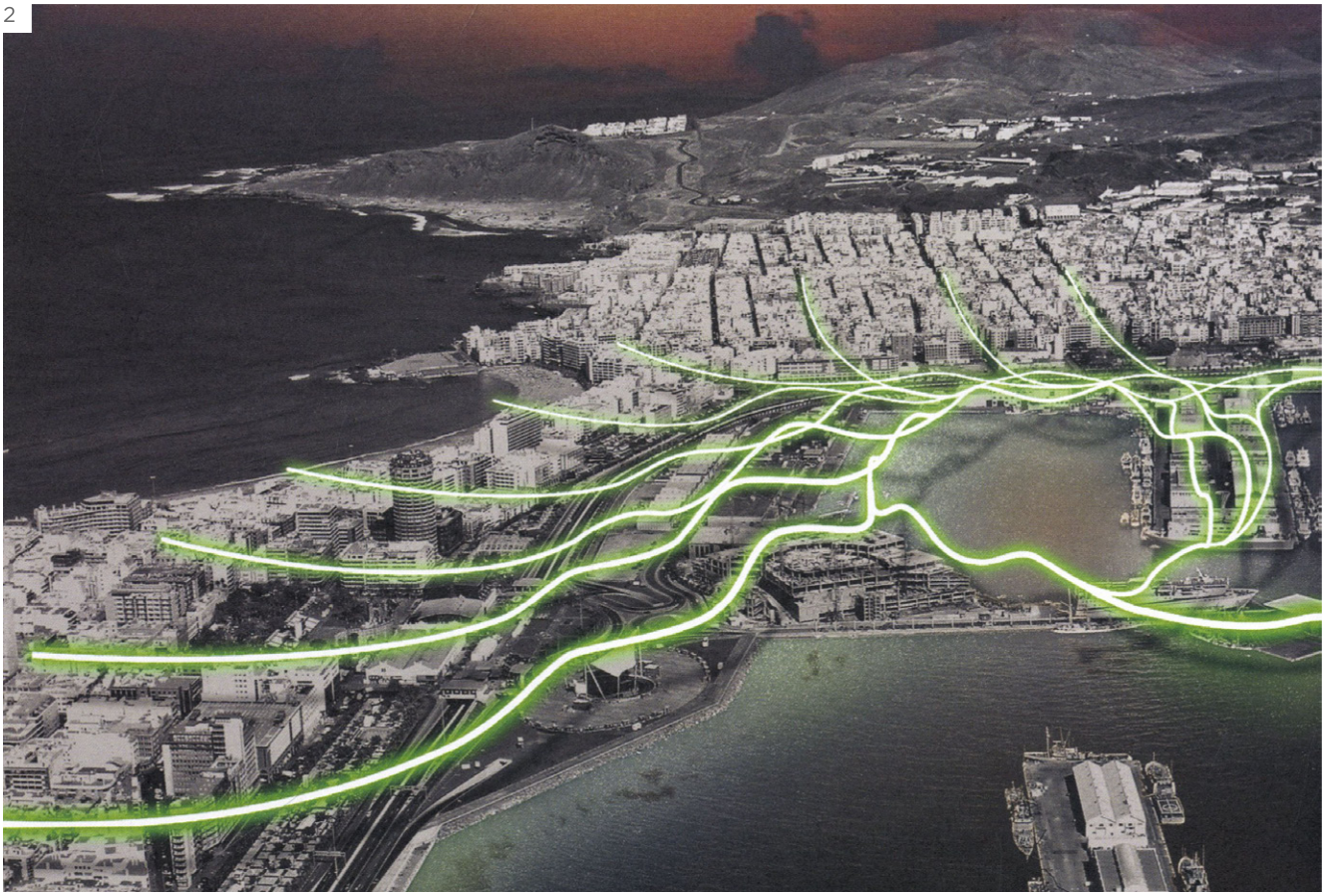
New landscape elements can become niches for species forced out of their original environment.

Existing urban spaces can be rescued from their current damaging interaction with nature.

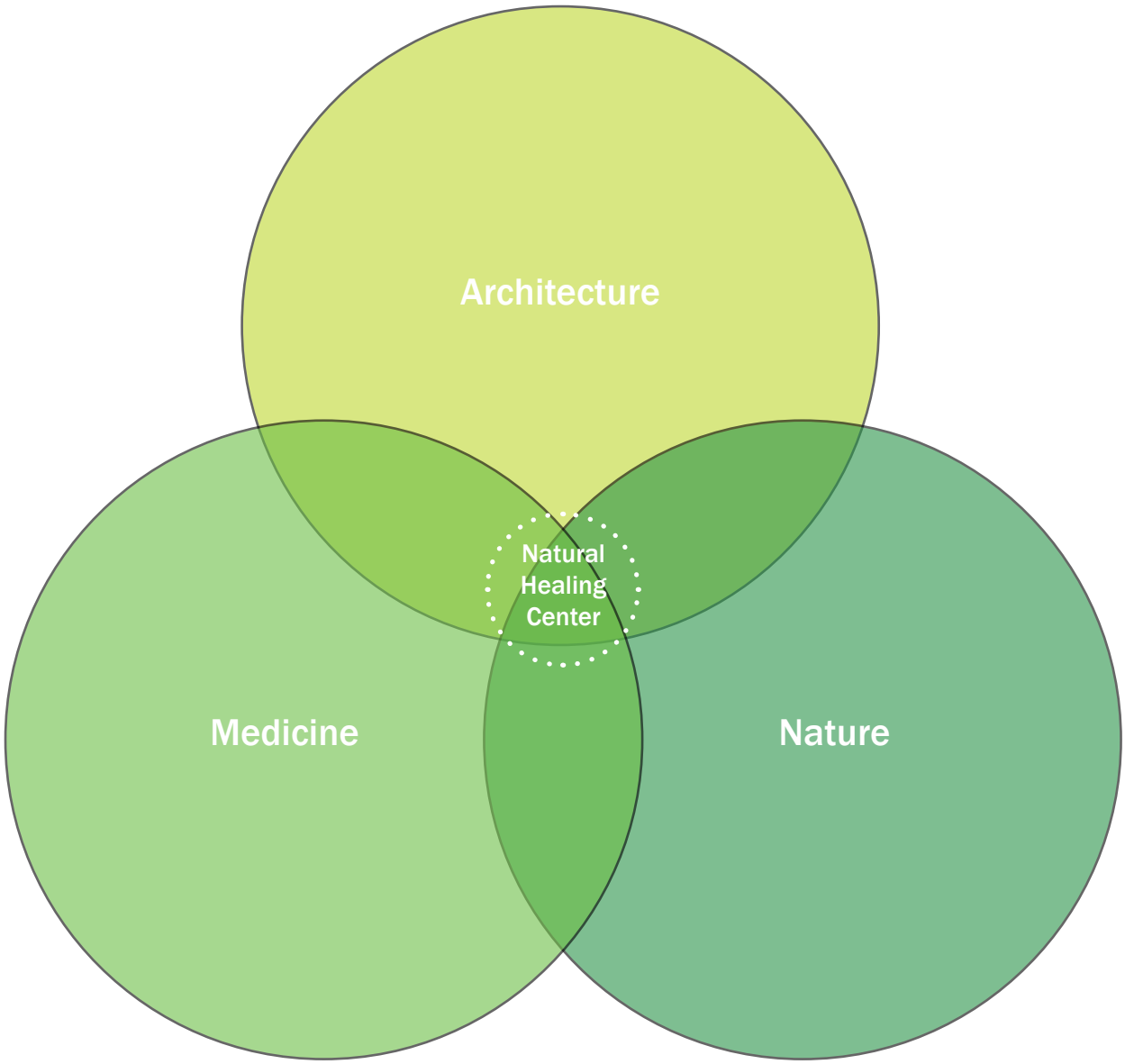
We can heighten the desire for new interactions between humans and nature where it is least expected: in derelict spaces." - Balmori

Balmori goes further than Ando, expressing the idea of healing urban spaces with the integration of nature more efficiently than the typical planter box. These new urban spaces can showcase the importance of nature within the city and demarcate places of urban interest. As buildings engage the city in a permanence, nature can address change as the city is constantly evolving to suit man's need. This relationship can put nature and architecture on the same stage, showing the porous effect of man interacting among both.

2



Project Themes



Architecture and Medicine

If someone asked you to picture a hospital, you would be able to, easily. You would picture the stark white walls that give little character to the place and the small rooms smelling of cleaning chemicals that have minimal views outside, and if lucky, that view is of a tree instead of a neighboring building. The healing environment is a standard in architecture and this is not to the benefit of the patients. It is a standardized formula that was created for maximum efficiency of the place, not maximum comfort.

There are architectural opportunities that are being missed in medical facilities that could promote health and recovery for patients. Such opportunities include access to daylight, views to nature, materials that elicit emotion, and a positive color palette. The architectural detailing of hospitals is what is lacking for most experiences and by simply adding wood panels on the walls, the room feels warmer than just bleached white walls. The hospital still needs to function as designed, but can be modified to suit the patient, not the doctor.

Architectural studies have been conducted and published to create certain design guidelines to promote efficiency in care that create proper circulation corridors, room layouts, and views from nursing stations[6]. Structural and mechanical innovations have been realized to allow flexibility for growth while improving upon standards in the hospital. These architectural innovations have helped create a healthy flow of work and care in the hospital but have done little to help the patients feel at ease. New studies have shown the importance of integrating nature into the building to promote health and are slowly being realized in the development of the new hospital typology.

3

4

Architecture and Nature

Study nature, love nature, stay close to nature. It will never fail you.

- Frank Lloyd Wright

Nature doesn't have a design problem. People do....Instead of using nature as a mere tool for human purposes, we can strive to become tools of nature who serve its agenda too.....What would it mean to become, once again, native to this place, the Earth - the home of all our relations?

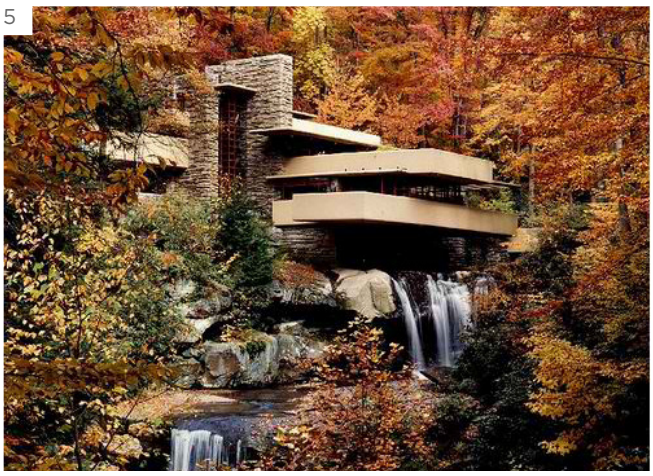
- William McDonough and Michael Braungart[7]

Architecture is the mediator between man and nature and as such, should be a direct response to the natural environment. Frank Lloyd Wright responded to the prairie with his distinguished prairie style architecture. The pinnacle example of this style can be seen in Falling Water, with its cantilevered floor slabs mimicking the cliffs of the area. Local materials, stone and concrete, mimic the natural colors found on the site and as the seasons change, the architecture does too, in the visibility of the project among the river, rock outcrops, and trees.

When building in a forest, blending architecture with nature is simpler as there is more to respond to. The basic forms come from the understanding of the materials available, as with the primitive hut. In recent years however, urban development has increased and nature and architecture are being tested in the city, not just in the open field or forest.

Urban use of nature has become the most recent development of architecture within the past few decades. In Frankfurt, Germany, Norman Foster created the Commerzbank Tower as an ecological solution for the skyscraper. Sky gardens were used to create social gathering spaces on every fourth floor, as well as provide natural ventilation for the entire building. Just using nature in an urban building is not satisfactory enough as architecture can relate to nature in many ways, including framing views and mimicking nature in form as with biomimcry and biophilic design. The mimicry can be literal or metaphoric, but should not just look like nature without performing as nature does. The Biomimcry Guild is a leading design firm that investigates nature's processes for understanding of how architecture can mimic such processes. One example of successful mimicry is an office and retail store in Zimbabwe that uses termite mound processes to natural heat and cool the building with no mechanical equipment. This project seeks to respond to nature in a similar way with the understanding of integrating architecture and nature in more than just a green roof, planted flower boxes, and atrium space. Natural processes will be integrated into the design from the beginning to make nature a part of the architecture, not just an add on.

5



6

7

Medicine and Nature

The typical medicinal environment is often very sterile and unfriendly to most. Conventional medicine is used in the major hospitals and is governed by the American Medical Association (AMA) in partnership with the pharmaceutical industry. Conventional medicine treats any health ailment by protocol taught in a medical university or during residency with surgery or prescription drugs. This protocol may be helpful for most circumstances but there are always those few that appear to be medically unresponsive to any treatment conventional medicine can provide. When a patient is left with more questions than answers from a doctor or hospital, the patient tends to question and distrust medical care. With nothing left to lose, the patient thinks of another option for care, alternative or natural medicine.

Natural medicine should not be the last choice for medical care as it is strongly routed in the natural processes of the body. Natural medicine has been around for millennia when man began using herbs to treat the sick. As technology developed, this practice lost its place in western culture as conventional medicine became the leading method for health care. Conventional medicine should not be looked at as wrong but as one option for health care. Natural medicine is often called complementary medicine as it treats the whole body and not a specific area affected.

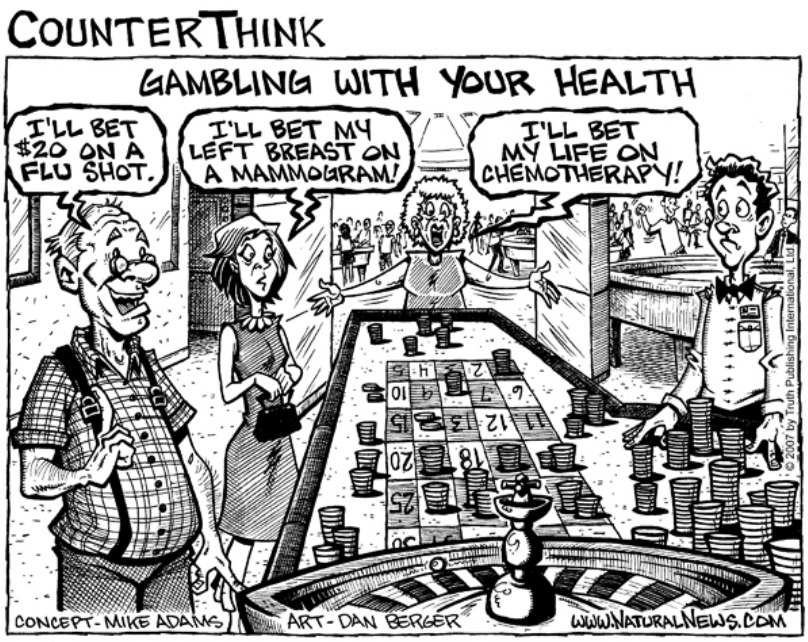
Natural medicine is an ancient practice that focuses on the whole body and practitioners focus on the underlying factors that are causing unhealthy symptoms. High-tech analytical machines are used to determine the problems or imbalances of the major body systems that can be responsible for symptoms. For headaches, improper balance, indigestion, or stress, a spinal x-ray can show pinched nerves or dislocated discs that are causing all of these symptoms and can be fixed with proper spinal alignment by a chiropractor. The healer focuses on the individual and treats them separately from anyone else with therapies geared to reversing medical problems.

Nature in medicine has been proven to enhance the healing the environment. Medical studies involving cancer patients have proven that images of nature have helped lower stress levels and increase healing time over patients that were shown images of the city[8].

8

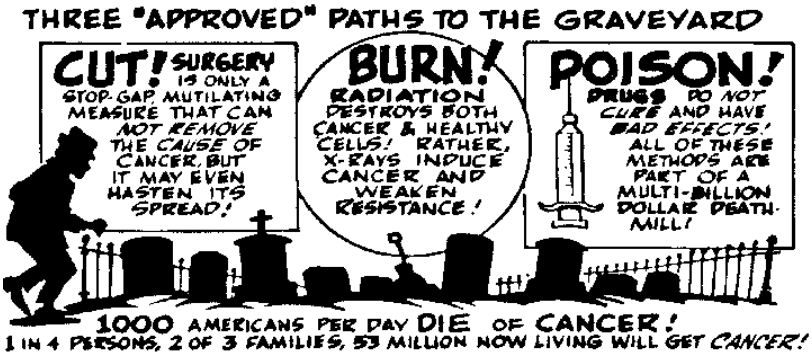
9

Media attention of alternative health care and conventional medicine.



10

11



12

With a large amount of negative attention on how traditional medicine is still causing medical problems, the media is helping people see that alternative medicine could be an option. As more and more question the normalcy of traditional medicine, more is being done to further botanical research.

Citations.

1. “Architecture - Definition and More from the Free Merriam-Webster Dictionary,” Dictionary and Thesaurus - Merriam-Webster Online, accessed May 09, 2011, http://www.merriam-webster.com/dictionary/architecture.

2. Diana Balmori, *A Landscape Manifesto* (New Haven: Yale University Press, 2010), pg. 224

3. Ecological Architecture: A Critical History. James Steele.

4. Kate Nesbitt, *Theorizing a New Agenda for Architecture: an Anthology of Architectural Theory*, 1965-1995 (New York: Princeton Architectural Press, 1996), pg. 458-61.

5. Diana Balmori, *A Landscape Manifesto* (New Haven: Yale University Press, 2010), pg. 225.

6. Noor Mens and Cor Wagenaar, Health Care Architecture in the Netherlands (Rotterdam: NAI Publishers, 2010), pg. 53.

7. William McDonough and Michael Braungart, Cradle to Cradle: Remaking the Way We Make Things (New York: North Point Press, 2002), pg. 30.

8. Kathleen McCormick, “Realm of the Senses,” Landscape Architecture V85, no. 1 (1995): pg. 60.

Images.

1. Children’s Museum in Hyogo, Japan by Tadao Ando.

2. Connectivity of Park and City. Parque de la Luz by Diana Balmori and Pelli Clark Pelli Architects.

3. Typical hospital room interior.

4. Phuket Hospital room with a view.

5. Primitive Hut.

6. Commerzbank Headquarters, Frankfurt Germany by Norman Foster.

7. Falling Water by Frank Lloyd Wright.

8. Items associated with conventional medicine.

9. Herbal supplements of alternative medicine.

10. “Medical Quackery (comic).” Independent News on Natural Health, Nutrition and More. Accessed May 12, 2011. http://www.naturalnews.com/021638.html.

11. “Gambling with Your Health (comic).” Independent News on Natural Health, Nutrition and More. Accessed May 12, 2011. http://www.naturalnews.com/025091_health_care_chemotherapy.html.

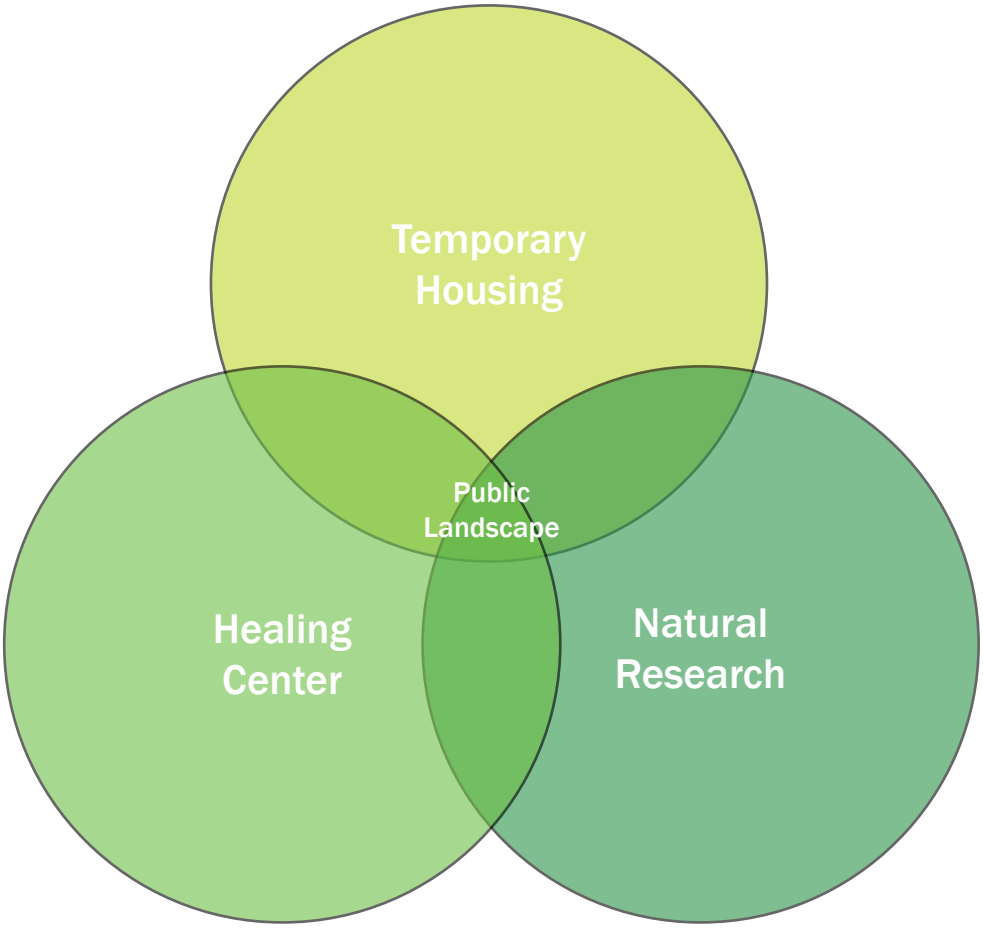
12. “Science-Based Medicine » On the Nature of “alternative” Medicine Cancer Cure Testimonials.” Science-Based Medicine. Accessed May 12, 2011. http://www.sciencebasedmedicine.org/?p=10.

2 Program

The general functions of the project will be a natural healing center and research facility for natural medicine. As medical practice and theory begin to shift in the understanding on natural treatment, modern medicine facilities are becoming more environmentally friendly. Hospitals are pursuing sustainable practices as well as seeking LEED certification in the United States. Although LEED is not a necessity for this project, the natural healing center will focus on holistic care as the primary medical treatment option for patients while engaging the project in sustainable design.

As a medical facility, patient rooms will be required. If long-term care is needed, possible family housing could be incorporated for short-term stay, depending on whether rural or urban. As research of nature and medicine is relevant for the advancement of the field, the program will include some research facility with laboratories in an adjacent wing, or even a separate building.

Landscaping will be the cohesive element in the design, creating a link between then patients and nature. A therapeutic garden will adjacent to the healing center to provide a more private natural setting for patients. If the research facility is in a separate building, a broad landscape will link the two, creating a park for the public good. As part of the healing of the site, the park will re-engage the public into the medical field, establishing a positive view on the cohesive relationship between architecture, nature, and medicine. People will no longer see the three as separate entities, but equal partners in the advancement of the human species on Earth in a positive light.



Understanding LEED and Sustainability

LEED (Leadership in Energy and Environmental Design) is a sustainable rating system developed by the United States Green Building Council to identify green methods for design, construction, operations and maintenance solutions. Based on a checklist, a project is awarded points for completing criteria that once totalled, provide points towards receiving LEED Certification. There are four classifications of certification, LEED Certified, LEED Silver, LEED Gold, and LEED Platinum from lowest to highest respectively. In the basic essence of LEED, the system is used to promote sustainability as a whole building approach, not just an added process. LEED targets the following areas of performance as vital to creating a sustainable project and within each category are several subcategories[1].

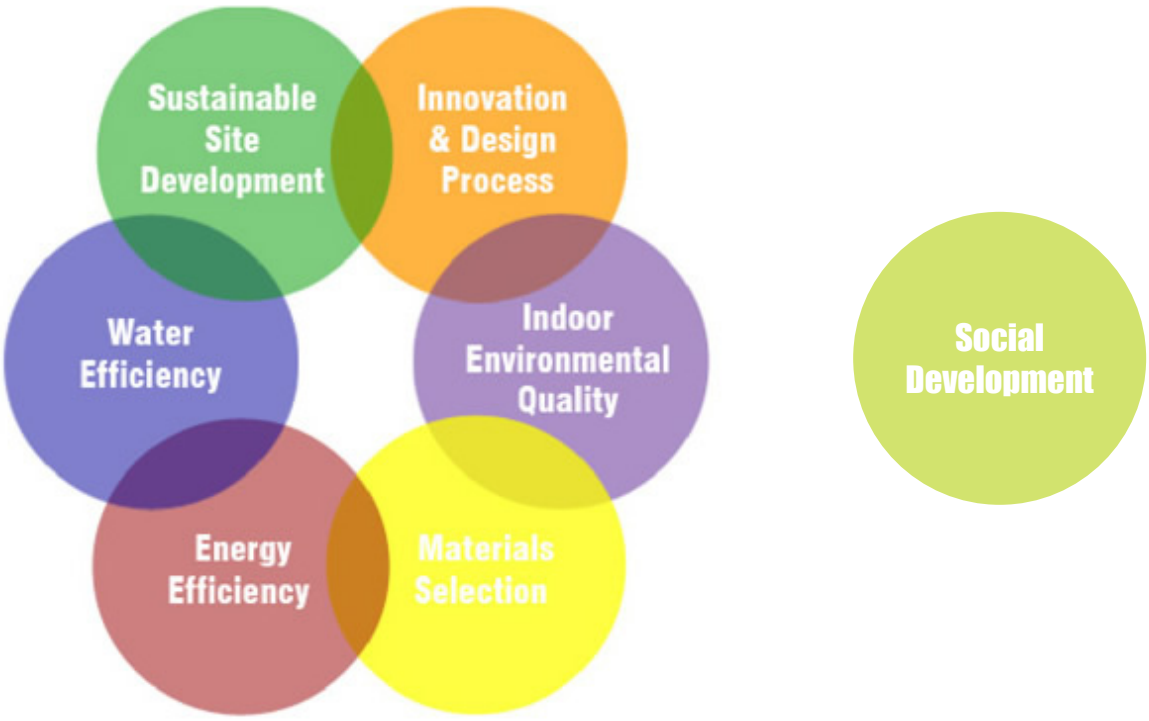
Sustainable Sites
Water Efficiency
Energy and Atmosphere
Materials and Resources
Indoor Environment Quality
Innovation in Design
Regional Priority

Many US projects seek LEED certification to showcase their business as sustainable and in doing so, create a positive public image for themselves. Sustainability should not be used as a tool to gain public recognition and increase profits as many are using LEED for. The fundamentals of LEED were established to encourage healthy building practices for the environment but has since turned into an advertisement program for companies.

LEED is very acceptable at determining efficiency of a building and provides guidelines on how to keep water and energy on site as much as possible to limit waste. The largest problem with LEED is how points are earned, as some points are earned in more than one category for the same reason. The result is still sustainable but the difference could be LEED Silver or LEED Gold. The rating system is primarily used to determine ecological sustainability.

Social sustainability is not factored into LEED in the idea of creating space the responds to the community and pedestrian. It encourages site development on an environmental level but does not rate the space, just the process. By encouraging proper social development of the neighborhood with open public ground floors, pedestrian friendly facades, response to neighborhood context, and transition zones, LEED would be much more enriched with culture and sense of place.

1



Sustainable Integration

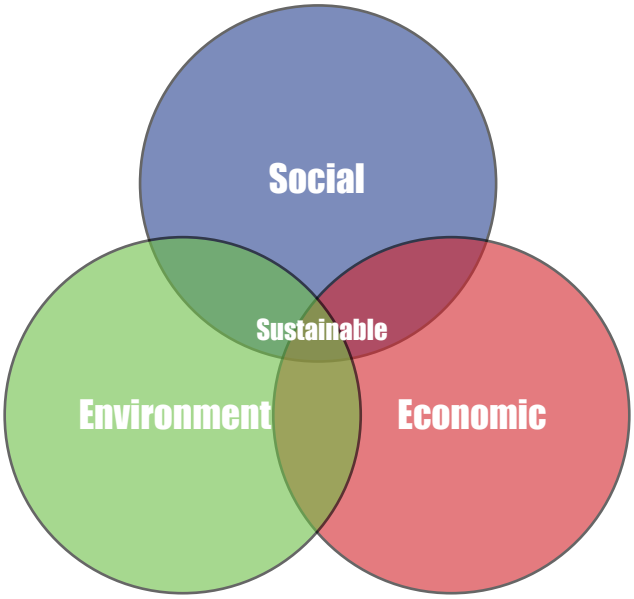
Sustainability is a loose term in today's society as everything is trying to be environmentally friendly, whether that be recycled, energy efficient, locally grown, or redeveloped. Due to the range of ways modern society is using sustainable, it needs to be clarified. Sustainability in architecture should be defined as properly engaging architecture to naturally develop a site to be reestablish anything that had been removed during development and creating an environmentally friendly building that contributes to society's growth and existence.

For site development, sustainable architecture can provide the natural processes that had been removed during the creation of a previous building or during construction. By incorporating native flora, the site ecosystems can be restored, bringing balance to site again. Public open space on the site can create a natural flow of use and help heal the site more. Healing the site is an effort of sustainability this thesis project seeks to pursue.

Healing with sustainable architecture goes beyond just site development. The architecture itself needs to heal the environment we build in. Part of the global reaction to sustainability is the need to reduce pollutants in the atmosphere that are harming the Earth and risking the life expectancy of the planet and all those living on it. The architecture should be environmentally responsive and engage all passive strategies that are appropriate for the site, climate, and building typology. Responding to site context can be an easy way to understand the type of architecture that is relevant to the site. Historical buildings tend to display the most information as they were built before any mechanical equipment was integrated and show how a building can naturally respond to temperature change, exchange air naturally, and remain in use for decades.

Once all passive strategies and landscaping is designed, the building can become more sustainable with the introduction of efficient mechanical systems. Mechanical systems should never be the only sustainable measure for a building and should not be the only reason something is called sustainable. Reducing energy and water use is essential to prolonging the resources we do have and for that reason, mechanical systems are needed in harsh climates and for certain complex building typologies in order for the program to function properly.

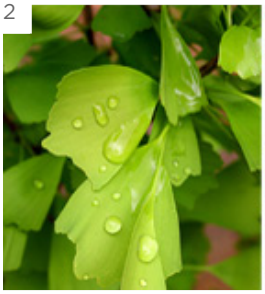
Sustainable architecture is one that responds to the existing context and further develops the site for the betterment of the environment, physical and social, while creating an environmentally responsive building that encourages the health of the inhabitants, the public, and the planet.



Programmatic Understanding

Natural health facilities vary in the amount of services offered as some are more focused practices while others are more retreats, as in therapeutic spas. The National College of Natural Medicine (NCNM) is located in is the oldest accredited program in North America that educates on natural medicine. The University was looked at as model for what teaching elements to include within the center and to learn about what is required of each service and possible relationships of the program. Using this school as a model, the program serves as a model for Oregon Health and Sciences University, the potential client for this thesis project. OHSU would be creating a new natural medicine program adjacent to the current facility in South Waterfront, Portland, Oregon.

2



Medical Services offered by the NCNM Clinic[2].

Acupuncture
Treatment of patients with the insertion and manipulation of needles in the body. Can be used to relieve pain, treat infertility, diseases, and promote general health.

Cancer Treatment
With a variety of therapy and management techniques, cancer patients are being treated to deal with the disease in a positive manner.

Chinese Medicine
A healing philosophy uniting the mind and body complimentary to naturopathic medicine.

Colonics
Removal of toxins from the colon and intestinal tract using water and mixed herbs.

IV Therapy
Administering direct intravenous therapy to stabilize chemical imbalances and speed recovery.

Homeopathy
Energy healing techniques to promote physical, mental, and spiritual awakening and growth.

Hydrotherapy
The use of water therapy to cure using heat and cold baths and compresses.

Minor Surgery
In-office surgery of the skin, removing cysts, foreign bodies, lesions, and superficial wound repair.

Musculoskeletal
Hands on therapy to treat muscles and soft tissues to reduce pain, stiffness, tension, aches and improve mobility. Techniques includce massage and chiropractic.

Nutritional Counseling
Health and diet counseling services to understand healthy eating habits, proper weight management, and understanding allergies and disorders.

Obstetrics
Natural childbirth care outside of a hospital, including prenatal and postnatal techniques to reduce complications associated with pregnancy.

Physical Medicine
Therapeutic manipulation of soft tissue, muscle, bones,a nd the spine using ultrasound, exercise, massage, water, heat and cold, and electrical therapy.

Sports Medicine
Treating sports injuries and nutrional counseling for athletes.

Wellness Exams
Physical exams and consultations for all ages and genders.

Occupancy and Square Footage

Based on the International Building Code, the two buildings will have the following uses.

Natural Healing Center as B type occupancy.
Research Facility is F-3 type occupancy.
Temporary Stay Facility is R-1 and R-2 type occupancy.

	Square Footage	Quantity	Total
Common Spaces			4630
Reception	300	1	300
Nurses Station	500	1	500
Consultation Rooms	100	4	400
Exam Rooms	100	8	800
Offices	100	4	400
Conference	120	2	240
Kitchen	240	1	240
Lab/Xray	1000	1	1000
Bathrooms	75	6	450
Storage	150	2	300
Medical Services			5415
Wellness exams			
Men	100	2	200
Women	100	2	200
Pediatric	100	2	200
Nutritional counseling			
Weight Loss	80	1	80
Detoxification	80	1	80
Diabetes Management	80	1	80
Minor surgery			
Skin Surgery	250	1	250
Radiosurgery	250	1	250
IV therapy			
Treatment Room	150	2	300
Adjacent Storage	80	1	80
Colonics			
Colon therapy	125	1	125
Homeopathy			
Treatment Room	100	2	200
Storage Room	150	1	150
Prepatation Room	80	1	80
Acupuncture			
Multiple rooms	100	4	400
Hydrotherapy			
Sitz bath	100	2	200
Warm bath	100	1	100
Sauna	120	1	120
Various methods	100	2	200
Bodywork			
Shiatsu massage	100	2	200
Reiki therapy	100	2	200
Yoga	100	1	100
Trigger point therapy	150	1	150
Craniosacral therapy (CST)	150	1	150
Musculo-skeletal (MSK)			
Physiotherapy	100	1	100
Chiropractic	100	2	200
Cancer Treatment			
Acupuncture and Herbs	100	4	400
Cell therapy	100	1	100
Alkalinizing therapy	100	1	100
Stress management	100	1	100
Nutrient therapy	80	1	80
Counseling	120	2	240
Herbal Pharmacy			800
Supplements			
Dry Herbs			
Homeopathic			
Herbal Tinctures			
		Net Total	10845
		Gross Total	16270

	Square Footage	Quantity	Total
Common Spaces			4380
Offices	100	15	1500
Kitchen	250	1	250
Lounge	150	1	150
Bathrooms	60	8	480
Library	2000	1	2000
Medical Laboratories			11850
Research			
Dark	800	2	1600
Dry	1000	8	8000
Wet	500	2	1000
Greenhouses			
Herbs	250	1	250
Consumable	500	1	500
Native	500	1	500
		Net Total	16230
		Gross Total	24345

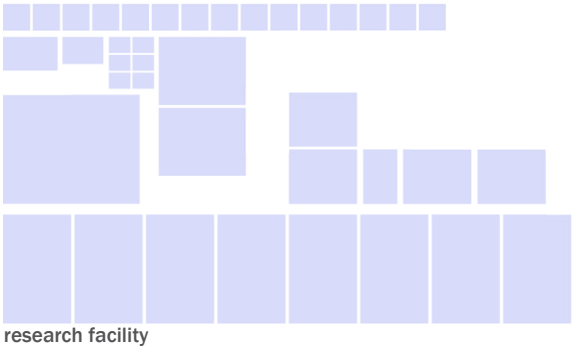
	Square Footage	Quantity	Total
Common Spaces			1150
Rental Office	200	1	200
Social Rooms			
Dining	150	1	150
Kitchen	200	1	200
Library	600	1	600
Meditation	500	1	500
Temporary Housing			19800
Single			
Patient	500	12	6000
Researcher	500	8	4000
Double			
Patient	700	8	5600
Researcher	700	6	4200
Triple			
Patient	950	6	5700
Researcher	950	4	3800
		Net Total	20950
		Gross Total	24640

Parking			
Temporary Residence			
1.5 per unit	160	66	10560
Medical Parking			
30% Program			5400
		Gross Total	15960

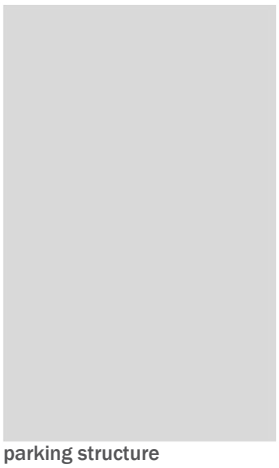
Landscape Spaces	
Therapeutic Garden	12000
Landscape	
Water	
Community Garden	6000
Flower	
Consumable	
Public Lawn	16000
Living Machine	
Gross Total	34000

Building	65255
Landscape	34000
Parking	15960
Gross Total	115215

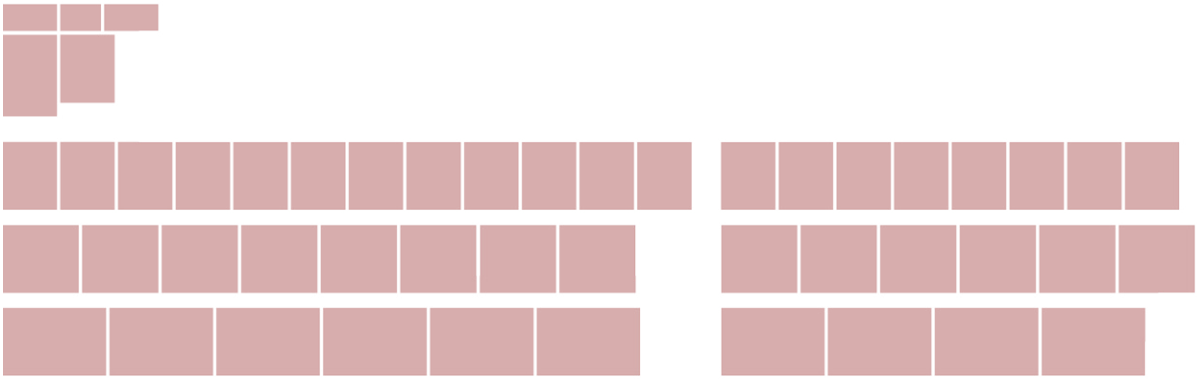
natural healing center



research facility



parking structure

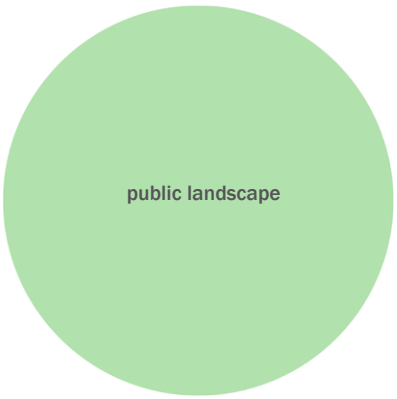


temporary stay units

therapeutic water gardens

therapeutic gardens

community gardens



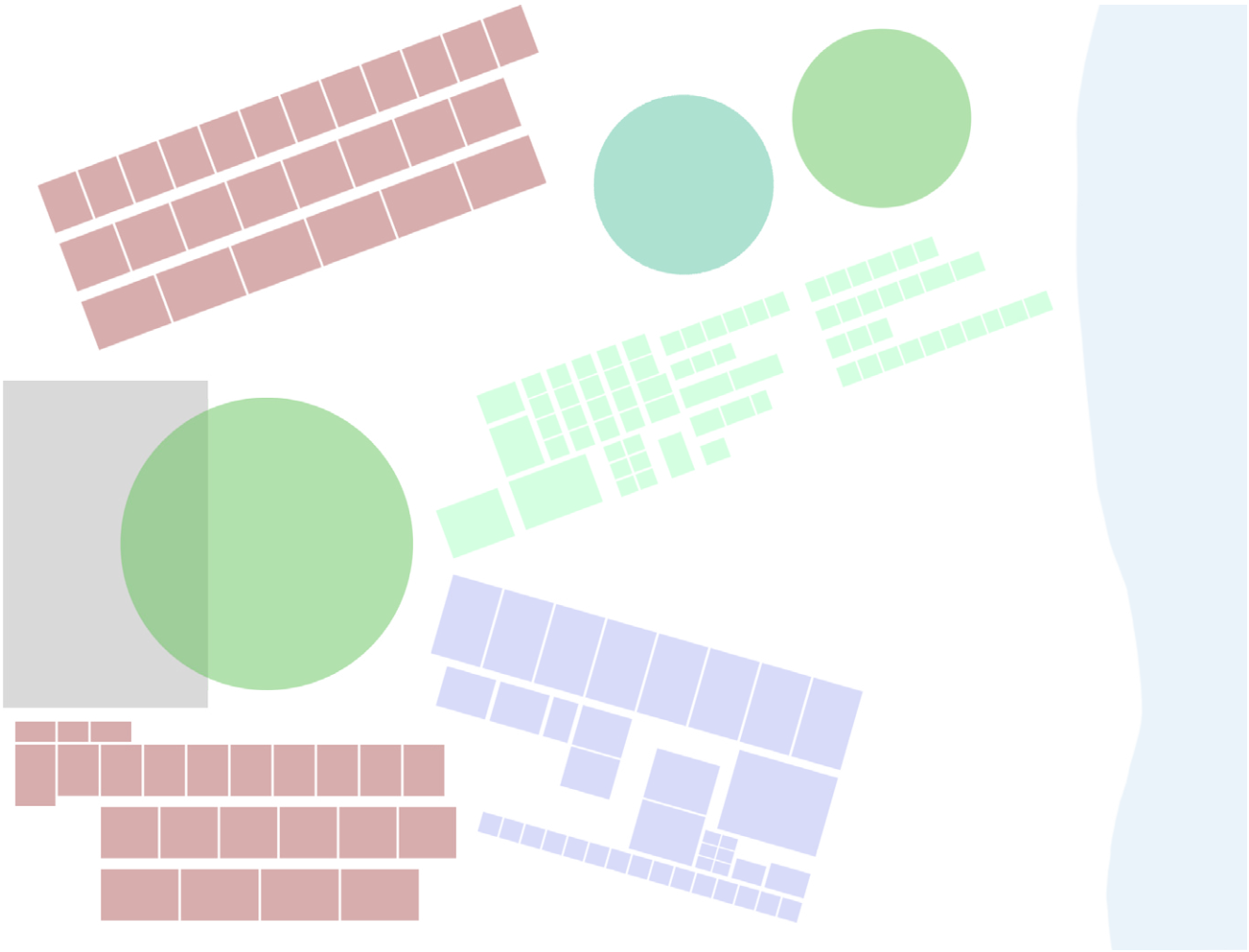
public landscape

Programmatic Relationships

The interrelationships of the three main programmatic elements - the healing center, research facility, and temporary housing - can be woven into the existing urban fabric in a series of buildings sharing a common nature. Each element will be linked and visible to the public from the central community landscape and gardens while more private landscape elements combine more private functions.

The therapeutic gardens are more private landscape spaces that are used to promote healing and therefore cannot be accessed by the general public. While promoting healing, the gardens need to connect the place of the patients and families that support them, therefore the housing and healing center will be naturally linked by both therapeutic gardens.

Landscape elements within the landscapes will need to provide community involvement in order to promote the interaction of the general public and the healing community. By initiating public gardening opportunities, the neighborhood can share space for food and plant production. The landscape can also be used as a sustainable tool for the facility as disguised in a natural wetland. With program along a river or bay, reincorporating natural wetlands will help restore natural balance to the environment that humans took. Wetlands of some sort lined all water bodies and by creating a link from the water to soft edge to wetland machine, the community can be engaged in the site's natural history as well as learn natural systems can function in our technological world.

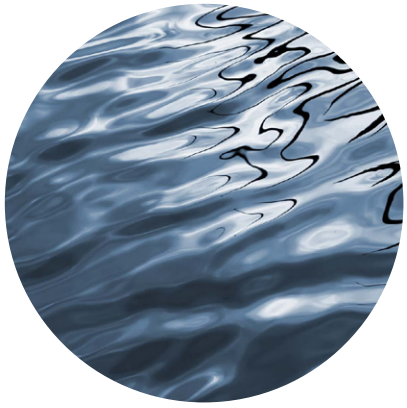


Architectural Elements for Design

Materials.
The feel of the project will be influenced by the material palette used throughout the project. Natural materials elicit a stronger reference to home and nature and therefore will be used for the healing center as much as possible. The natural building elements can also create the blurred boundary of inside and outside that is desired for the project.

3-5





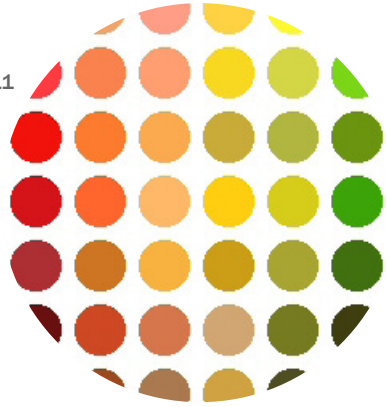
Open Spaces.
One of the largest problems with conventional medicine hospitals is the lack of open space. Strict corridors of small rooms create a sense of enclosure for patients and by simply introducing a larger room for waiting or a shared television room can create a stronger sense of space and introduce light.

6-8



Colors.
White walls do not create any type of positive feeling for patients. Color research has shown that certain colors create mood effects and can establish connections on sight alone. Using warmer tones creates a sense of welcome while bright colors may be overwhelming but visually striking.

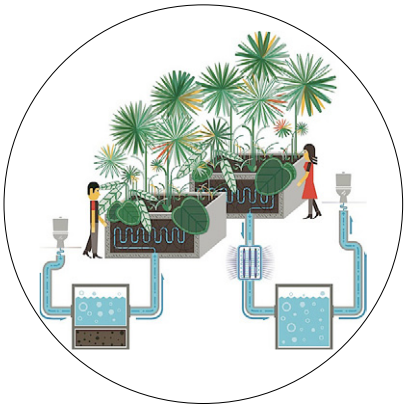
9-11




Landscape Elements for Design:

Living Machine System.
A natural wetland can be a landscape element the public understand and knows. By incorporating the living machine, the wetland will go further than most are aware of, allowing new knowledge of this natural system. Nature can clean the waste of the medical facility properly as well as manage water on site. Simple signage can educate the community on what this ecosystem can do.

12-13

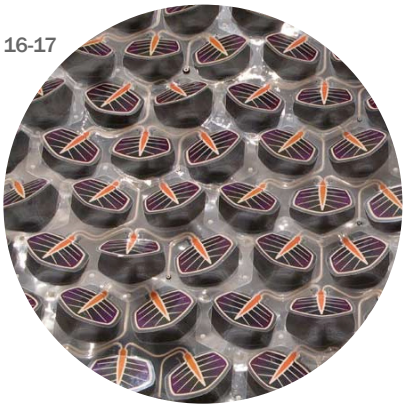


Public Gardens.
Community is essential in order for civilization to thrive. Creating a public community in an urban setting will allow different social groups to gather in one place, sharing a conversation that may not happen anywhere else. Naturally grown foods can help foster healthy eating and living habits.

14-15

Solar Ivy.
As part of the on going research on sustainable practices, biomimicry has begun to shape technology. Although the ideal solution for this project is to use passive systems for the most part, certain technology has lent itself to being faux-nature in appearance. Solar ivy is the latest solar panel development as each individual “leaf” can respond to light and win.

16-17



Daily Narratives - Landscape and Building

A New Patient's Arrival

After receiving treatment for back pain and taking countless medications, nothing seemed to work to relieve the pain. With my back in constant torment, working at the computer was almost impossible. My dreams of designing were falling away with the pain and as a last resort I thought of chiropractic care. Always thinking of it as being financial robbery, I decided to try the facility near the UCSF medical park where I had tried to receive medical treatment before. I made the appointment for a Tuesday afternoon.

Upon arriving at the location, it took me several seconds to identify the building among the trees. My iPhone was saying I had arrived at the address but all I could see was a park and trees, with what appeared to be vertical gardens in the distance. I asked a walker along the sidewalk adjacent to the park where the Natural Healing facility was, and the man kindly instructed me to park on street and then follow the yellow plantings to the healing facility. He informed me also that when the path splits, the plantings will change but remain the same color to guide the visitor. I asked why their were no signs and the man laughed, saying there were signs on the ground as to what color to follow.

A Cancer Patient's Journey

Chemotherapy was my ultimate fear. Losing my hair like I had seen my mother and father was something I could not bare to show my family but it was necessary in order to live another day with them. I could deal with the hair but the soreness and lack of life during treatment is something my children would not be familiar with so I researched ways in which to overcome the side effects and found a natural healing strategy located on the cancer treatment brochure.

I called the number and spoke with a kind receptionist about more detailed information. She was able to provide information to me on alternative treatments that can boost the body into a natural healing state, reducing the length of chemotherapy effects on the body. If treatment is started early, the after effects are minimal and most patients were said to have gone about their normal day. The final thought she provided me was that natural methods can even reduce the risk of cancer returning by adapting lifestyle choices to be more environmental friendly. She had convinced me and helped me schedule a consultation with a natural therapist.

Upon arrival at the address, I was amazed by the lack of building compared to the vastness of the landscape. I followed the receptionists direction on where to park and how to navigate the trees to the healing center. Once I arrived at the building, I noticed how much life the building evoked, atypical of the medical buildings I had been treated at prior. I'm not sure if it was the materials used or the amount of nature surrounding the entry, from path procession to entering the lobby. It almost seemed as if the building grew from the nature.

Once waiting for just around 5 minutes, a nurse directed me to a consultation room. During our brief walk, I saw connections to the outdoors everywhere and what appeared to be a therapeutic garden behind the building. Several patients were gathered together and engaged in conversation. Another was walking with a nurse, casually discussing something in the distance. This place seemed ideal, almost like a natural haven in the busy day to day experiences of everyday life for a mom, a wife, a daughter. Once I entered the consultation room, I noticed again the natural view, this time on a pond. Something about the view of the calm water made being in a medical building much more comfortable and relaxing. The nurse and I discussed my cancer and current treatment in order to establish my new natural treatment plan. She advised therapeutic massage and reiki therapy as initial measures to calm my internal qualms. The next step was to meet with a living therapist to engage proper nutrition and healthy activities to maintain a higher natural quality of life post-treatment.

After receiving my initial therapy, I felt much different, much less stressed and focused on how my life was put on pause by the cancer. I spent half an hour in the therapeutic garden while the euphoria wore off. I scheduled more appointments and treatments so that with this new natural healing, hopefully I can reduce my chances of cancer again and remove the threat from my family's life.

Citations.

1. “USGBC: What LEED Is.” USGBC: U.S. Green Building Council. Accessed May 17, 2011. http://www.usgbc.org/DisplayPage.aspx?CMSPageID=1988.

2. “National College of Natural Medicine: A Naturopathic School and Classical Chinese Medicine School Located in Portland, OR - NCNM Clinic,” National College of Natural Medicine: A Naturopathic School and Classical Chinese Medicine School Located in Portland, OR - NCNM, NCNM Clinic, accessed May 09, 2011, http://www.ncnm.edu/ncnm-teaching-clinic/ncnm-clinic.php.

Images.

1. Key areas of human and environment health. “Green Wall Benefits - LEED Credits.” Green over Grey™ Living Walls and Design Canada - Green Wall Vancouver, Vertical Garden. Accessed May 17, 2011. http://www.greenovergrey.com/green-wall-benefits/leed-credits.php.

2. “National College of Natural Medicine.” National College of Natural Medicine: A Naturopathic School and Classical Chinese Medicine School Located in Portland, OR, accessed May 09, 2011, http://www.ncnm.edu.

3. Highline Materials. “Wood on the High Line.” The High Line. Accessed May 17, 2011. http://www.thehighline.org/news/2009/06/28/wood-on-the-high-line.

4. Natural Stone Wall by The Wall. “Stone Natural Portland Oregon - Retaining Walls Using Recycled Materials from ‘The Wall’” The Wall - Portland Retaining Walls Built From Recycled Materials. Accessed May 17, 2011. http://www.bythewall.com/stone-natural_9.html.

5. Water. Autodesk Revit 2011 texture.

6. Laguna Honda Hopsital Interior. Lee, Evelyn. “Laguna Honda, California’s First LEED Certified Hospital.” Inhabitat. January 24, 2011. Accessed May 17, 2011. http://inhabitat.com/laguna-honda-is-california’s-first-leed-certified-hospital/.

7. Community Health Center waiting room. “U of L, Glasgow/Barren County Family Medicine Program - Hospital/Campus.” University of Louisville, Glasgow/Barren County Family Medicine Residency Program. Accessed May 17, 2011. http://www.glasgow-uofl.org/HOSP.HTM.

8. St. Amthony Hospital interior hallway. Stephens, Suzanne. “St. Anthony Hospital | ZGF Architects LLP | Gig Harbor, Washington | Building Types Study | Architectural Record.” Architecture Design for Architects | Architectural Record. Accessed May 17, 2011. http://archrecord.construction.com/projects/Building_types_study/healthcare/2010/St_Anthony_Hospital.asp.

9. Warm color palette. “Determining Color Palettes.” Rosalind of Arden. Accessed May 17, 2011. http://www.rosalindofarden.com/?p=40.

10. Unfriendly hospital hallway. “Cma0823-hospital-hallway.” Susie B. Magazine: 21st Century Fox. Accessed May 17, 2011. http://www.susiebmag.com/archives/1319/cma0823-hospital-hallway.

11. Interior hallway mural. Official Website of Veronica Ruiz De Velasco - Disciple of Rufino Tamayo and Jean Dubuffet. Accessed May 17, 2011. http://www.veroart.com/_html/exhibitions.html.

12. Wetland Machine. Daily, Jessica. “Wastewater Treatment Plant in San Francisco.” Inhabitat. February 21, 2011. Accessed May 17, 2011. http://inhabitat.com/laguna-honda-is-california’s-first-leed-certified-hospital/.

13. Wetland Machine diagram. Berg, Nate. “Deja Poo: The Living Machine Sewage System.” Wired.com. Accessed May 17, 2011. http://www.wired.com/science/planetearth/magazine/17-06/st_sewagegrid.

14-15. Community gardens in Portland. “Portland Community Gardens - Portland.com.” Portland, Oregon - Portland.com. Accessed May 17, 2011. http://www.portland.com/community-gardens.php.

16. “Solar Ivy Interesting Alternative Energy Design.” PaulTech Network. Accessed May 17, 2011. http://gopaultech.com/blog/2009/07/solar-ivy-interesting-alternative-energy-design/.

17. Solar Ivy. Accessed May 17, 2011. http://solarivy.com/the_idea.

3 Precedents

For this thesis project, precedents are used to provide an understanding of the space to be created and how other architects have responded to the same typology. When looking at precedents, they will be analyzed for they respond to nature and create space within the project that creates such a habitable environment for healing.

Projects that will looked at for medical centers are:
Healthcare Center 2009 by NORD Architects
Maggie Centres by various architects

Medical research facilities are:
John Curtin School of Medical Research by Lyons Architecture
Botanical Research Institute by H3 Hardy Collaboration Architects

Temporary housing are:
Temporary Housing in Parla SLP 156 by Ronda Architects Pizarro
Neue Hamburger Terrassen by LAN Architecture

Besides architecture precedents, examples that showcase nature in urban design are:
Ken Yeang's ecological skyscrapers
The Washington State Convention and Trade Center
The Ford Foundation

Healthcare Center for Cancer Patients
NORD Architects
Copenhagen, 2009

"Research shows that architecture in itself can be healing and have a positive influence on peoples' recovery. The key is to have a human scale in the architecture and create physical surroundings with a homey atmosphere."

NORD Architects[1] recently won a competition for a healthcare facility for cancer patients. The qualities of the design evoke aesthetics uncommon for health facilities while engaging principles of healing architecture. The 7 Principles of Healing Architecture are:

Unity Of Form And Function
Polarity
Metamorphosis
Building-Site Relationship
Natural Building Envelope
Architectural Color
Spatial Order – Nature and Experience

Nature is closely related to the architecture, being incorporated in internal courtyards, terraces, and gardens. The facility is 1800m2 (19375 sqft) and was inspired by the Maggi Centres in the United Kingdom. The scale of the project is almost that of a house, to create a sense of comfort. The building provides rehabilitation and social support spaces for patients and their families.

"You know you are sick when you enter a hospital. Otherwise you wouldn't go there. The large buildings with their grand receptions areas are not places where you hang out just for fun. But the new Healthcare Center for Cancer Patients in Copenhagen designed by NORD Architects aims to be just that: a place where you come to get better, get knowledge and have fun.[1]"

The plan is organized with social spaces along the interior, surround the atrium space for maximum light and privacy from the street. Therapy rooms are placed on the exterior and there is a double heighted space that all circulation is organized around. On the northern part of the site, there are work rooms and offices for maximum controlled light.


Social Spaces
Private Therapy
Group Therapy
Offices/Work Rooms
Service/Storage

Maggie Centres
Various Architects
United Kingdom

The purpose of Maggie's Centres[2] is to help you make a healthy adjustment to the impact of cancer on your life. Maggie's program has five core elements in a supportive non-institutional environment, emotional and physical support, relaxation and stress management, health information, benefit advice and support sessions. There are seven built centers already with four being planned. The existing centers have been created in the United Kingdom only and by world famous architects.

1. Edinburgh – 1996 – Richard Murphy
2. Glasgow – 2002 – Page\Park
3. Dundee – 2003 – Frank Gehry
4. Highlands – 2005 – Page\Park
5. Fife – 2006 – Zaha Hadid
6. London – 2008 – Roger Stirk Harbour + Partners
7. Chelthenham – 2010 – MJP Architects

1


2


3


4


5


6

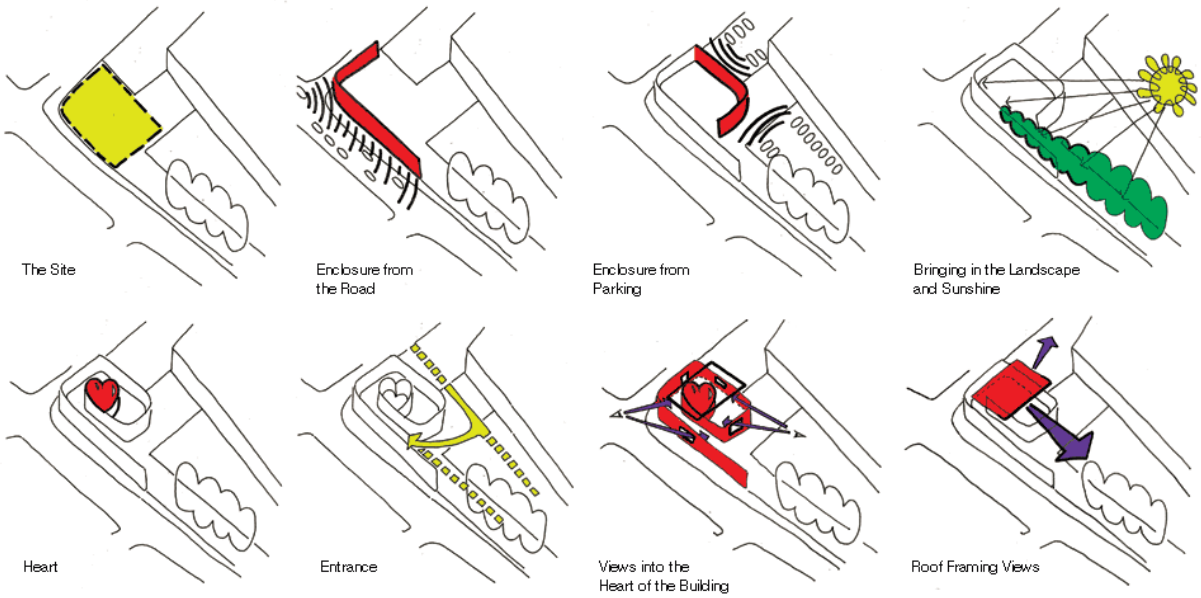

7


Maggie Centre London
Richard Stirk Harbour + Partners

The center in London[3] is being looked at in depth for the type of strategies it used for creating a calm and healing place within an urban concept. Nature was used to create a buffer system against the heavy street traffic, as well as an eight foot wall. The building is 370 m^2 (3980 ft^2), about the third the size of the healing center for this project. The concept of the project was to create a place that feels opposite of a hospital, almost house-like. NORD did the same with their new health center after looking at Maggie Centres for inspiration and understanding. As with a home, the community kitchen was placed at the center to give prominence and all others rooms are accessed from the kitchen. The overall effect of the building is a warm, friendly environment where patients can learn about the impact of cancer on their lives and how to recover from the disease.

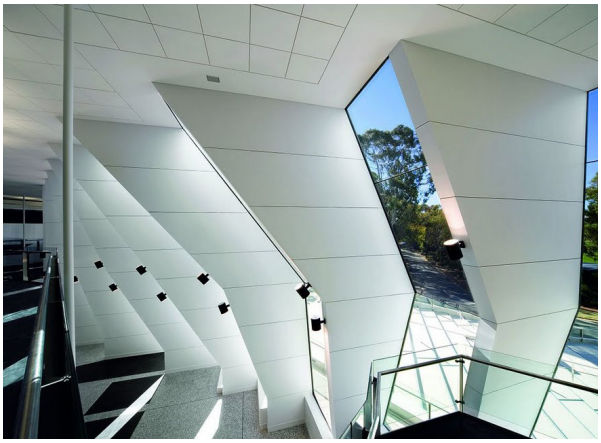
To create an interior as an escape for the city, the Centre was enclosedd by a large exterior wall to reduce noise of the busy corner. Using nature as a buffer also helped reduce noise before it entered the retreat space within. Birch trees were chosen to filter noise for the project as well as provide visual beauty. Smaller vegetation was used in the internal courtyards that would thrive in the London climate, although not native to the city. Entries into the building are through the gardens, creating nature inside and out for the procession through the spaces. The angle of the roof, as well as cut outs frame views out of the building at nature. The majority of interior rooms all face the outdoors, whether it is an internal or external garden. Built into the roof, louvres in the overhang deflect direct light from entering the building.

As said prior, the kitchen and social rooms are located at the center of the plan. Shared therapy rooms are located in the northeast and southwest corners, each havign direct views into a garden as a constant engagement of nature. Smaller private therapy rooms are located at opposite corners and overlook gardens as well, sometimes the same, but have smaller windows for privacy. Work rooms for patients are located adjacent to the main public rooms at the center and services and storage are placed near the private therapy rooms. Reading rooms are located on the second floor overlooking the kitchen with offices pushed to the outer walls to keep healing focused on the interior.



John Curtin School of Medical Research
Lyons Architecture
Canberra Australia, 2007.

Serving a medical campus, the building engages the public in the research by showcasing the work done behind the walls typically hidden. The exterior detail of the building was chosen to provide a dynamic character to the typical blank buildings associated with this typology. Labs are connected with interior glass windows to facilitate visibility and connectivity within. The visibility of the labs open the typical closed spaces to the public, allowing them to understand and appreciate the research[4]. The typical lab dimensions are 20'x60', including circulation space between lab benches and support rooms. Dark laboratories are placed away from the circulation however as light and the public cannot be a part of this research.



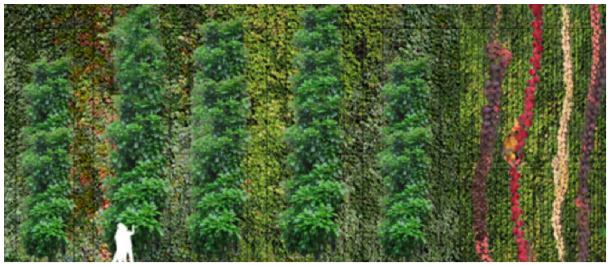
Botanical Research Institute
H3 Hardy Collaboration Architects and Balmori Asscociates
Fort Worth TX, 2011.

BRIT[5] is a non-profit research and conservation organization with a dired plant collection of over one million species, representing the majority of earth's flora species. This new facility will house the expanding plant collection, almost two million species in a state of the art sustainable project, seeking LEED Gold. The entire site is 5 acres adjacent to the Fort Worth Botanical Garden complex.

The programmatic elements of the building are distributed into three pieces across the site.
Structure One is 44,000 sqft and contains the administration offices, research facilities, classrooms, exhibit space and 2 garden terraces. Structure Two is 25,000 sqft and contains the herbarium and library. The final element of the design is the landscape.

The landscape is a 'working' landscape to unify the project and showcase the plants[6]. As the buildings were disconnected on the site, the garden facility and the new institute, something needed to unite the two – the landscape. With the introduction of the landscape, the site becomes one. A new permeable parking lot was added with planted elements that extended to the edge of the existing roads. Planting was also added to the existing parking to unite the two parking zones. Incorporating research into the landscaping first starts at the parking lot also. These research fields are the placed between parking rows to engage the visitor immediately with the nature of the site and its subjects.

The sustainable features of the building are furthered with living facades, both on the walls and roof. Research was conducted prior to planting to find the proper species that would thrive in a minimal soil environment. Most species were native to the Texas area and have name tags for visitors identification. In continuing with native species, the entry path to the institute is an organic braid of vegetation and water into the site. All species were selected for vibrancy to create a welcoming and positive mood upon entry. In the back of the institute, a natural Fort Worth prairie is reconstructed to preserve the disappearing system. Limestone and sands are used as seating and paving elements to showcase the natural geology below too.



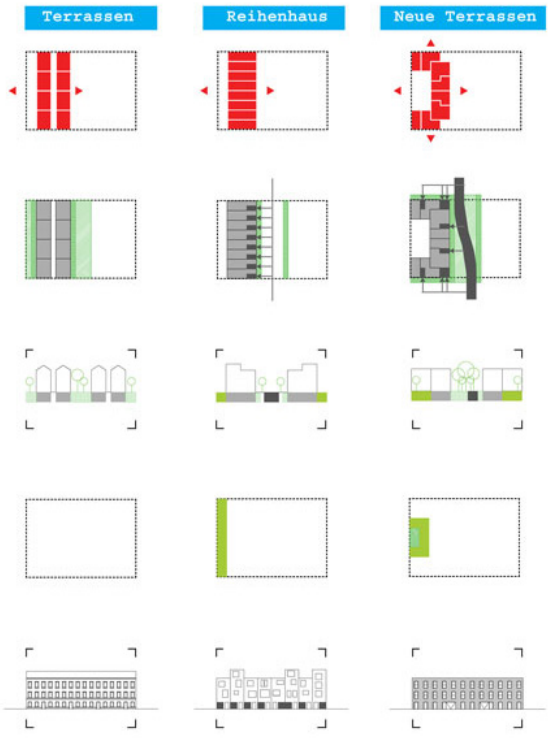
Temporary Housing in Parla SLP 156
Ronda Architects Pizarro
Parla, Spain 2005

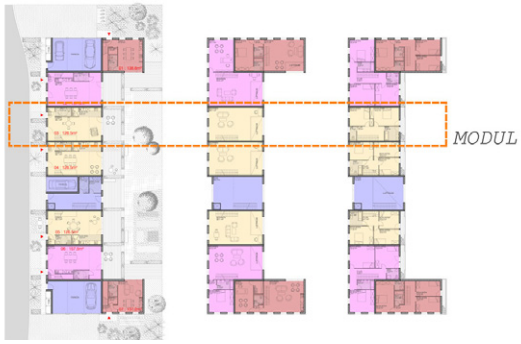
The proposal was to follow the competition theme of building the country, an interpretation of creating unique experiences within the city and not strictly function. The plan was created to create playful communities in the urban space while keeping the ground floor as open as possible to allow the most flexibility of activity for each hour and season. Each sqaure 35 meter tower is organized around a central area that provides high quality light and ventilation to increase the sense of community between neighbors on all levels. Each apartment has fixed services, kitchen and bathroom, to allow maximum flexibility of living space to expand a two bedroom into a five bedroom. Each apartment also has shaded outdoor space connected to the living area. The exterior cladding is done simply to keep the project affordable with wood paneling and 18" aluminum plates[7].

Neue Hamburger Terrassen
LAN Architecture
Hamburg Germany, 2009

This project had a similar site to the one this project is pursuing, a former industrial site. The new residential community was to be integrated into the city on the rehabilitated river site. The largest issue the design faced was how to integrate the history and context of the neighborhood into the project, not so much the actual site[8]. The houses were organized linearly with planted green strips running along the block houses and a central shared garden to be used by all for cultivating produce. In order to create the proper typology for the site, row houses and terraced housing were combined.

By removing the circulation from the immediate edge of the building, the units have more privacy and a peaceful setting. Cars are removed to the exterior of the project and by creating a serpentine road form, cars are slowed, providing more safety for the neighborhood. The open landscape spaces also provide a break in the buildings as all windows and doors are created to be the same except for where a shared space is located. This break in facade and form allows light to saturate the landscaped strips and open interior rooms.





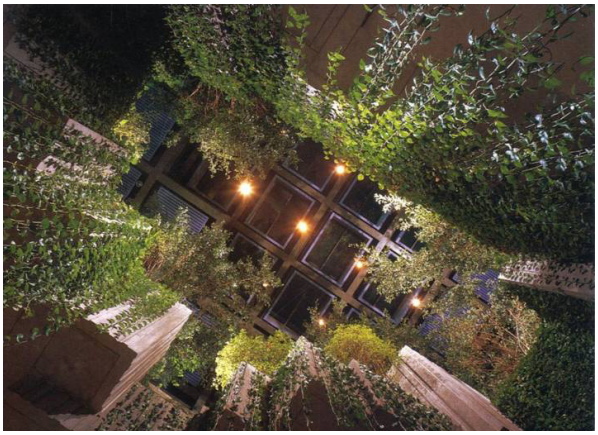
Urban Architecture with Nature

Today's use of nature in the urban environment is more of a decorative element, at least for Ken Yeang's projects in Asia. The skyscrapers and mid-rise complexes all incorporate green banding strips and green roofs but do not fully integrate nature into the project. It may look environmentally friendly to most because of the greenery but being green is not always sustainable. Creating these ecological skyscrapers in the mid-tropic climates also is easier to create green elements and ventilated buildings as little fluctuation in climate needs to be accounted for like it does in the northern United States.

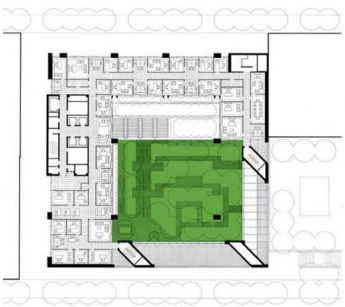
In the northwestern United States, The Washington State Convention and Trade Center[9] uses nature as a much more integrated piece. Working with landscape architects from the beginning allowed nature to take root in the form and detail of the project, from walls to courtyards to exterior plazas. The walls of the main interior plaza were created to mimic nature, specifically the canyons in the region to show that architecture is in direct response to context and should adapt just as nature does. The idea of adaptation also is evident with the open floor plan of all areas to allow various sized events to take place within the same "room." The indoor atrium blends into the exterior plaza with the use of materials and similar landscape elements, both plant species and paving. The Ford Foundation in NY does the same, with the program wrapping an interior atrium on two sides, creating an L shape. Programmatic spaces uses the atrium for ventilation and daylighting.

Ken Yeang Projects

Washington State Convention and Trade Center



Ford Foundation



Citations.

1. "Healthcare Center." Nord Architects Copenhagen. Accessed May 17, 2011. http://www.nordarchitects.dk/featured/healthcare-center/.

2. "Maggie's Cancer Caring Centres: What Is a Maggie's Centre." Maggie's Cancer Caring Centres: Home. Accessed May 17, 2011. http://www.maggiescentres.org/about/introduction.html.

3. "Maggie's Centre." Rogers Stirk Harbour + Partners. Accessed May 17, 2011. http://www.richardrogers.co.uk/work/all_projects/maggie_s_centre

4. "John Curtin School of Medical Research Stage 1, Australian National University » Lyons." Home » Lyons. Accessed May 17, 2011. http://www.lyonsarch.com.au/anu-john-curtin-school-of-medical-research-stage/?b=1.

5. "About BRIT." www.brit.org. Accessed May 17, 2011. http://www.brit.org/about.

6. Balmori, Diana. *A Landscape Manifesto*. New Haven: Yale University Press, 2010.

7. "0504 : RUEDA PIZARRO." Main : RUEDA PIZARRO. Accessed May 17, 2011. http://www2.ruedapizarro.es/index.php?/projects/0504/.

8. "LAN - NEUE HAMBURGER TERRASSEN." LAN Architecture. Accessed May 17, 2011. http://www.lan-paris.com/project-neue-hamburger-terrassen.html.

9. Cooper, Paul. Interiorscapes: Gardens within Buildings. London: M. Beazley, 2003.

4 Site

As a healing project, the site needs to be involved in the process. In order for this to take place, the siting of the project needs to be in an area where healing can begin for the patients and the environment. As all places on the Earth, any area of the planet could be considered but for the most part, the United States seems to be suffering more than European countries.

In the United States, the typical areas to consider are urban, rural, and suburban areas. All could have their own possibilities to consider for design. By quantifying each, the three locations can be assessed in reference to each other.

a | healing the urban fabric:

- 60% revitalization of an abandoned site
- 20% connection to the city - garden, park, transit
- 10% proximity to water as an urban escape
- 10% location to the hospital community

b | on the urban periphery:

- 50% brown-field site
- 30% separation from city
- 15% proximity to water as an urban escape
- 5% location to the hospital community

c | a rural retreat:

- 60% retreat from city entirely
- 30% connection to nature
- 5% location to city rail system
- 5% location to the hospital community

The ideal site would be a brownfield site in need of restoration within the downtown area of a major city in the US. This site would be along the river, bay, or ocean allowing the connection with water, a common calming component in most cultures. Having a site within a close proximity to an existing hospital would be beneficial also, as it would introduce the current trend in medical healing theory.

The most beneficial site for an emerging natural health facility is Portland, Oregon.

Portland, Oregon.

Why Portland?

Portland is the 23rd largest city in the US and is becoming the emerging green city in our country. Portland has been referred to as one of the most environmentally friendly or "green" cities in the world even. The city has begun to create its own environmental goals, one being is to protect and enhance the natural and built environment[1].

By setting this goal, Portland has begun to achieve recognition by other communities as an emerging "green city." The city is currently undergoing a comprehensive redevelopment plan, reuniting the urban fabric with nature. As a leader in modern urban theory, Portland is becoming a pedestrian and commuter friendly city, with partial removal of the car. As of 2010, Portland has received the following honors.

America's Cleanest City.
- Reader's Digest, 2005

#2 Greenest Place in the World.
- grist.org. 2007

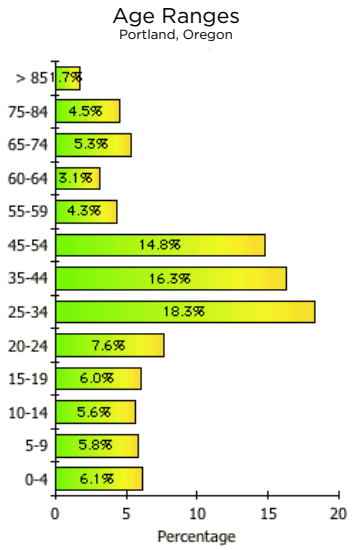
#1 Green City.
- SustainLane, 2008

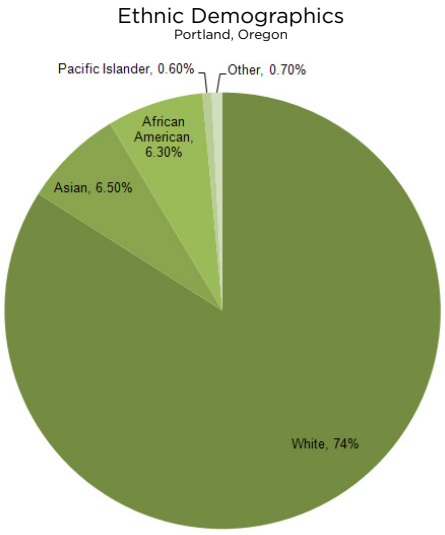
#3 Least Wasteful City.
- Nalgene Outdoor, 2009

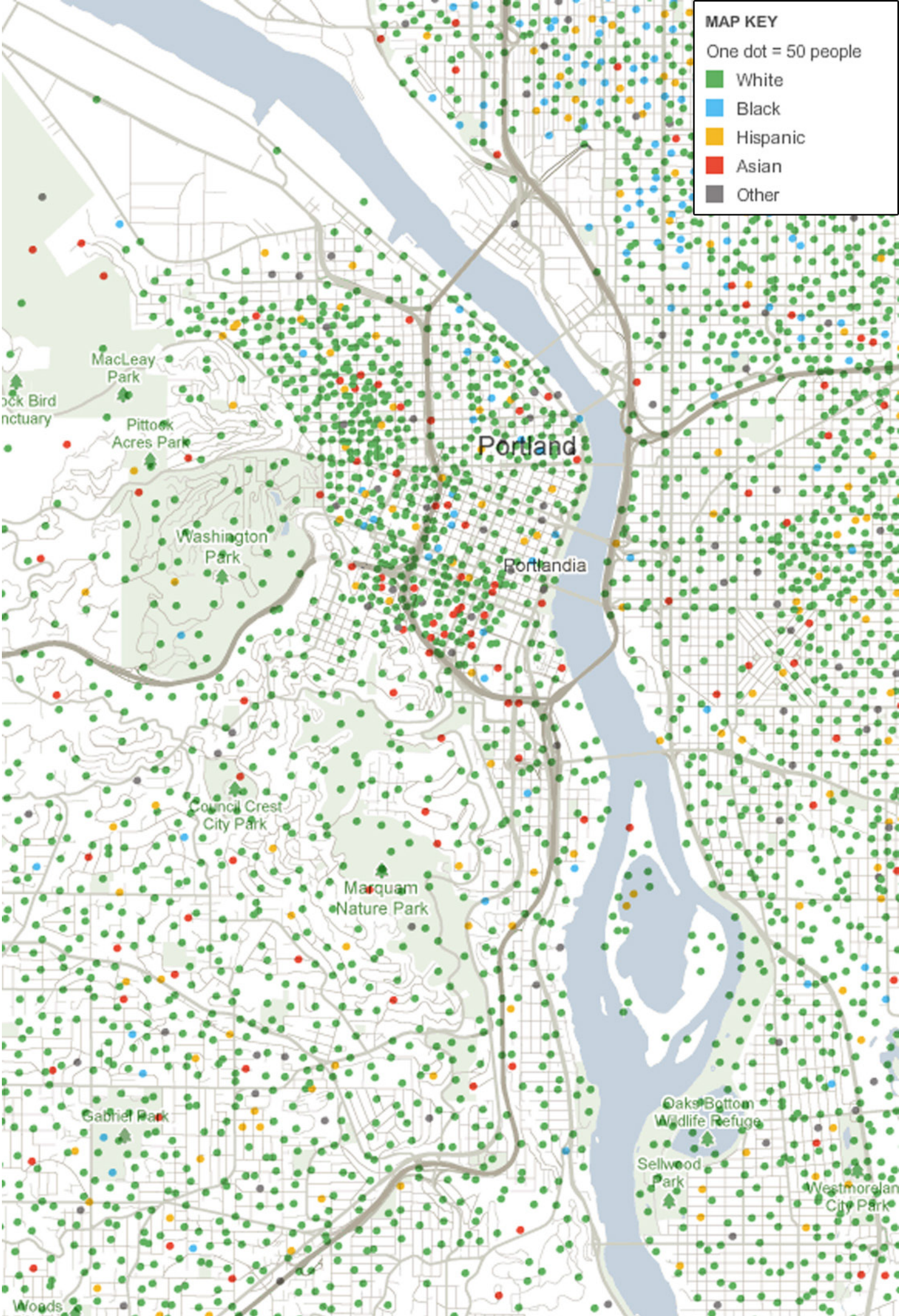
Greenest US City.
- Business Courier of Cincinatti, 2010

Population.

As of 2010, the population of Portland is 583,776. The density is 4288 people per square mile. This population puts Portland as the 5th largest metropolitan area on the west coast. In the past decade, Portland's population has increased by 15%[2]. Portland is also a younger community as of the mid 1990s when young adults entered the community during the dot-com boom.






MAP KEY
One dot = 50 people
White
Black
Hispanic
Asian
Other
MacLeay Park
Pittock Acres Park
Portland
Washington Park
Portlandia
Council Crest City Park
Marquam Nature Park
Gabriel Park
Oaks Bottom Wildlife Refuge
Sellwood Park
Westmoreland City Park

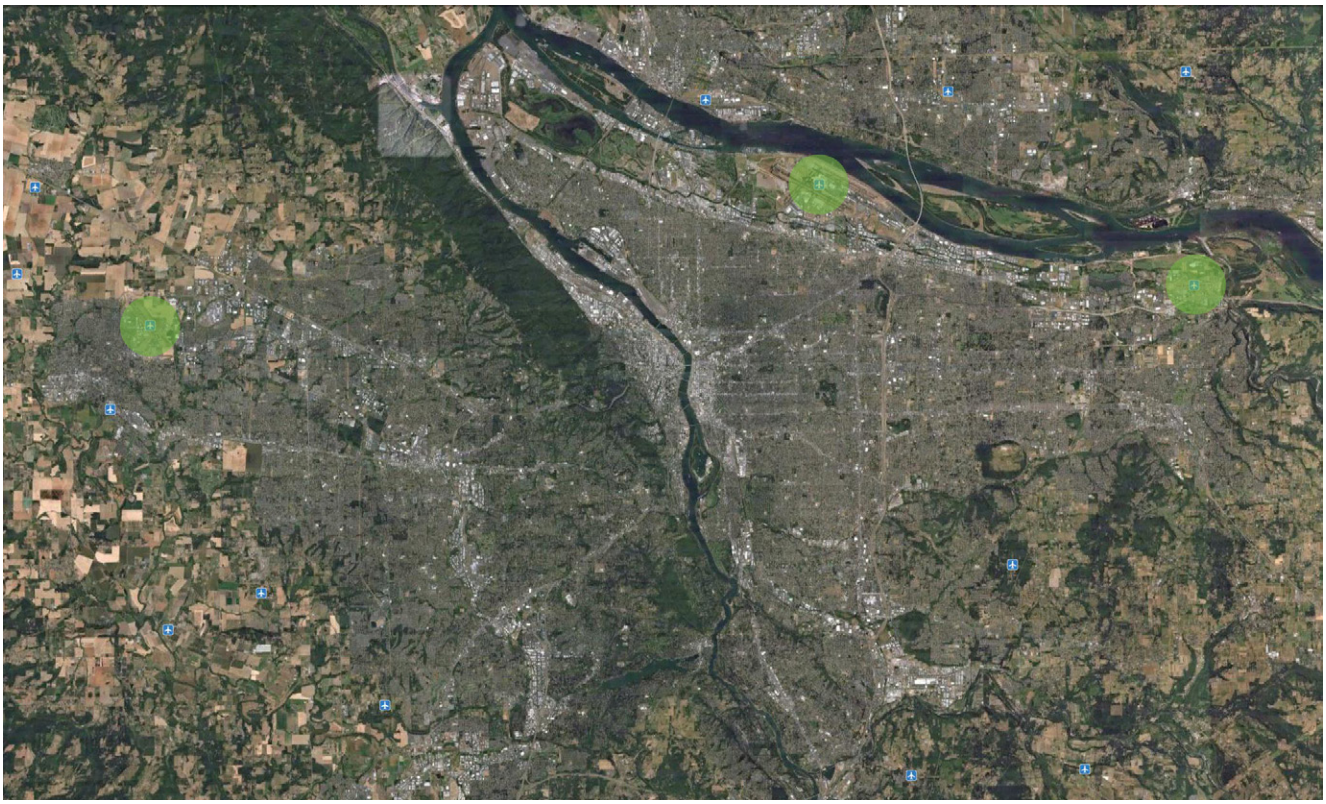
Getting Around Portland.

Arriving by air.

There are three major airports in the Portland area, all owned by the Port of Portland. The largest of these airports is Portland International, or PDX. The two other airports Portland Troutdale and Portland Hillsboro act as overflow terminals for PDX as it serves 90% of passenger travel in Oregon. Major US and international airlines use Portland as the northwestern hub.

The three airports are all easily accessible by public transportation provided by the TriMet light rail system. When the smaller airports are used as overflow for PDX, this light rail system helps keep everyone connected to the city easily.

Besides the general public, the airport also serves a small military population. The Air National Guard owns 10% of the area, occupying the western edge of the site. Public and military use are separated completely and rarely engage each other. Architecturally, PDX showcases the lightness of structure elegantly. Nature is incoroporated into the architecture through use of greenery, water, and open air[3].

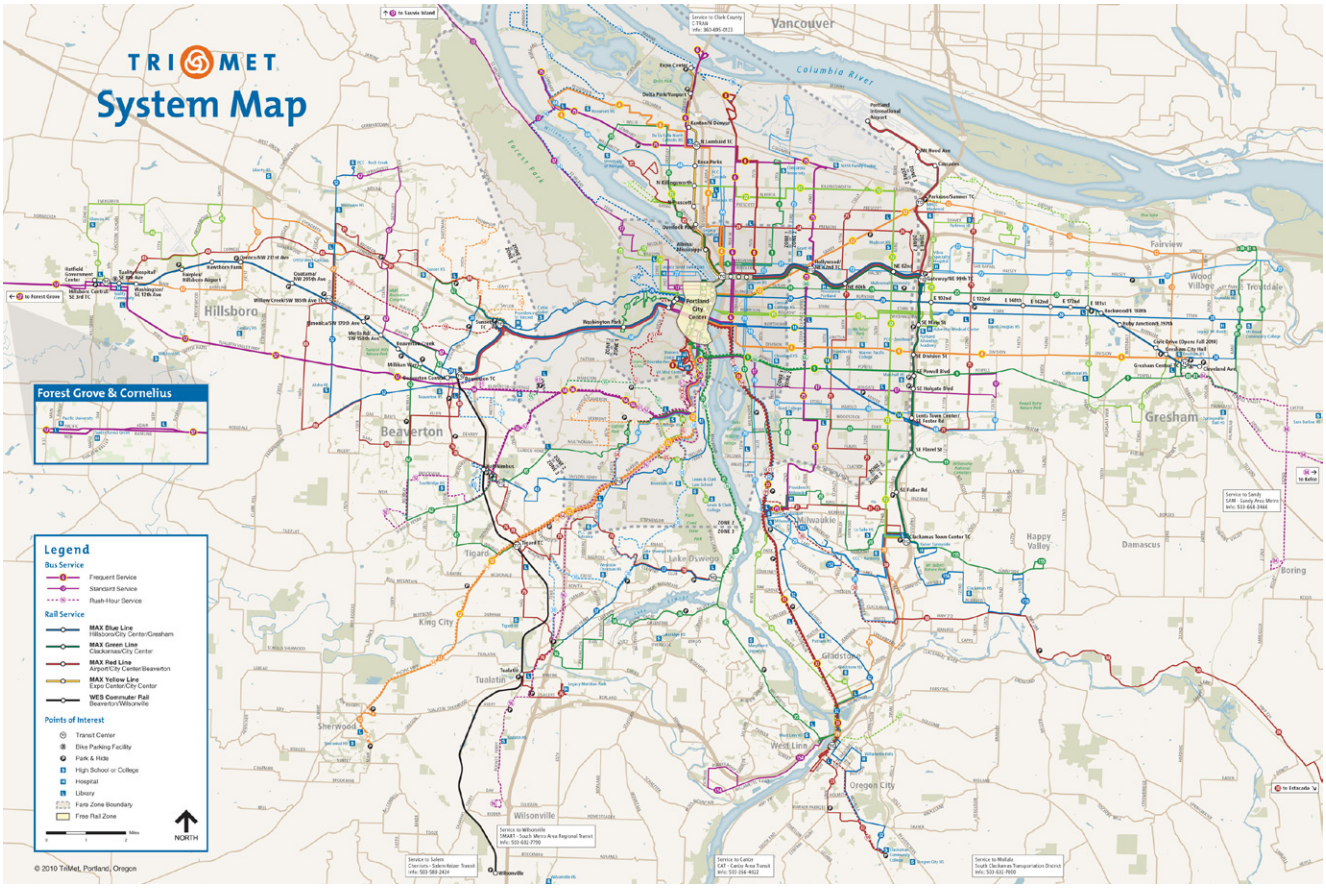


The TriMet Network[4].

Portland has an extensive public transit system serving the majority of the greater Portland area. The major transportation lines include the MAX (Metropolitan Area Express) Rail System, the Streetcar, an Aerial Tram, busses, and the WES (Westside Express Servivce) Commuter Rail. Below is a comprehensive map showing all public transportation services in the greater Portland area.

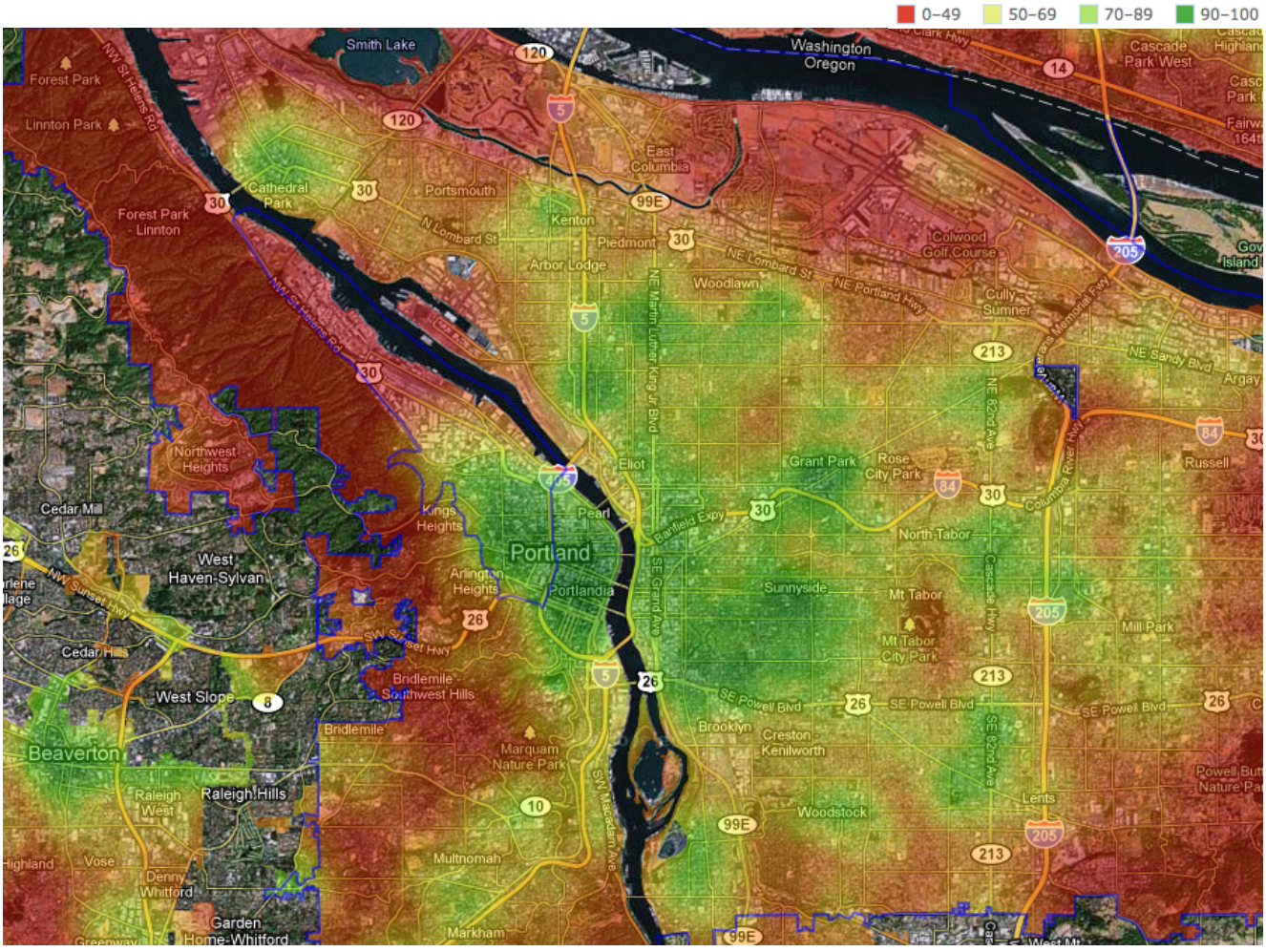
There are four light rail lines, named by colors. The Red Line extends north to southwest connecting PDX through the city center to neighboring Beaverton. The Blue Line connects the east and the west, from Gresham to the Portland Hillsboro Airport. The Green Line connects southeast Clackamas to the city center while the Yellow Line creates an urban loop connecting the city center to the expo center.

Buses and commuter rail lines connect the rest of the neighboring communities to the city center.



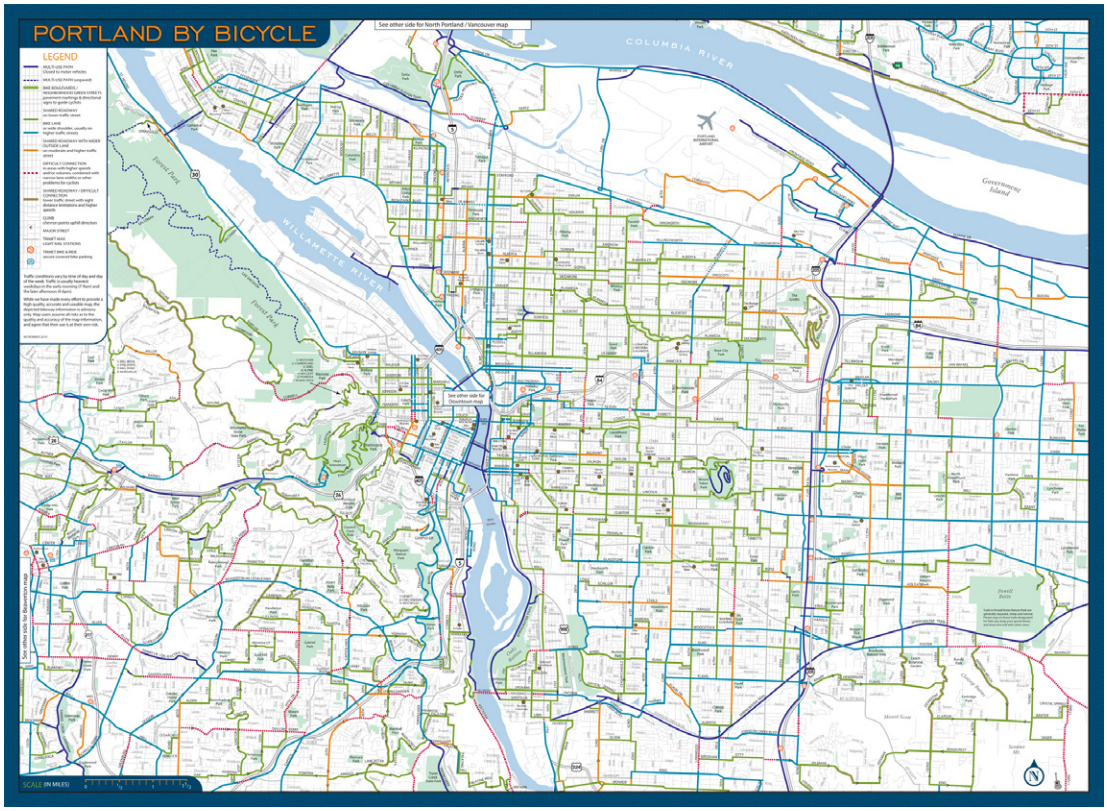
Walking around Portland[5].

The walkability of Portlandis acceptable but not entirely high like other cities. The downtown has mostly every amenity possible to serve the community. As the neighborhoods extend past downtown, the amount of amenities within a comfortable walking distance begin to decrease until going across the river. The two most viable places to live within Portland, as far as walkability, is in downtown or just across the river. According to walkscore.com, the average person will only walk a mile for services. Based on their rating system, Portland is 71% walkable on average while downtown is 92%. The city does encourage walking and wants to make it accessible to the general public, including residents and tourists alike. The city provides walking maps free of charge to everyone at the welcome center, as well as downloadable maps on the city website. The entire city is available, as well as detailed neighborhood maps.



Biking in Portland[6].

When thinking of Portland, one often thinks of the extensive bicycle community. Portland is continuing to enrich this network for the benefit of all, humans and nature alike. Currently, there are over 324 miles of bike ways serving the community with more to come. The majority of these miles, 202 miles, are dedicated to bike lanes that share the road with the car, while others are within neighborhoods and along former rail lines. Seen as equivalent to motorized vehicles, bikes share roadways, as well as on street parking. Removing two parallel parking spaces for vehicles can provide bike parking for around 35-40 bicycles. Only small curb barriers divide the spaces for safety purposes.



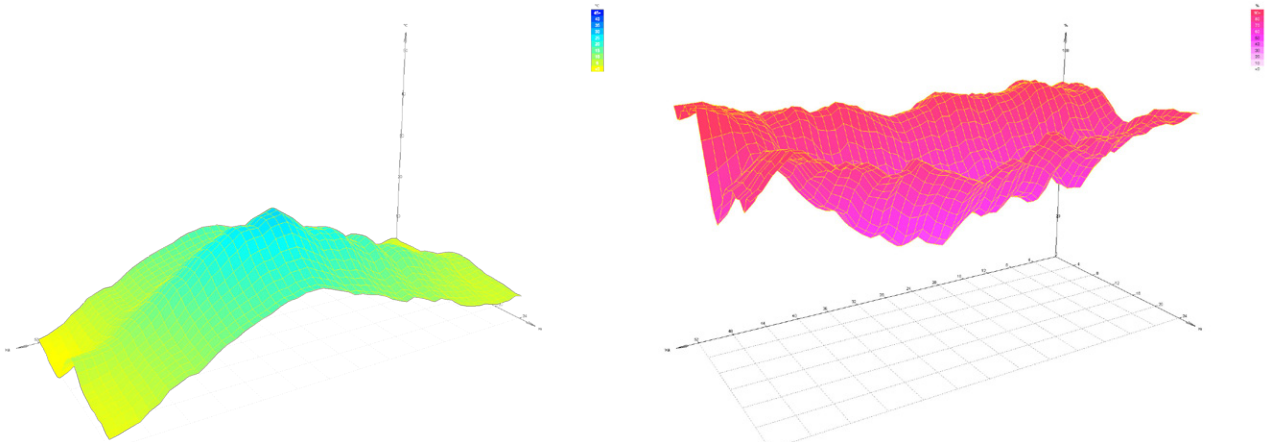
Just as with walking maps, the city has mapped bicycle routes for its commuters and residents. Heavily traveled routes and parking are demarcated to encourage usage and social interaction. Approximately 8% of Portland's commuter population bicycle to work everyday, which is ten times the national average and larger than any other city in the United States. Part of this number is due to facilities provided by the city and Portland's desire to clean the air one bicycle at a time.

Portland, Oregon.

The Climate.

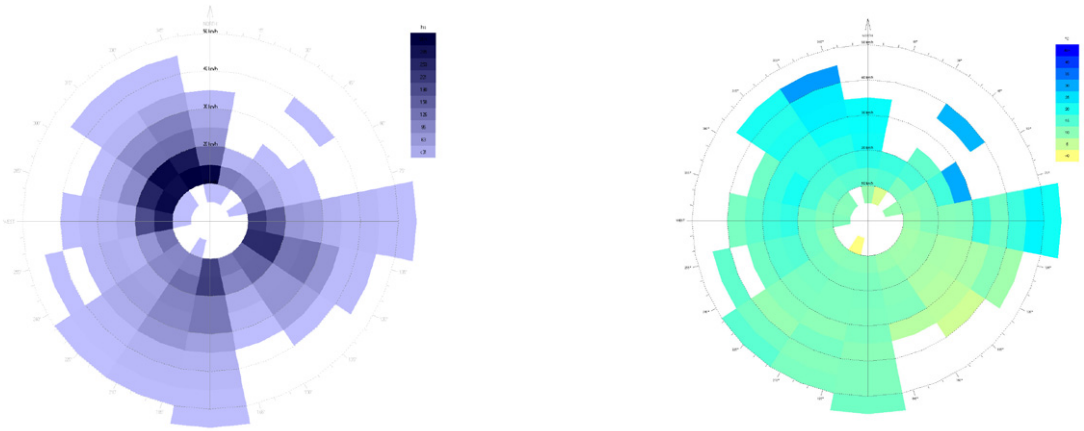
Temperature and Humidity.

The average temperature range for Portland is 40° to 80°F, for winter and summer respectively. In summer, July and August have the hottest days, ranging from 80° to 100°F. In winter, the temperatures are mild and relatively humid. Temperatures range from 25° to 40°F usually. The average humidity for Portland is over 80% for the morning and average 55% in the afternoon. The winter months are more humid than the summer months, with high humidity in October annually.



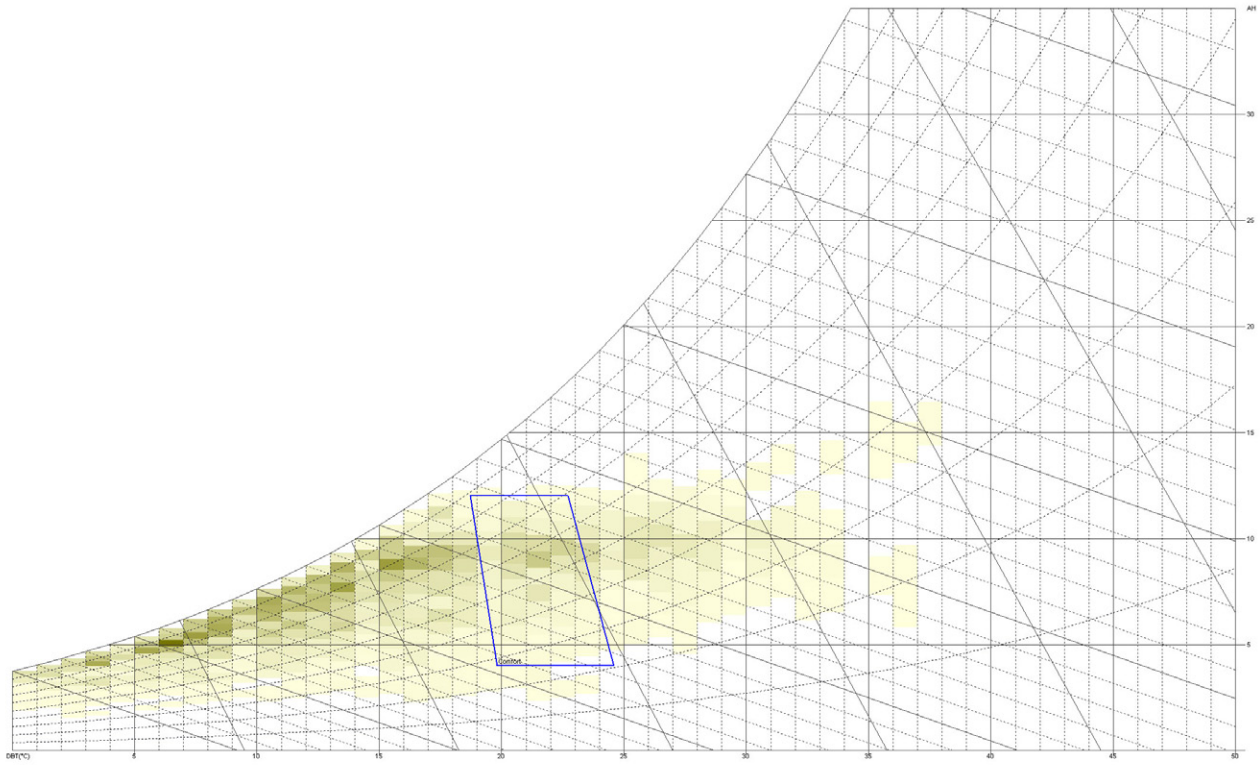
Wind Direction.

Predominant winds come from the northwest and southeast for the majority of the year. While occasional stronger winds come from the southwest, the winds are generally between 10-12 mph. This speed is the minimum speed for a small residential turbine motor, 10kw. As seen in the graph below, the warmer summer winds are coming from the northwest and east while winter winds come from the southeast primarily. Proper landscape strategy can negate the effects of the cool winter wind on building.

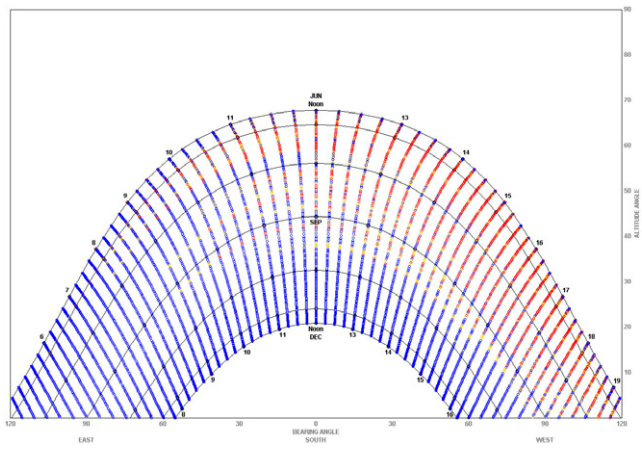


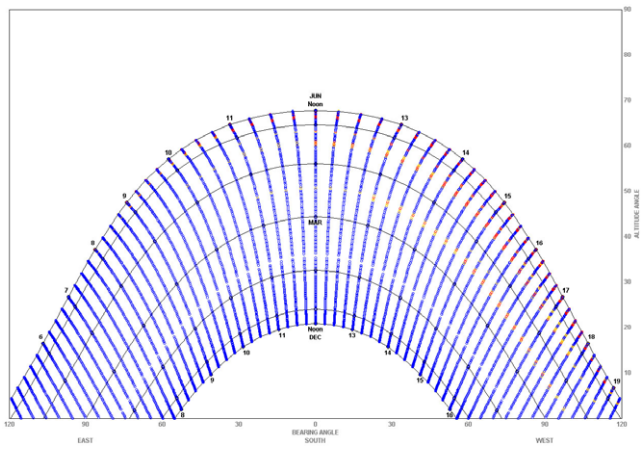
Comfort Levels.

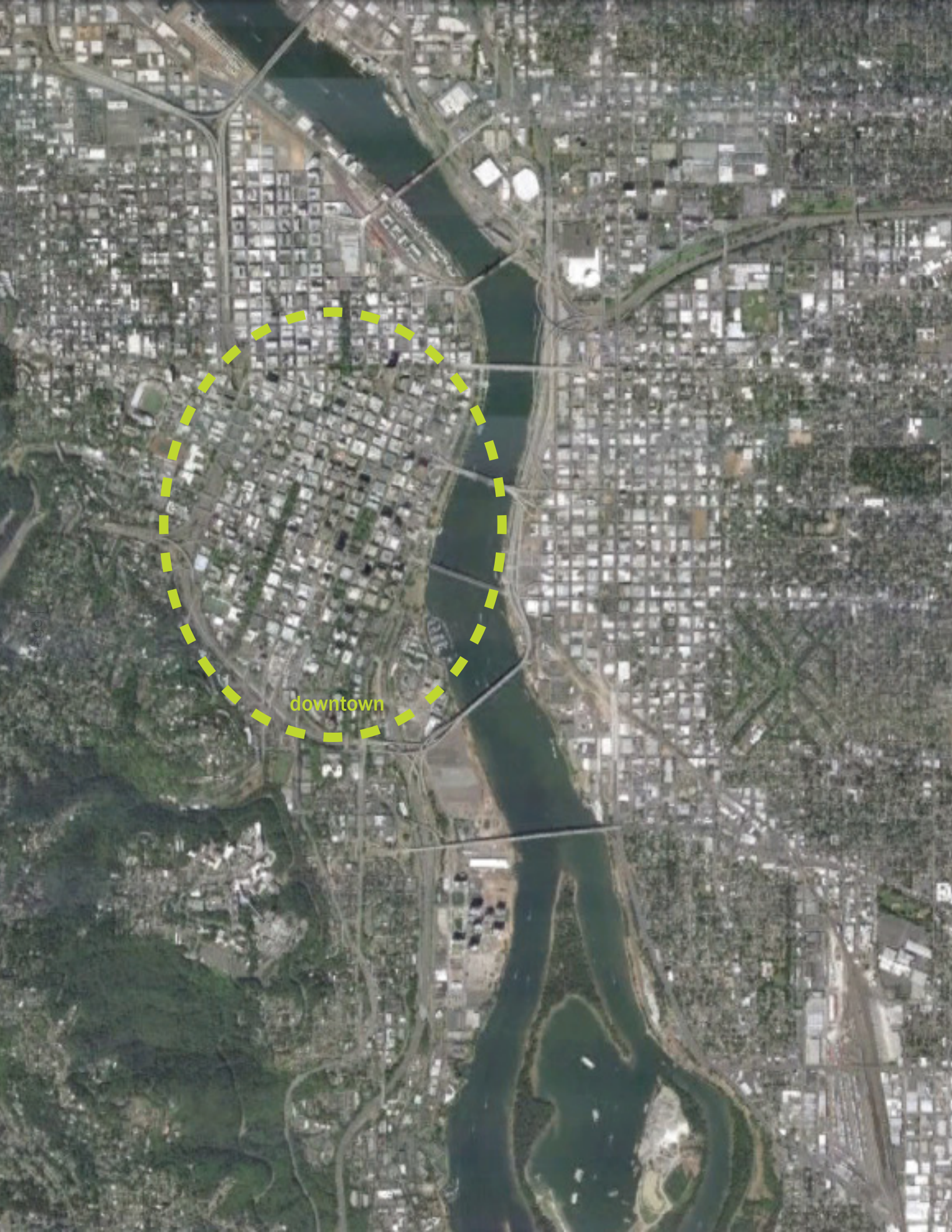
The level of comfort in Portland is below the average person's comfort zone, resulting in the use of heating more frequently than cooling. The ideal comfort zone, 70° is only achieved 4% of the time without any design consideration. Using only passive methods, comfort can be extended to 64% throughout the entire year without the help of any mechanical equipment necessary. The most influential passive strategy is proper orientation that allows direct solar heat gain.



Due to each season, the requirements for shading are differentiated. In summer and fall, shading needs to be done prominently on the south-west sides of the building when the temperature is exceeding 70°, on average. In spring and winter, direct solar gain is needed to passively heat the building. Shading is only to be used in the afternoon at few instances, mostly at the end of the fall and the start of summer on the west facades. On the images below, red represents when shading is needed and blue represents when direct solar gain is needed for the proper comfort maintenance.






downtown

Portland, Oregon.

A History[7].

Known as the clearing in the early 1840s, “Portland” was used as a small river stop for travelers headed to Oregon City and Fort Vancouver. The Clearing gained prominence when the river was mapped to be ideal for larger shipping vessels, unable to travel to Oregon City.

Portland was acquired in 1843 by William Overton and Asa Lovejoy, encompassing 640 acres of land including the Clearing, waterfront, and timber forests.
Portland was named in 1845 by Francis Pettygrove for him hometown of Portland, Maine after winning a coin toss against Lovejoy. Portland could have been Boston.

The city’s population was 821 in 1850. As the largest settlement in the NW, it had hotels, trading posts, and a weekly newspaper. The city was incorporated in 1851.

In 1889, Portland was deemed the filthiest city in the Northern states due to unsanitary conditions.

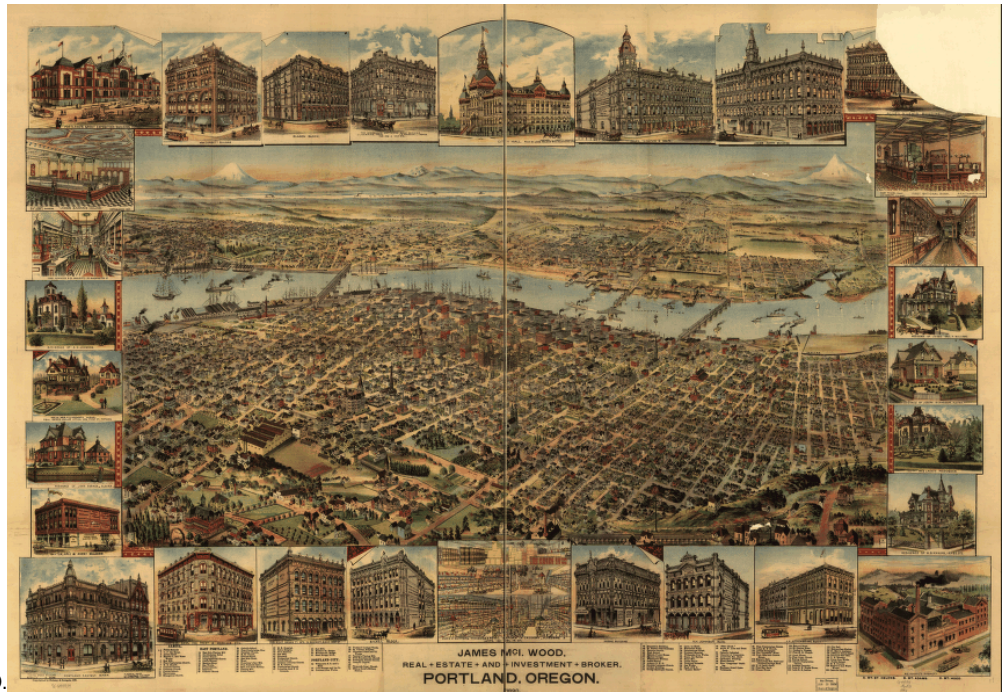
Portland was the largest port in the NW until Seattle was connected by railroad to the East. Goods could be shipped more easily now.

Portland grew in 1891 when it absorbed two cities, Albina and East Portland.

In 1905, Portland hosted the Lewis and Clark Expo. With this recognition, Portland’s population doubled to 207,200 in 1910. Two more cities became part of Portland in 1915, Linnton and St. Johns.

In the 1940s and 1950s, Portland had an extensive organized crime community. Local and national groups were involved and the local paper, feared an coup d’état.
During WWII, Portland was used as a ship manufacturer

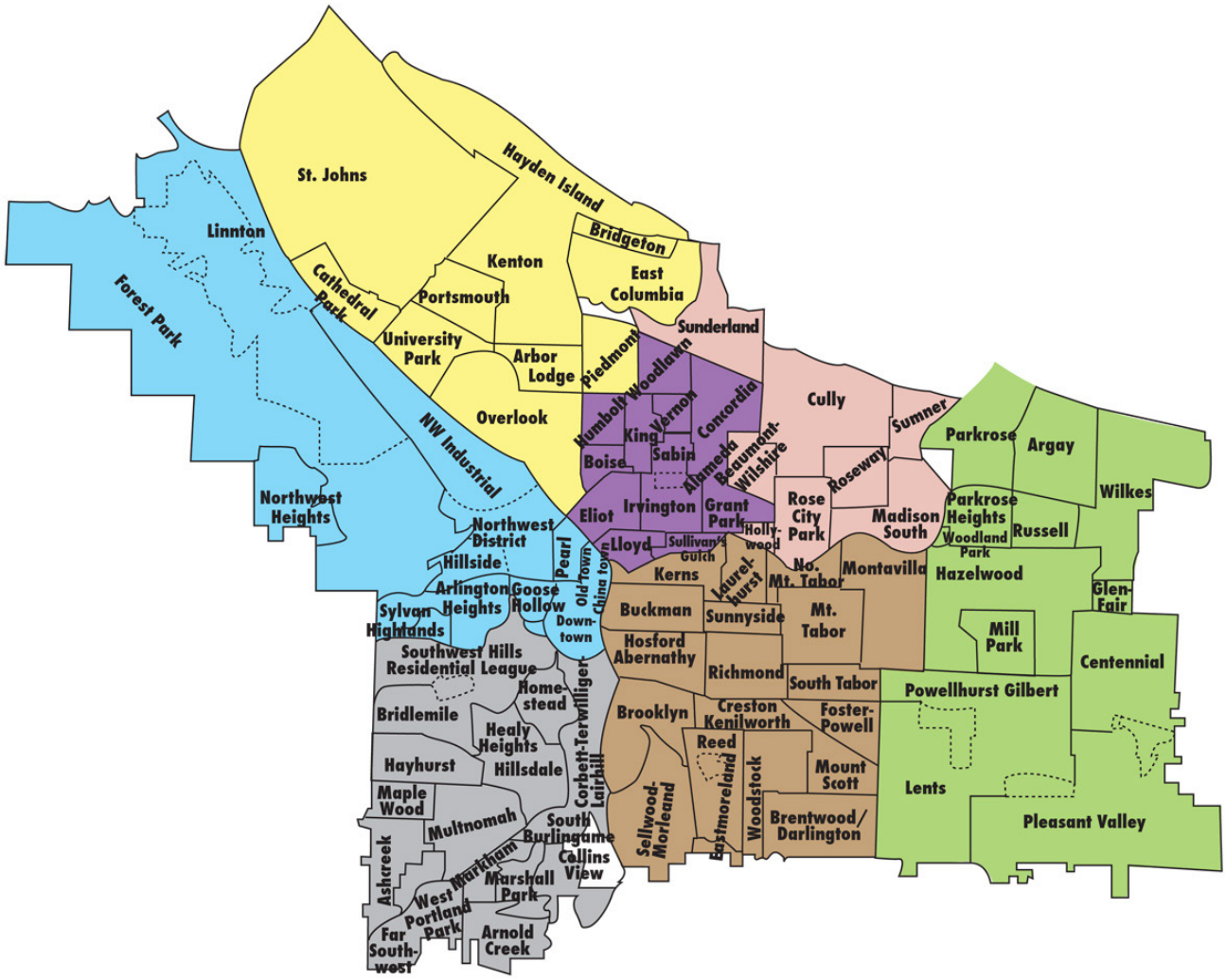
In the mid 1990s during the dot-com boom, Portland’s population grew with the arrival of young, creative adults. When Seattle and San Francisco’s art community began to decline, Portland became the artistic hub as 10,000 artists were living there at the turn on the century.



Portland, 1890.

Portland Neighborhoods.

There are seven neighborhoods in Portland. Each neighborhood is named after the geographic region of the city where it located. Each neighborhood has specific characteristics that differentiate it from the others while each has elements common to each other that distinguish Portland as a distinguished community. Part of the continuity of the neighborhoods is defined with the existence of greenways and a network of pedestrian oriented paths, both walking and bicycling. The seven neighborhoods are distinguished by color while each neighborhood area is outlined and named within.

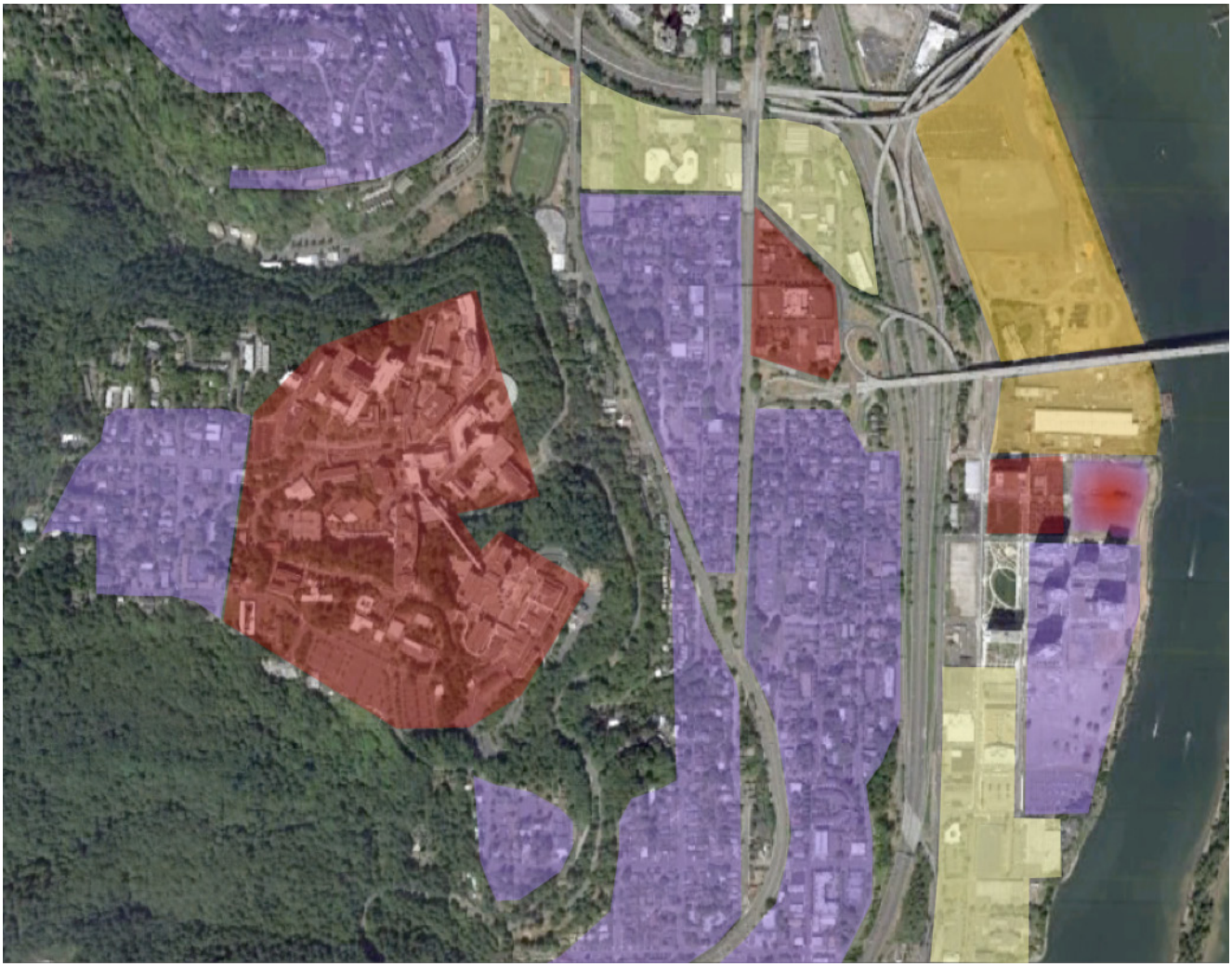


The South Portland neighborhood is the current neighborhood undergoing rapid development. The site was formerly known as the Corbett-Terwilliger-Lair Hill neighborhood until 2006 when the name was changed to reflect the geographic location. There are six areas within the neighborhood, South Waterfront, Lair Hill, Corbett, Terwilliger, Johns Landing, and South Portland Historic District. There are several neighborhood parks and community gardens within South Portland, nine specifically.

South Portland.

The Urban Fabric.

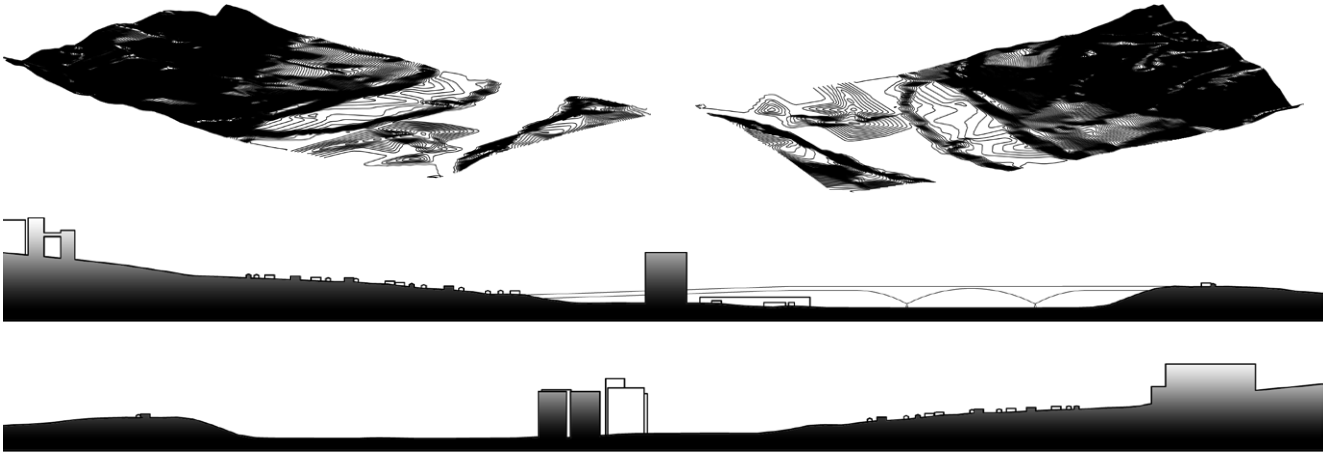
The northern border of the neighborhood is defined by the interstate knot just above the Ross Island Bridge. Most commercial zones are located around this knot mostly for ease of access and flat topography while residential is placed within the hillside. As the water was important to industry, the existing industrial site is along the river between the interstate knot and Ross Island Bridge. Scattered between these areas are medical buildings, on top of the hill and near the major interstates. As Portland is dedicated to preserving its green spaces, much of the western area of the neighborhood is left untouched. Partially due to the topography, areas of the neighborhood are unbuildable, as there is greater than 15% grade and only coniferous trees can thrive.



South Portland.

The Topography.

Along the river, the slope is rather flat to accommodate the former industrial site and interstate. Once on the western side of the interstate, the terrain begins to rise steadily. Many residential developments have been built on this slight grade until another large roadway bisects the hill. West of this road, the slope becomes steep and only the large OHSU campus was built on the steepness. East of the river, the slope is much steeper than the west bank and is only used for roadways until the slope levels out for residential neighborhoods and community projects.



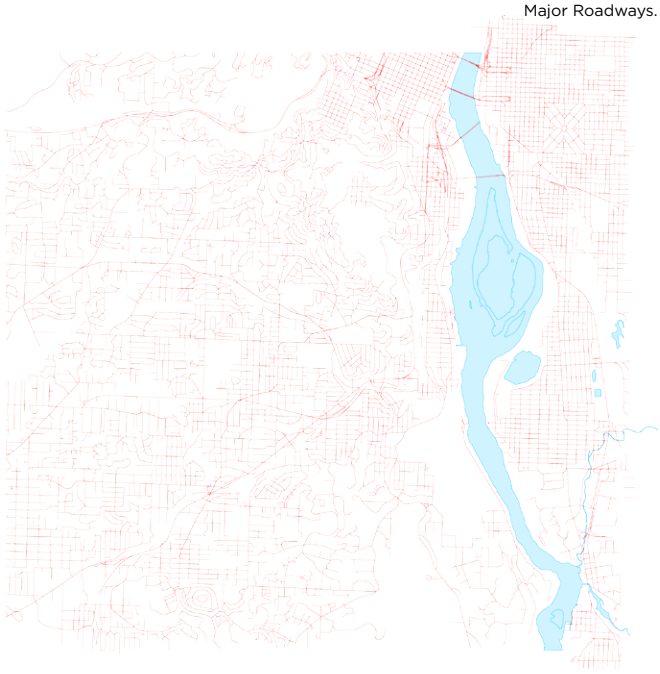
South Portland.

Streets and Public Places.

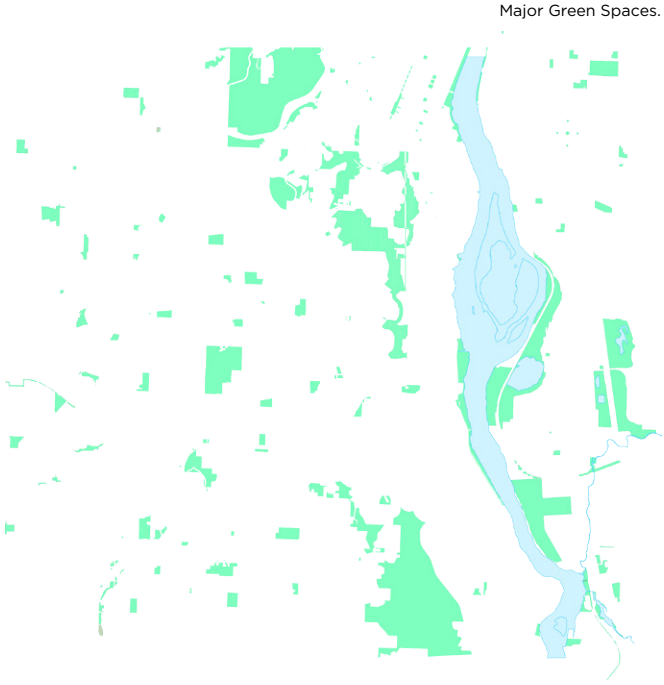
The streets of Portland are loosely organized on a grid system for its primary organization. The majority of roads run north-south and east-west for this reason except when the topography interrupts the organization. Major avenues are used to ascend the hills and become as organic as the river itself. When looking at the street grid, large voids are left in the fabric where green space typically fills these voids.

Unlike the organized roads, the TriMet system stems from the river and winds its way into the hills to serve the community. Linear routes are used whenever possible once within the neighborhoods as it runs along the streets. Many public amenities are located near these routes and in parks.

Major Roadways.

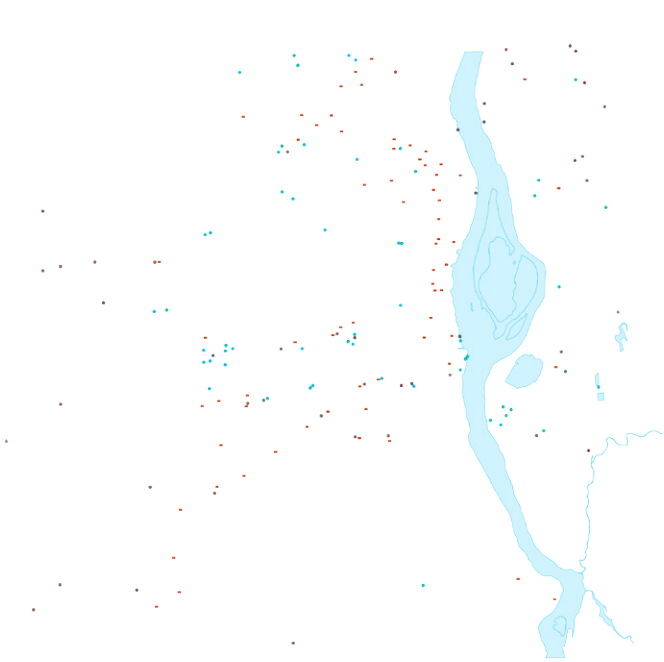


Major Green Spaces.



TriMet System.

Public Amenities. (water, restrooms, gardens, mail)



South Portland.

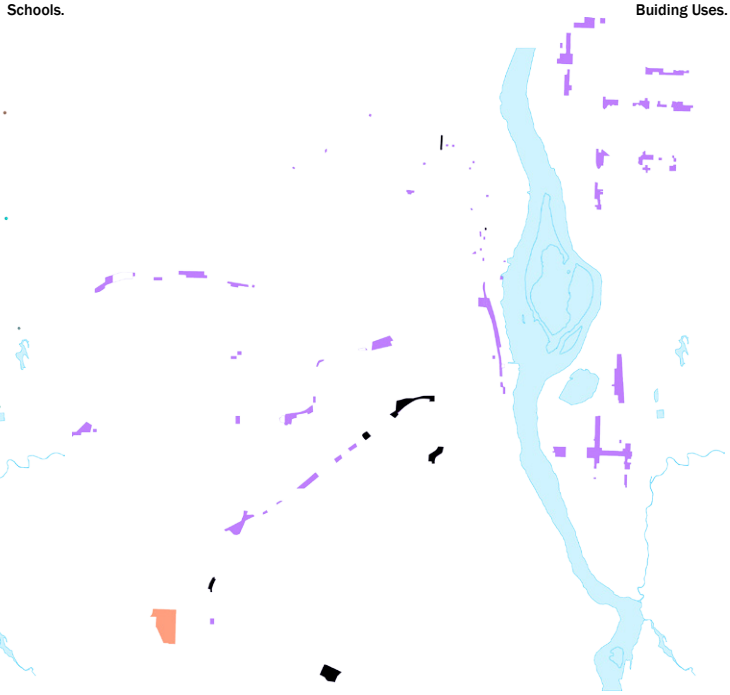
Building Uses.

Most major buildings within the neighborhood are placed along the avenues that navigate the terrain. Housing is placed within the more organized gridded streets to provide structure for the individual lot sizes. Schools naturally are placed along the busier routes within any city or town for ease of access, whether it be for the students, parents, or public use.

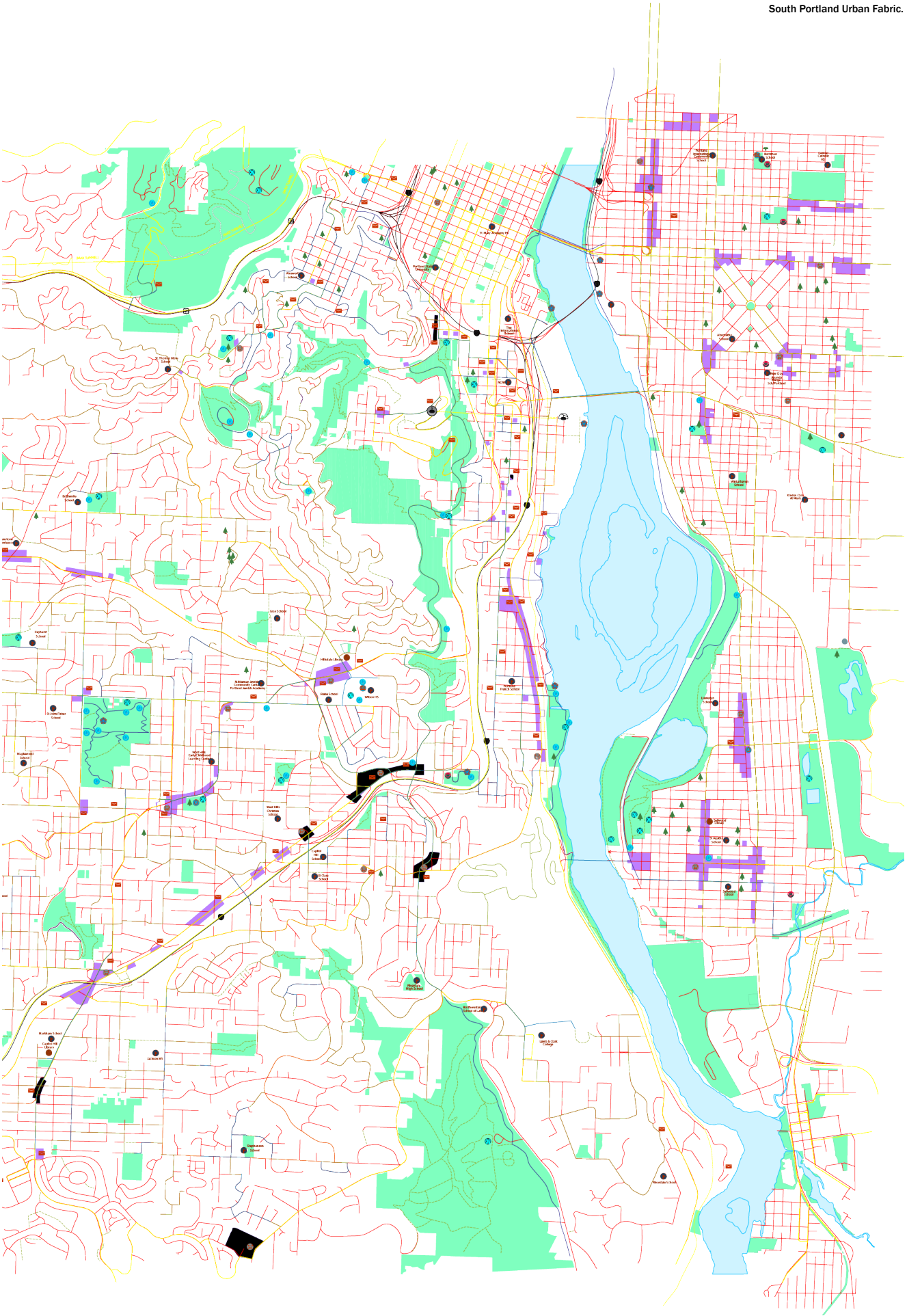
As for the actual uses, commercial and retail are the most visible larger scale projects along the streets. Due to zoning laws, industry has been removed from the river in order to make it more accessible to the public and green ways. Only little industry exists within the neighborhood now as a result of the codes. The steep slope also contributes to the placement of larger buildings as to not destroy any land or vegetation than what is minimally needed.

Schools.

Buiding Uses.



South Portland Urban Fabric.



South Waterfront.

Understanding the Past.

South Waterfront is in the northeast area of the neighborhood. For the majority of the site's existence, the site was an industrial zone. The land of South Waterfront was formerly forest land until modified for commercial means. The majority of the South Portland neighborhood was covered in coniferous trees although South Waterfront was more diverse. South Waterfront is shown in historical records as a riparian forest, making it unique to the larger neighborhood and the natural filter for the river. Natural streams drained the hills into the Willamette River. Due to its close location to the river, the site was also located in a flood plain. Once industry began to develop on the site in 1910, the natural land use was disturbed and would soon become a construction wasteland. The 130 acres were transformed from green space to an industrial park in 1910 due to the close proximity to the river. The site was ideal for machinery, hardware, and production for timber building.

Due to WWII, the became the site for ship salvaging. Navy vessels were lifted onto the site where the ships were dismantled and salvaged for wire, aluminum, and piping. Other manufacturing companies on site were producing agricultural chemicals that would begin to pollute the site's ground.

In 1980, Portland created a comprehensive plan to redevelop the area into dense area. The former industrial buildings were removed to allow for mixed commercial buildings to be erected starting in 1988 with the zoning change. In 2004, the site was rezoned again to allow for residential densification[8].

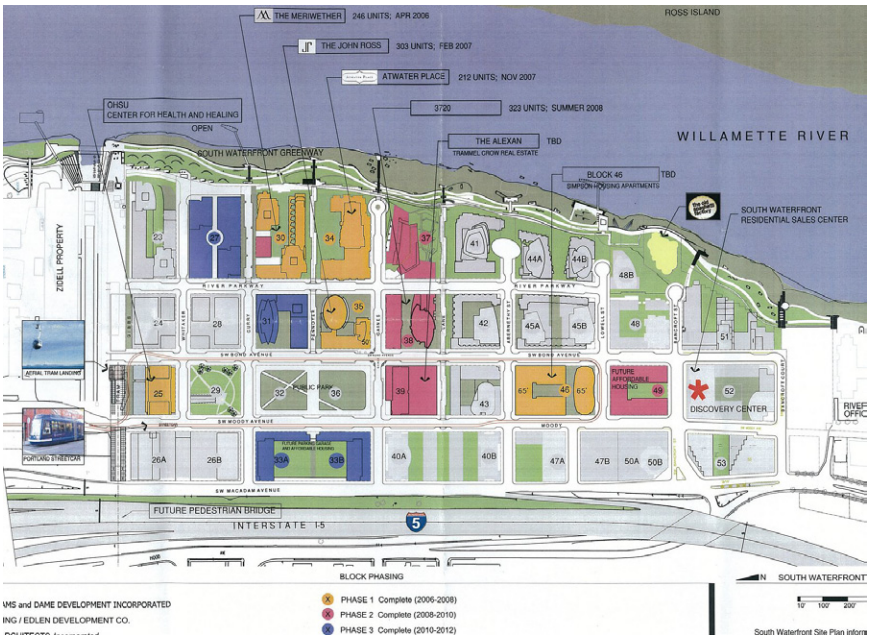
The site is still undergoing change from 2004 as residential and mixed use towers emerge from the landscape. The historical pictures show the change through the recent years has slowed from the previous decades but continues to grow. The major developments in the past years include connecting to the OHSU campus west of the neighborhood in the hillside. As part of the community connection, landscape improvements have been made in redeveloping Elizabeth Caruthers Park, as well as greening the streets for comfort.

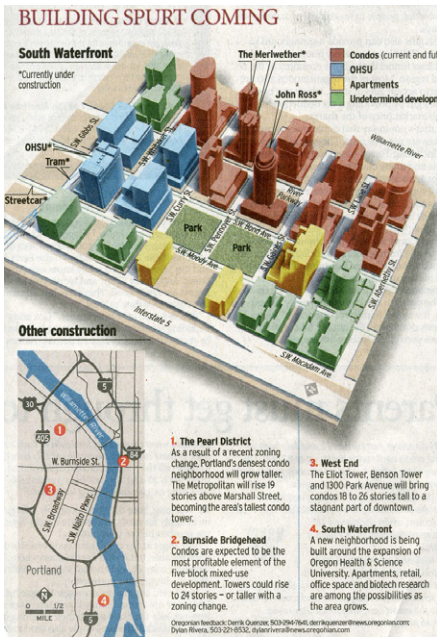
South Waterfront.

Development.

The new neighborhood has been in development following a 2003 South Waterfront Plan to densify the site. It is one of the largest redevelopment projects underway in the United States. The master plan was adopted by the Portland Bureau of Planning in 2003 and has established zoning regulation for the development of the neighborhood area.

As part of the initiative to become new in today's society, the redevelopment is forcing sustainability upon all developers to initiate healthy living for the city and its people. All projects within the neighborhood must seek LEED Silver as a minimum, although certification is not mandatory. With this high-rise sustainable neighborhood, it will be the fifth green community for Oregon. Plans have been conceived with various architects to develop the site in three built stages, as of 2012, and one landscape project. Only five of the residential high-rises have been built while others are planned[9]. As with most planning projects, some parts of the plan have not been determined completely and are still being negotiated, as can be seen in the varying two images at the bottom of the page. For this project, the majority of the masterplan will be accepted, while certain functions of towers will be altered to create a more cohesive plan for the inhabitants and guests. More green space is needed to keep the towers from overriding the street and removing the human scale that is prevalent in Portland's downtown. Most of the urban streets are planned with landscaping to allow this transition from street to low-rise to tower, as well as beauty.



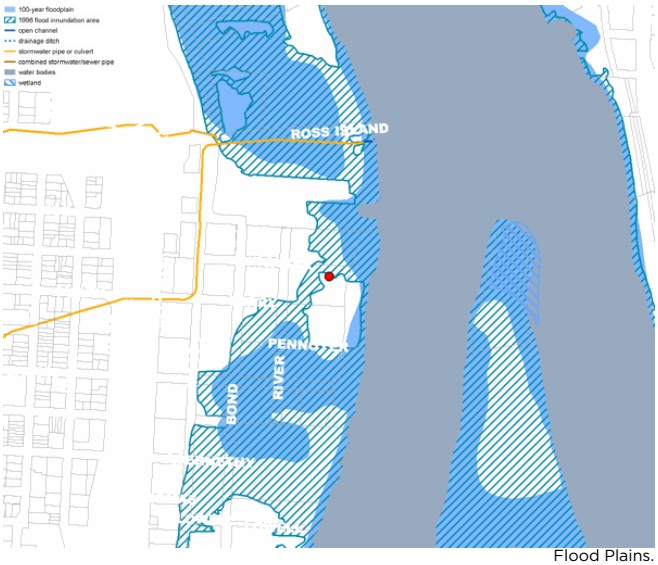


South Waterfront.

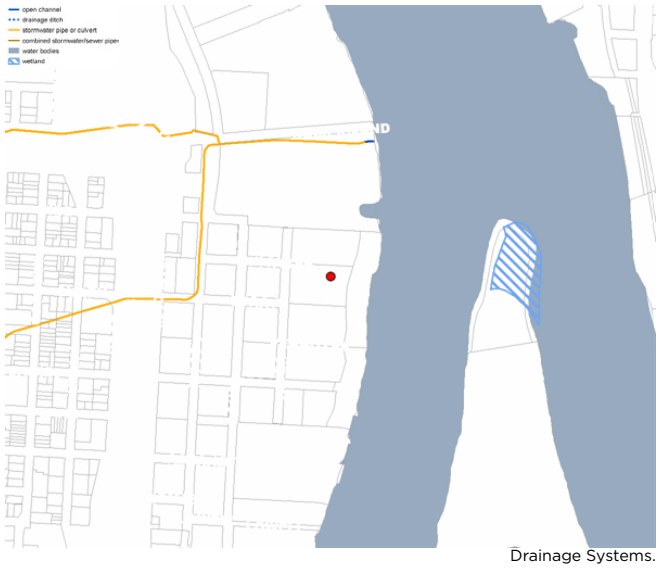
The Site Currently[10].

South Waterfront is located along the Willamette River and is a directly affected by this proximity. As a riverfront site, the floodplain needs to be understood when designing. The entire site is just outside the 100 year floodplain but has been affected by a large flood in 1996. Since there is little natural drainage for the site to do industrial development, plant life will need to be able to endure storm water runoff. There are no wetlands in the area to preserve but as this was once a forest, it has potential to be rebuilt.

Portland is a very sloped site for the majority of the neighborhoods except riverfront property. For this reason, Downtowan and South Waterfront are very flat and can be easily developed. The steepest part of the site is less than 25% grade and occurs at the river edge where small herbaceous plants still grow. Little plant life exists on site due to industrial development since 1910 but as noted before, the site used to be a riparian forest that buffered the waterfront. Vegetation can bring diversity back to the site and eventually increase the soil typology to host more fragile plant life again.

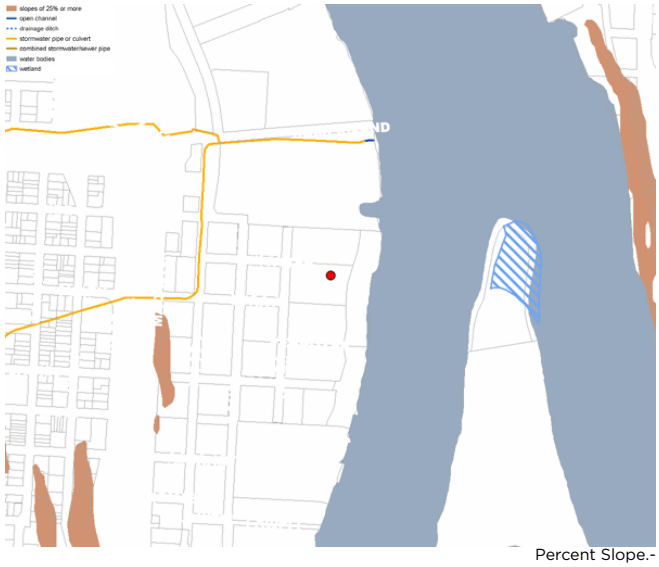


Flood Plains.



Drainage Systems.

Vegetation.



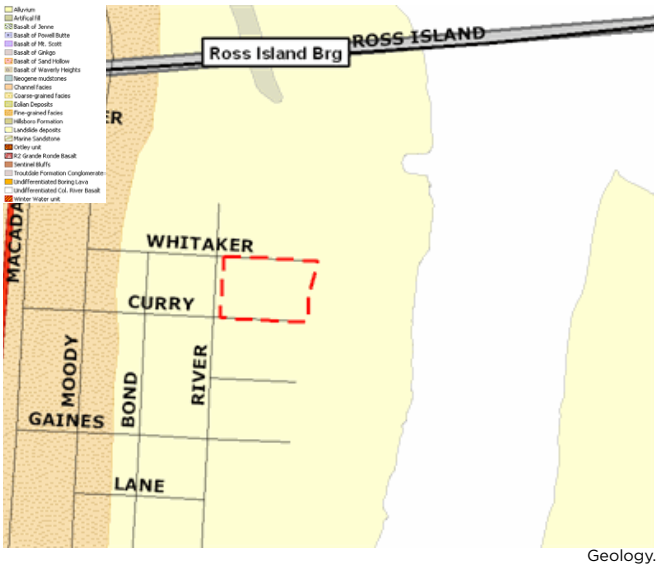
Percent Slope.-

South Waterfront.

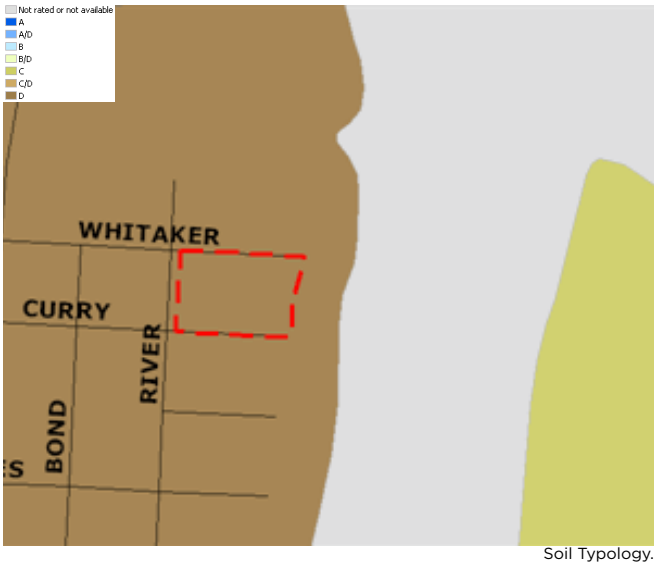
The Site Currently.

The geology of the site is considered alluvium due to large concentration of settlement from the river deposits, including clay, silt, and sand. Areas along the river have been mapped to be 45 meters deep, or 144 feet by the USGS topographic study. The soil type is very similar and classified as Type D. There are four types of soil in the US with A being classified as high infiltration and D being very low. The geology of the site has accounted for very poor water absorption and high runoff, creating a constant need for man made drainage as vegetation and soil are not adequate for the job.

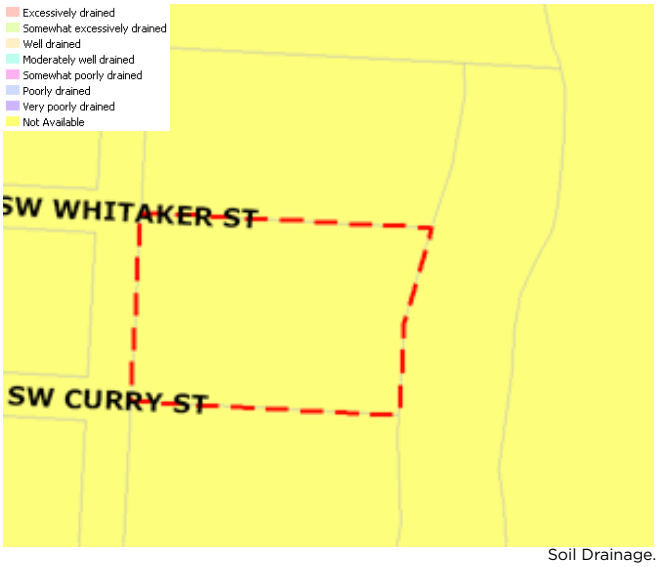
The soil drainage for the site should be classified as poorly drained in the least but due to development on the site, the soil drainage is demarcated as 'not available.' The soil has been significantly modified and can no longer retain water properly, becoming a paved surface in the sense of drainage. The water table for the site is considered to be less than 20 feet below grade and is not heavily surveyed as it is not in a protected area. The water table depth is averaged based on observed local groundwater and surface water elevations throughout the year.



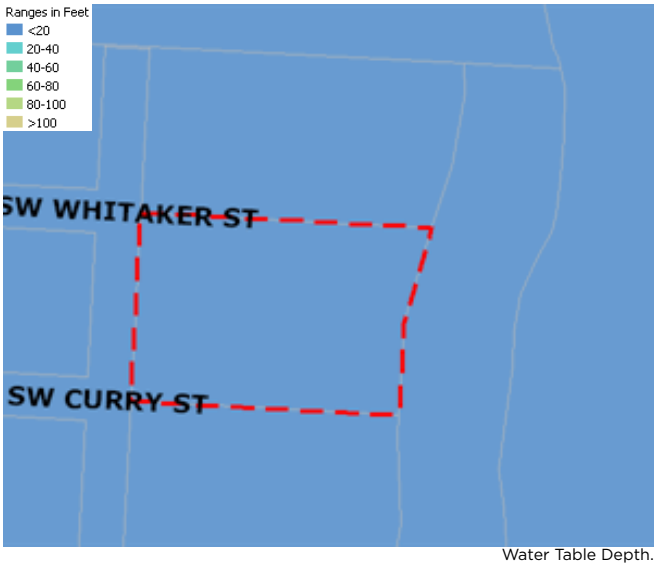
Geology.



Soil Typology.



Soil Drainage.



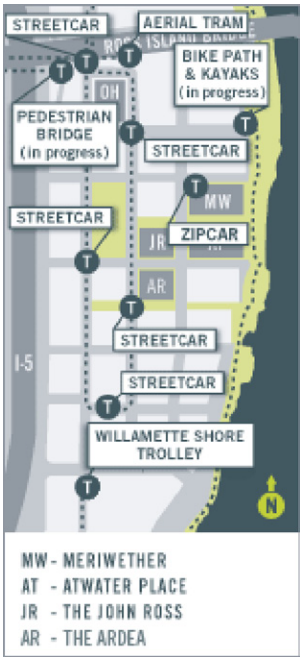
Water Table Depth.

Existing Architecture.

Residential Towers.

There are five projects constructed on the site currently, four of which are mixed-use residential towers. All towers have received at least LEED Silver certification as required by the neighborhood plan. Transportation has been developed into the site as planned, running two streets parallel to the interstate. Current projects are in progress to develop the pedestrian connections into the site, including a pedestrian bridge and bike paths. Retail is located on the ground floor of the Meriwether and Atwater Place buildings as associated with the reatil planned streets. All projects have placed parking underground and created roofscapes for the public before the residential tower rises from the public mid-rise. Each building is featured on the architect's website as a featured project.

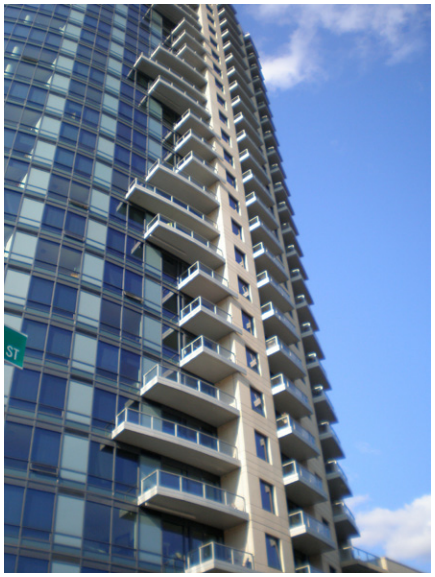
Project architects include THA Architecture, TVA Architects, and GBD Architects[11].



Existing Architecture + Nature + Community.

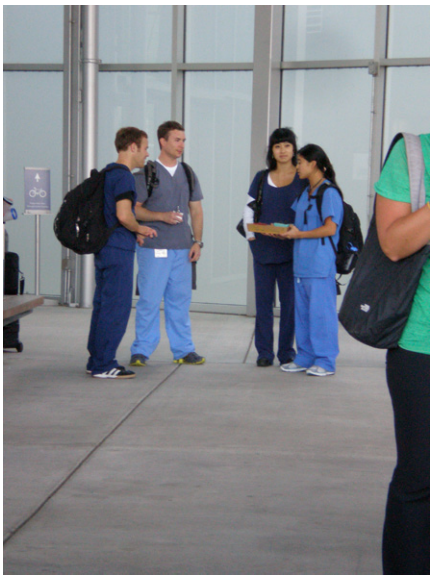
Site Visit - July 27-29, 2011.

Upon visiting the site, it is much more alive than images on South Waterfront's website and Portland's show. The site is in constant movement, from delivery trucks to joggers to dog walkers to medical professionals to tourists. Each parkscape hosts a variety of people in clusters, usually mid-morning, lunch, and post-day shift (around 5:30-6:30pm). Although the towers are soaring, the low-rise on street is all you feel and you're blissfully unaware of the towers. The glass used on every tower reflects nature so when walking the neighborhood, all streets seem expansive.



Existing Architecture + Nature + Community.

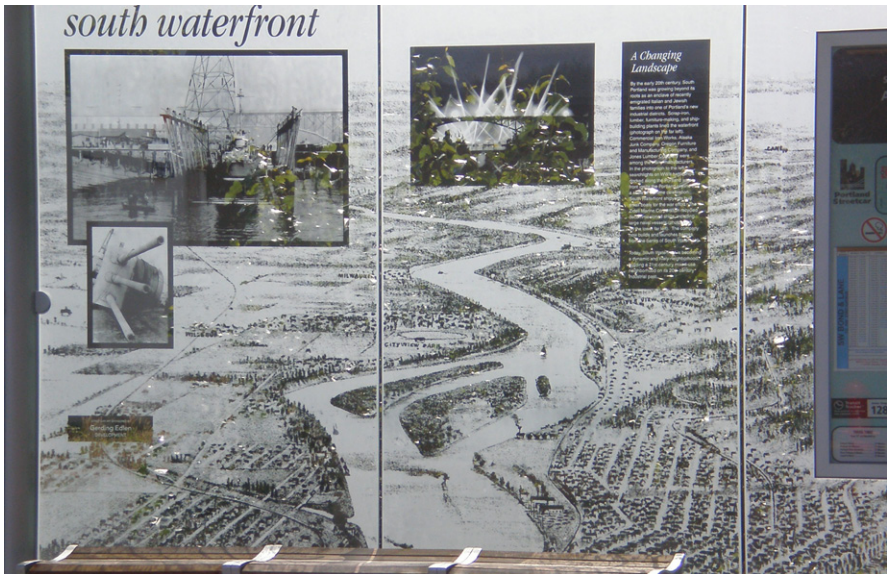
Site Visit - July 27-29, 2011.




sw Moody Ave

Existing Architecture + Nature + Community.

Site Visit - July 27-29, 2011.



Citations.

1. “Sustainable City.” City of Portland, Oregon. Accessed May 17, 2011. http://www.portlandonline.com/index.cfm?c=43046.

2. “Portland (city) QuickFacts from the US Census Bureau.” State and County QuickFacts. Accessed May 17, 2011. http://quickfacts.census.gov/qfd/states/41/4159000.html.

3.. “KPDX - Portland International Airport.” AirNav. Accessed May 17, 2011. http://www.airnav.com/airport/KPDX.

4. TriMet: Public Transportation for the Portland, Oregon, Metro Area. Accessed May 17, 2011. http://www.trimet.org.

5. “Walk Score of SW River Parkway Portland Oregon.” Get Your Walk Score - A Walkability Score For Any Address. Accessed May 16, 2011. http://www.walkscore.com/score/SW-River-Parkway-Portland-Oregon.

6. “Bicycles.” City of Portland, Oregon. Accessed May 17, 2011. http://www.portlandonline.com/transportation/index.cfm?c=34772.

7. “Historic Portland.” Portland History. Accessed May 16, 2011. http://www.pdxhistory.com/html/historic_portland.html.

8. Johnson, Marie. 2002. South Waterfront Plan. Portland Oregon: Bureau of Planning. Publication number 36111. (PDF version of the document downloaded May 9 2011).

9. Johnson, Marie. 2002. South Waterfront Plan. Portland Oregon: Bureau of Planning. Publication number 36111. (PDF version of the document downloaded May 9 2011).

10. “PortlandMaps Detail Report.” PortlandMaps. Accessed May 16, 2011. http://www.portlandmaps.com/detail.cfm?action=Explorer.

11. “South Waterfront » South Waterfront Architecture Series.” South Waterfront. Accessed May 16, 2011. http://www.southwaterfront.com/art_and_design/architecture/.

5 Regulation

South Waterfront Plan

Land Use, Design Guidelines, and Zoning

In 2003, the South Waterfront Plan became effective to guide the design process to create the vision created by the Portland Bureau of Planning. The plan defined its design guidelines into five categories: land use and urban form, greenways and parks, transportation, distict-wide environmental design, and district development. All categories are decribed and then enhanced with zoning codes and design strategies the Bureau would like to see implemented.

The main goals of the Plan include:

Land Use and Urban Form.

Encourage a rich mix of uses in the district.
Encourage a highly urban character in the district.
Reinforce the district's relationship to the river.

Greenways and Parks.

Develop a multifunctional river greenway.
Provide a variety of experiences for people living and working in the neighborhood.

Transportation.

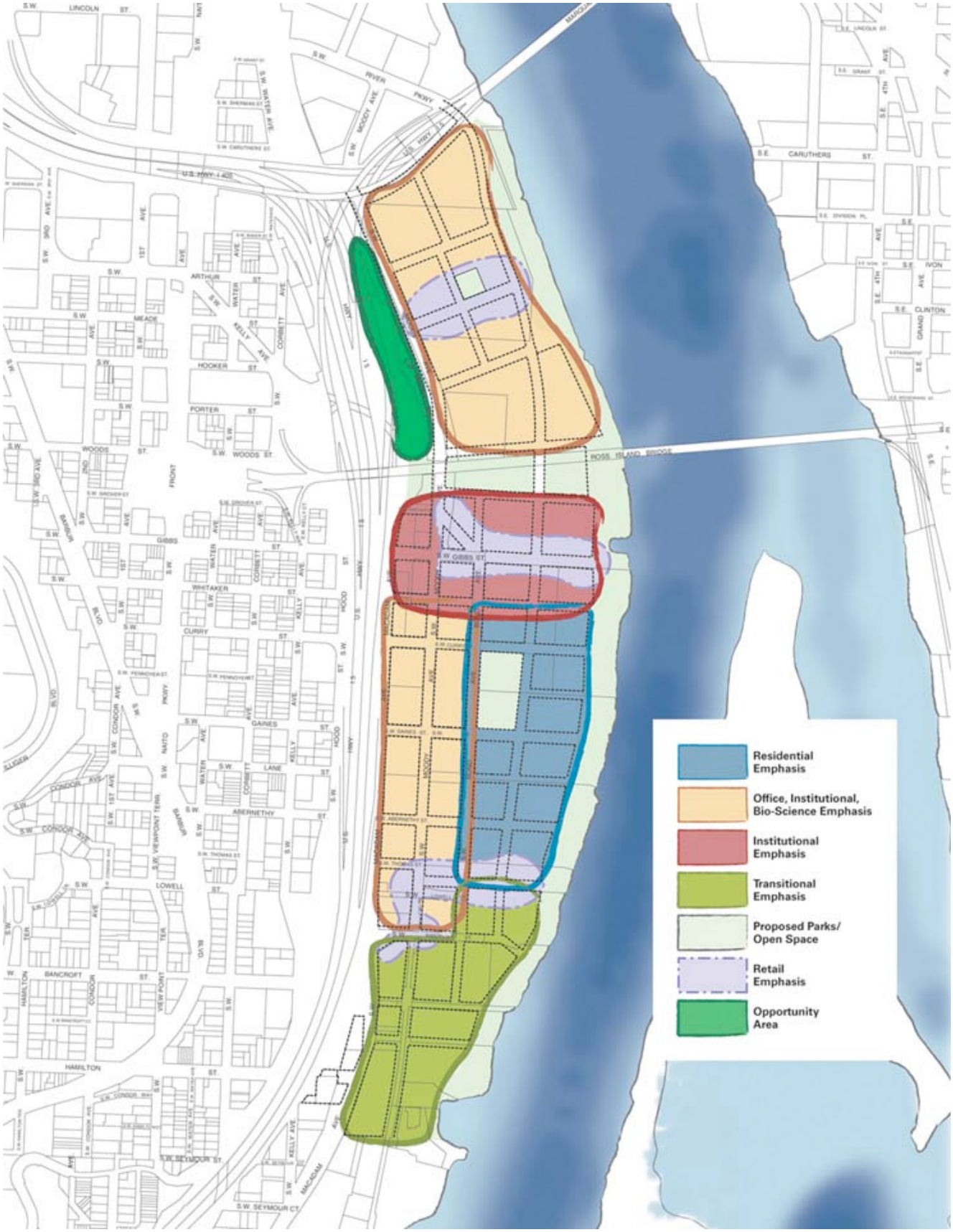
Promote alternative transportation modes.
Provide strong connections to the Willamette River and greenways.
Provide flexibility to serve existing and future development.

Environmental Design.

Improve the environmental conditions of the neighborhood.

District Development

Target public funding to stimulate private investment in the district.
Aggressively seek government funding to develop infrastructure.
Invest in infrastructure and urban amenities.


Residential Emphasis
Office, Institutional, Bio-Science Emphasis
Institutional Emphasis
Transitional Emphasis
Proposed Parks/ Open Space
Retail Emphasis
Opportunity Area
S.W. LINCOLN ST.
S.W. RIVER PKWY.
S.W. MOODY AVE.
U.S. HWY. I-405
S.E. CARUTHERS ST.
S.E. IVON
S.E. CLINTON
ARTHUR ST.
MEADE
HOOKER ST.
PORTER ST.
S.W. WOODS ST.
ROSS ISLAND BRIDGE
S.W. GIBBS ST.
WHITAKER
CURRY ST.
GAINES ST.
ABERNETHY ST.
LOWELL ST.
BANCROFT ST.
HAMILTON
S.W. SEYMOUR ST.
S.W. SEYMOUR CT.

Land Use and Urban Form

Expected Use.

Office and research are planned to occupy the northern part of the development between the two bridges. The interstate makes this location ideal for businesses and not residences.

Residential development is planned for the center of the neighborhood to create a residential core in the project. The location is away from heavy traffic noise and has favorable views to Ross Island, Mount Hood, and the hills.

Retail development is planned for the streets running east/west to filter people into the site, while providing connections with the existing urban fabric.

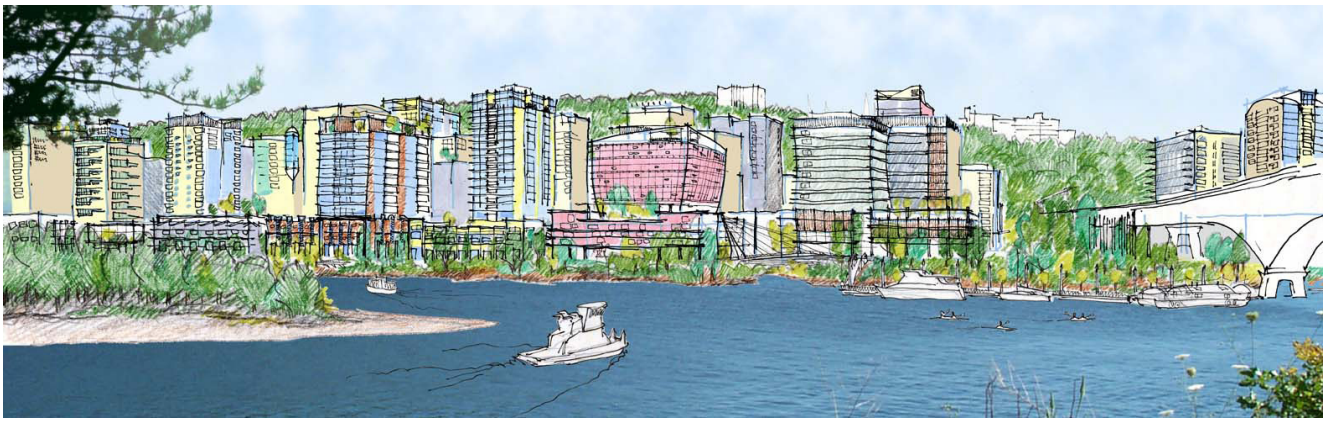
Mixed-use will be integrated into the neighborhood to provide transition zones from the existing neighborhood to the denser development planned for South Waterfront. Examples of mixed-use include offices, hotels, and restaurants[1].

Urban Form.

Building height is to be limited to provide adequate views and scale to the site as to not overpower the Willamette River and surrounding neighborhoods.

Visual access to the river is important and therefore building form will be limited to keep a continuity on east/west streets. Setbacks for larger buildings will be implemented above 50 feet and all buildings will be limited to 75 feet wide for the east and west facades, facing the river.

Pedestrians are to be accommodated in the neighborhood and specific streets will require more open ground floors to activate the areas. Building setbacks allow a large 12 foot sidewalk and vegetated planting to strengthen the presence of the pedestrian[2].

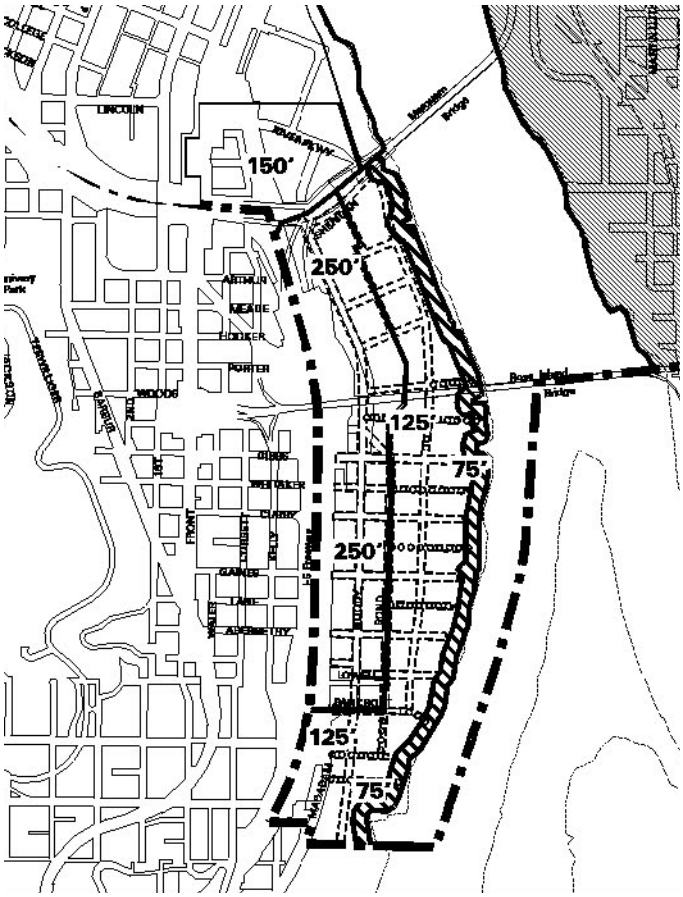


Land Use and Urban Form.

Zoning and Regulations

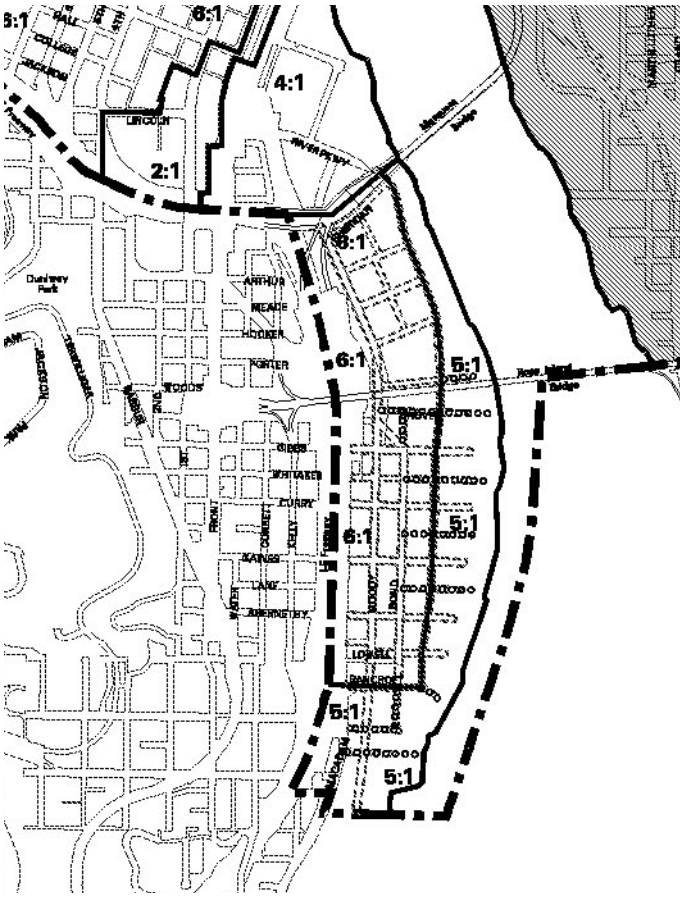
Height.

For the location of the site, a maximum height of 125 feet is allowed unless certain additional measures are met. If any part of the building is located on the greenway, the height can only be 75 feet. These bonus measures include building setbacks, floor to floor heights, specific square footage per floor, and others. If bonuses are met, the height can reach 325 feet maximum, including mechanical equipment and antennae[3].



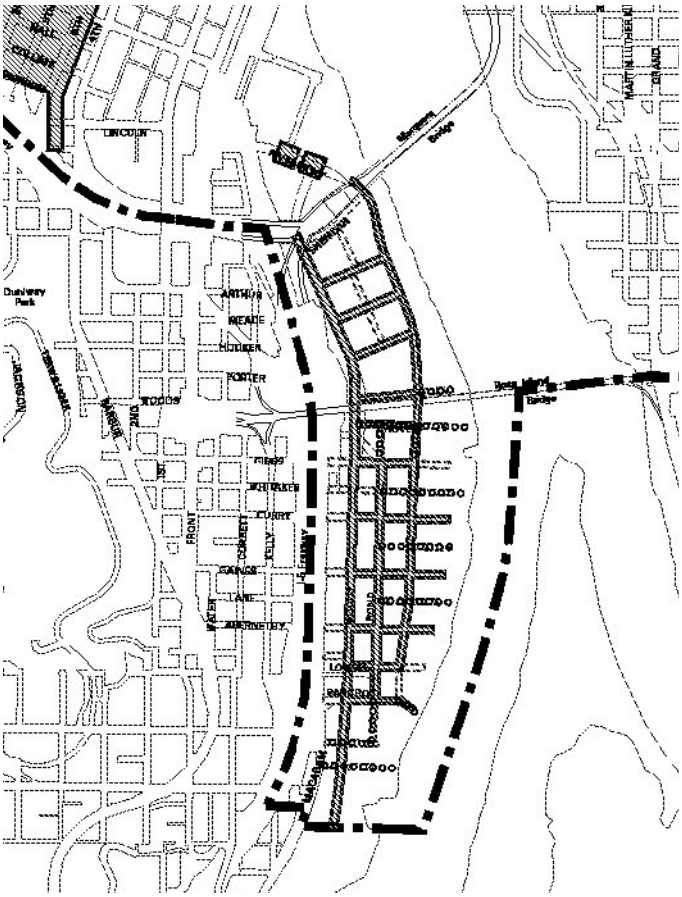
Floor Area Ratios.

On the map, the FAR is indicated to be 5:1. Written into the code, automated parking is encourage but not counted in this ratio. The FAR of South Waterfront are the largest in Portland, encouraging the densification of the site. Bonus floor area options are available to increase the FAR of this region to 7:1. Options to increase FAR include the addition of residential units, day care facilities, retail, art pieces, locker rooms, and greenway connection[4].



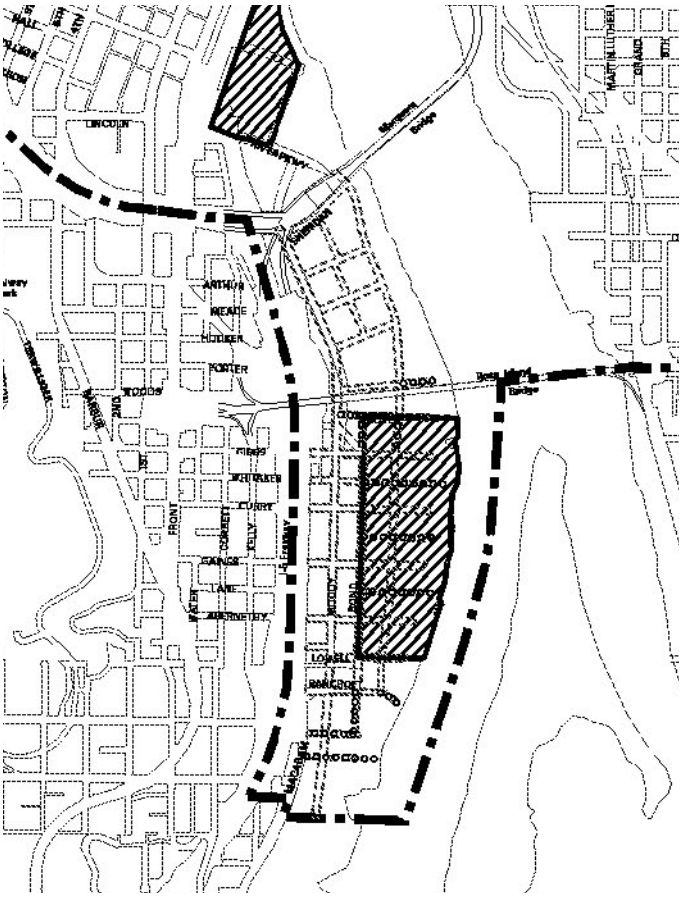
Land Use and Urban Form.

Zoning and Regulations



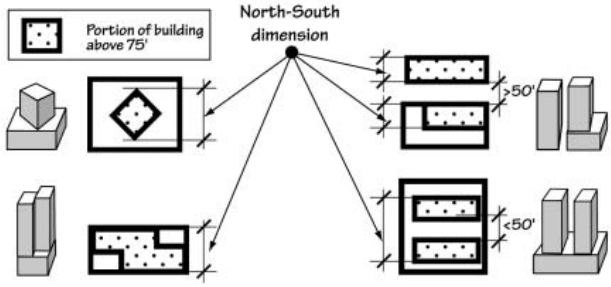
Pedestrian Access and Development.

With the western edge of the site on a “building line”, the building edge must extend to within 12 feet of the lot line and create pedestrian space between the sidewalk and the building. The exterior wall of the ground floor must be at least 15 feet tall and engage the street. Planting may be added if it conforms to Zone 3 guidelines. Windows above the ground floor should be designed to add to the skyline and promote interest in the built environment, if within 200 feet of a streetcar or aerial tram[5].



Residential Zones.

This area has been deemed suitable and attractive for residential development based upon views and reduced noise. One unit per 1000 sq ft is required, or 43 units per acre. For any residential project, a tower must be constructed above 75 feet to allow views and light to reach street level and can only be 125 feet wide north/south. A diagram of orientation for towers on a mid-rise block is below[6].



Land Use and Urban Form.

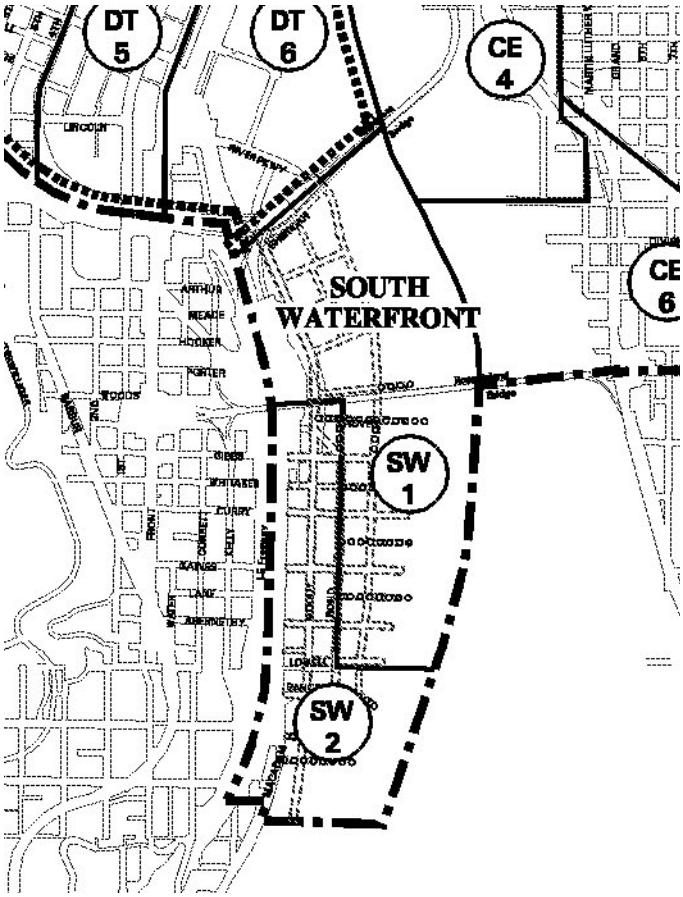
Zoning and Regulations

Parking.

For offices, colleges, or medical centers, parking is required. The code mandates 2.4 spaces per 1000 sq ft unless the light rail is extended to the site. Parking can then be reduced to a lower number subject to approval. The parking must operate as accessory or commercial at all times. For retail, up to 20 spaces is allowed. Other uses are allowed a maximum of 60 spaces per use, not including residential. If mixed-use, office and medical regulations apply.

For new dwellings, 1.7 spaces per unit is required. New hotels require 1.0 space per room while existing hotels require .7 spaces per 1000 sq ft.

Bicycle parking must conform with vehicle regulations and the same number is required[7].

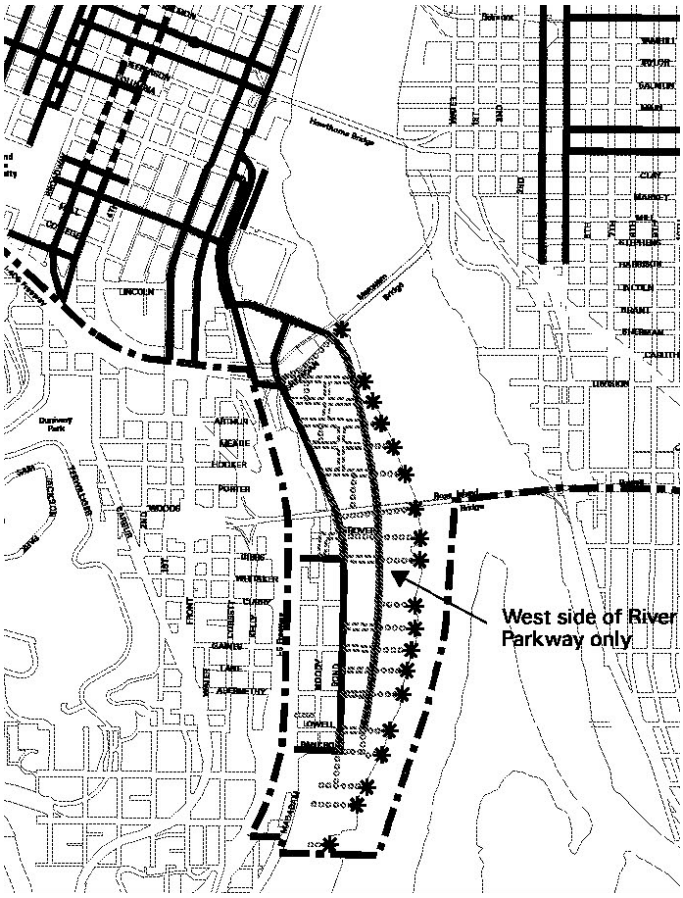


Parking Access.

All parking must be placed 75 feet away from any light rail structure. Parking lots or structures can only be accessed from demarcated streets on adjacent map, and these streets can only be used for on street parking as well. Bicycle parking must follow vehicle requirements.

Parking lot sizes can be 40,000 sq ft or 30% of the site, whichever is larger. If surface parking, the lot must be 100 feet away from a light rail and cannot be within 300 feet of the top of the river bank.

Parking structures are allowed but must meet all standards, including street front usage and vegetation requirements of the zone[8].



Building Code.

Occupancy and Egress.

Natural Healing Center is classified as B type occupancy, as an outpatient clinic and medical office.
Research Facility is F-3 type occupancy.
Temporary Stay Facility is R-1 or R-2 type occupancy.

For the healing center, 100 ft^2 gross is required for each occupant. Using the gross square footage to calculate egress for the entire building, 160 people can occupy the building at one time. The maximum travel distance is 300 feet with sprinklers, 200 feet without. The maximum common path is 100 feet, sprinkled and if a room only has one egress, its maximum egress is for 49 occupants. The minimum dead end corridor length is 50 feet, sprinkled and must be 44" wide to serve greater than 49 people. Stairs must be 44" wide as well to accomodate the same occupancy load.

For the research facility, 100 ft^2 gross is required for each occupant. Using the gross square footage to calculate egress for the entire building, 240 people can occupy the building at one time. The maximum travel distance is 400 feet with sprinklers, 300 feet without. The maximum common path is 100 feet, sprinkled and if a room only has one egress, its maximum egress is for 49 occupants. The minimum dead end corridor length is 50 feet, sprinkled and must be 44" wide to serve greater than 49 people. Stairs must be 44" wide as well to accomodate the same occupancy load.

For temporary stay facility, 50 ft^2 gross is required for each occupant. Using the gross square footage to calculate egress for the entire building, 245 people can occupy the building at one time. The maximum travel distance is 250 feet with sprinklers. Sprinklers are required for thi type of housing project. The maximum common path is 75 feet and if a room only has one egress, its maximum egress is for 10 occupants. The minimum dead end corridor length is 20 feet and must be 44" wide to serve greater than 49 people. Stairs must be 44" wide as well to accomodate the same occupancy load. An emergency door or window is required for sleeping areas.

For more detailed information, The Architect's Studio Companion provides detailed explanation and charts of codes for each occupancy type.

Structure.

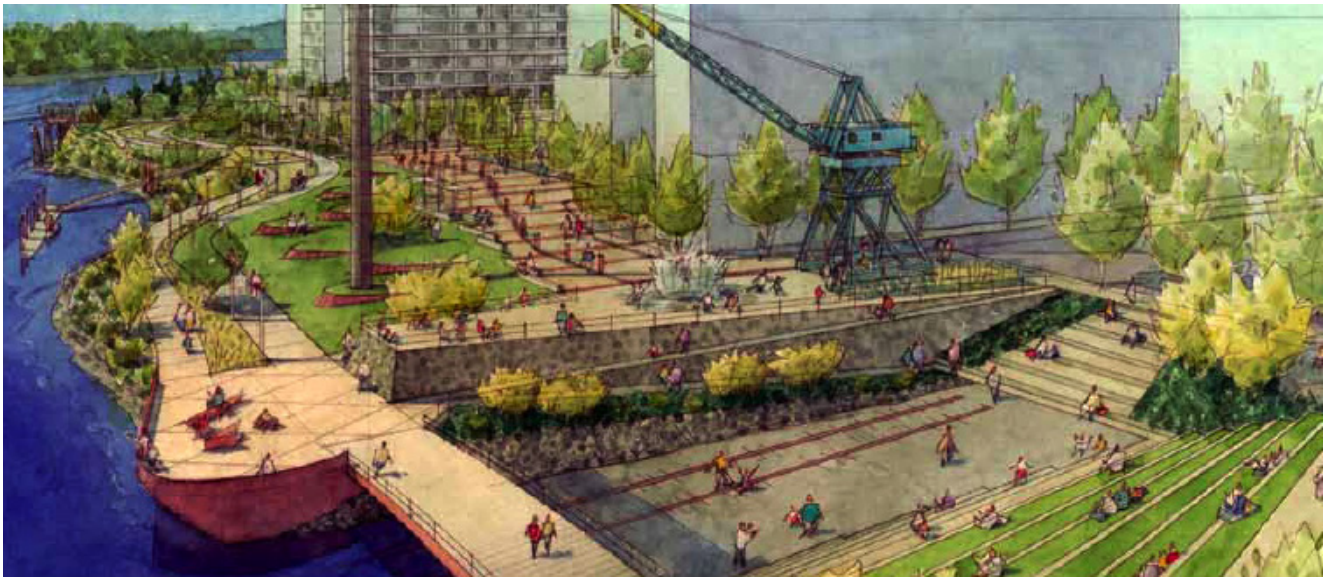
Looking at the occupancy type for live loads, offic buildings should be designed as light to medium loads. In designing with a safety factor, 100 psf should be used to calculate structure. Hotels and operating rooms have similar structural requirements. Wood frame is not appropriate for the building types mostly so concrete and steel will be the most viable options. In understanding of the flexibility of program, steel structure will allow for the most adaptable space with the least amount of structure. Concrete has better thermal mass properties however and can be a viable option for sustainable construction. For the height of the project, at least six stories will be needed and concrete can used to accomplish.

Greenway and Parks.

Greenway and Parks.

Development Intent.

In an effort to protect the Willamette River, conservation and maintenance of the green area is regulated by the zoning code. Some of the focus will be to increase the quality of land and public space along the established river edge. A separate Greenway Plan was created in an effort to further the plan in sustainable practices, including storm water management, diverse species, and public access zones. The Greenway plan must conincide with the guidelines of the South Waterfront Plan. A greenway plan had already been created and construction should begin shortly. The greenway plan is an extension of the greater Portland greenway extending from downtown including river parks, bike paths, and trails. The main elements include a large sculpture lawn and river overlooks.



Greenways and Parks.

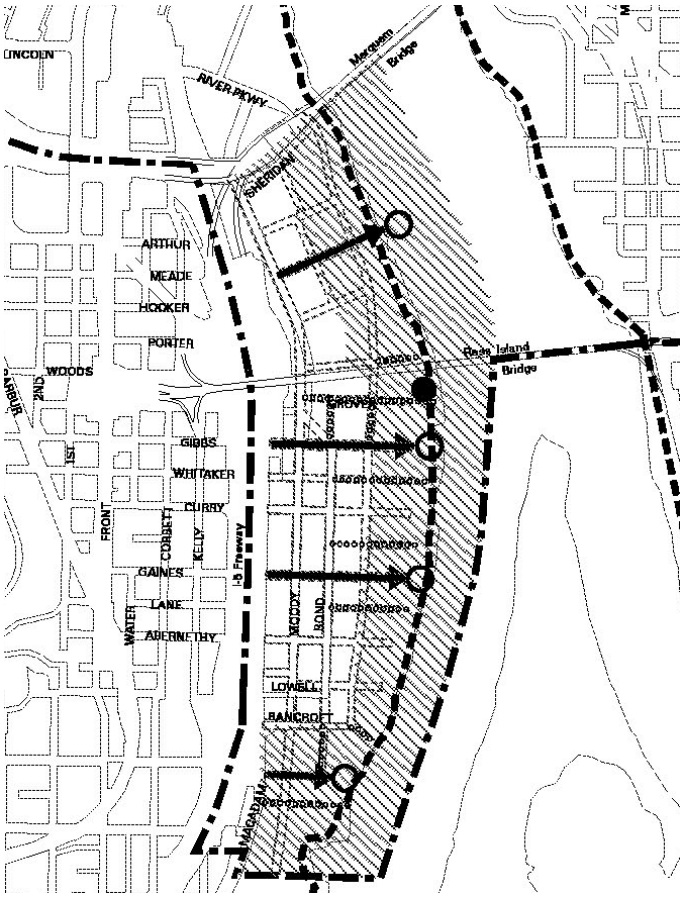
Zoning and Regulations

Public Access.

Access to the greenway was created in the general zoning of the plan to create view corridors, stopping places, and clearings along the Willamette River.

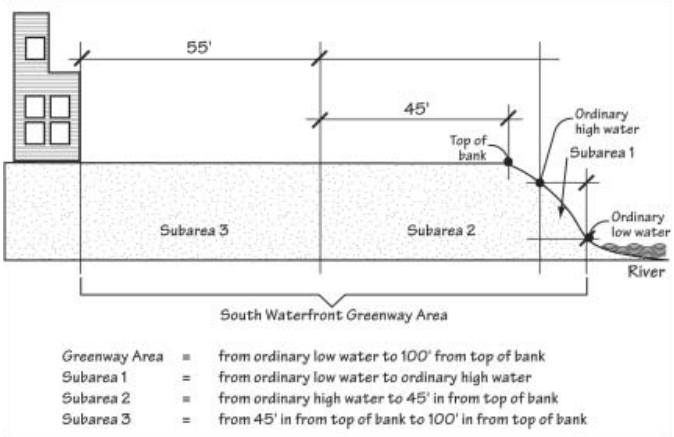
Major viewpoints are at least 1600 sq ft in area and must be adjacent to a greenway trail. All benches and materials must conform to the plan desginate by the Bureau of Parks and Recreation.

Minor viewpoints are locations along the greenway with views of the river. Plantings need to be controlled to prevent views from being blocked and cannot be larger than three feet. The minor corridors must be 20 feet wide and be centered on the access street.



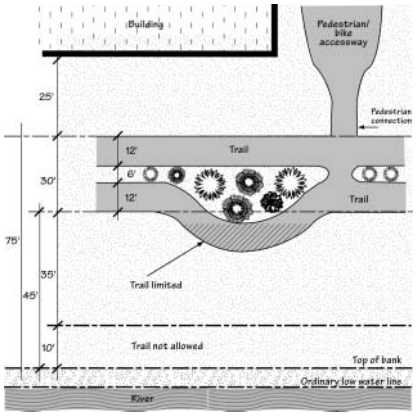
Sub Area Planting Zones.

Designating planting types are distinguished by subareas in the diagram on the right. For Subarea 1, the plantings are mostly shrubs. Subarea 2 and 3 are a mixture of trees and shrubs. All subareas require at least 80% of landscaping but must conform to paved requirement outlines of each area.



Public Trail Standard.

On the right is a diagram provided in the zoning codes that gives dimension standards for trails, plantings, and open green space along the river.



Design Guidelines.

Portland Bureau of Planning and Sustainability.

In addition to the Bureau of Planning Code outline, the city created a set of guidelines to follow for the development of the area. In a series of sections, the guidelines provide design strategies and examples for architects and planners to follow. The guidelines are based on public opinion and a desired image for the neighborhood set forth by politicians and urban planners. The guidelines sections are:

A – Portland Personality

A1 – Integrate the River
A1-1 – Develop River Edge Variety
A1-2 – Incorporate Active Uses Along the River
A2 – Emphasizing Portland Themes
A3 – Respect the Portland Block Structures
A4 – Use Unifying Elements
A4-1 – Integrate Ecological Concepts in Site and Development
A4-2 – Integrate Stormwater Management
A5 – Enhance, Embelish, and Identify Areas
A5-1 – Consider South Waterfront's History and Special Qualities
A6 – Reuse / Rehabilitate / Restore Buildings
A7 – Establish and Maintain a Sense of Urban Enclosure
A8 – Contribute to a Vibrant Streetscape
A9 – Strengthen Gateways

B – Pedestrian Emphasis

B1 – Reinforce and Enhance the Pedestrian System
B1-1 – Facilitate Transit Connections
B1-2 – Enhance Accessway Transitions
B2 – Protect the Pedestrian
B2-1 – Incorporate Outdoor Lighting That Responds to Different Uses
B3 – Bridge Pedestrian Obstacles
B4 – Provide Stopping and Viewing Places
B5 – Make Plazaz, Parks, and Open Spaces
B6 – Develop Weather Protection
B7 – Integrate Barrier-Free Design

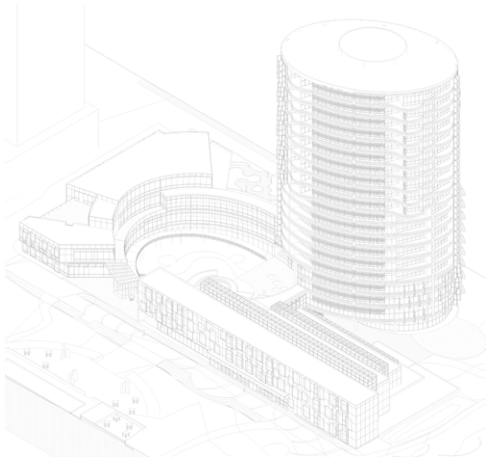
C – Project Design

C1 – Enhance View Opportunities
C2- Promote Quality and Permanence in Development
C3 – Respect Architectural Integrity
C4 – Complement the Context of Existing Buildings
C4-1 – Develop Complementary Structured Parking
C5 – Design for Coherency
C6 – Develop Transitions between Buildings and Public Spaces
C7 – Design Corners that Build Active Intersections
C8 – Differentiate the Sidewalk-Level of Buildings
C9 – Develop Flexible Sidewalk-Level Spaces
C10 – Integrate Encroachments
C11 – Integrate Roofs and Use Rooftops
C12 – Integrate Exterior Lighting
C13 – Integrate Signs
C13-1 –Coordinate District Signs

Greenway Development

1 – Design a Cohesive Greenway Trail System
2 – Address Greenway Edges
2-1 – Address Streets and Accessways
2-2 – Address Adjacent Open Space
2-3 – Address Bridges
3 – Incorporate a Diverse Set of Gathering Places
4 – Integrate Materials, Structures, and Art
5 – Enhance the Riverbank
6 – Design Diverse Plant Communities
7 – Define and Strengthen the Reaches
7-1 – North Greenway Reach
7-2 – Central Greenway Reach
7-3 – South Greenway Reach
8 – Create and Enhance Habitat

6 Design



Professionals from all fields alike seem to have come to the most logical conclusion: when mother nature gives us problems in the form of changing living standards, limited resources, and incurable diseases, she also gave us the right tools to solve these problems. The only work to be done now is to rediscover this tool...

The medical community is changing. Sustainable architectural designs are changing. Can one community understand all changes in 2011 from medical ideals integrating nature to architecture engaging place - cultural, social, environmental?

As the high-rises create a new example of sustainable living, the buildings themselves need to create a more dynamic character for the communites in the area: students, medical professionals, and middle-aged residents. All share the space separately and if placed together, could break percieved social boundaries between the three.

Initial Strategy.

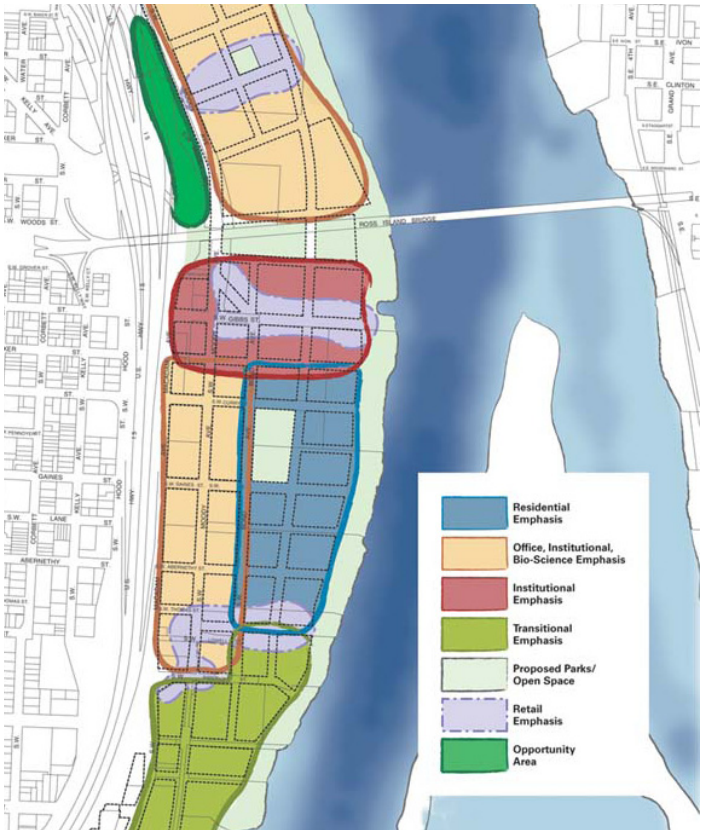
Masterplan proposal.

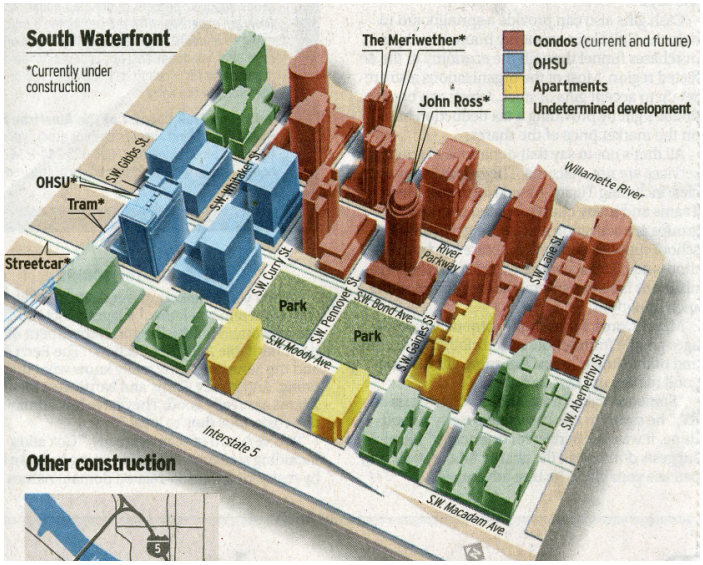
The general layout for the proposed master plan for the city has broken down the new South Waterfront area into sectors for development. The first image is that of the overall planning proposed to the city and voted upon, which received a yes to go ahead with construction. The second image is from a newspaper clipping showing another masterplan, more detailed with building massing, but the overall zoning is varied.

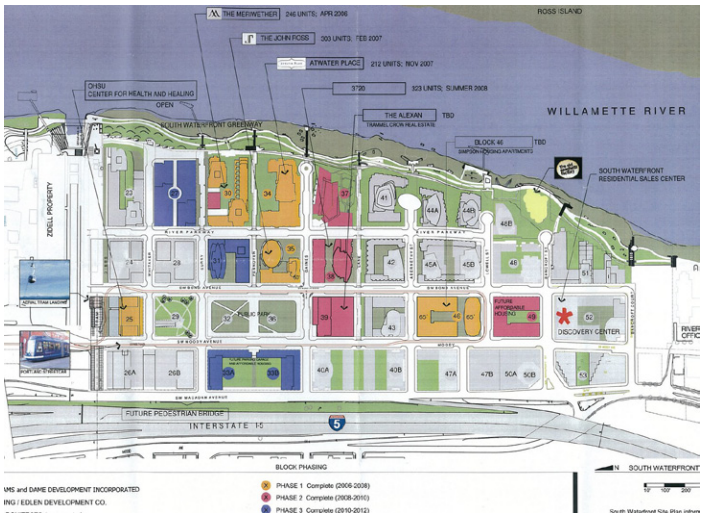
For my thesis site, I am looking at the overall masterplan as being accepted (building heights, greenways, paths, parks, and transit) while looking into how to best zone the typology of the buildings.

The general organization of heights is fine, with towers along the river and low-rises along the western edge, adjacent to the highway. The question I am asking of the masterplan however is the need for all the towers to be at the same height and the need for so many of them, removing the existing contact with nature the inhabitants have.

Oregon Health and Sciences University (OHSU) is a prominent hospital overlooking the site, and even has a smaller medical facility on site, anchoring the northern edge. Due to the prominence of this organization, many of the medical staff live in the neighborhood and surrounding neighborhoods as well, both professionals and students. For this reason, OHSU was looked at as a potential client and the program is lacking a natural medicine component. This makes my idea of a hollistic healing center a viable option for this community and needs to be located near the existing facility. For this reason, it seems the original zoning (the top image) will be most relevant and something to structure my zoning strategy around.

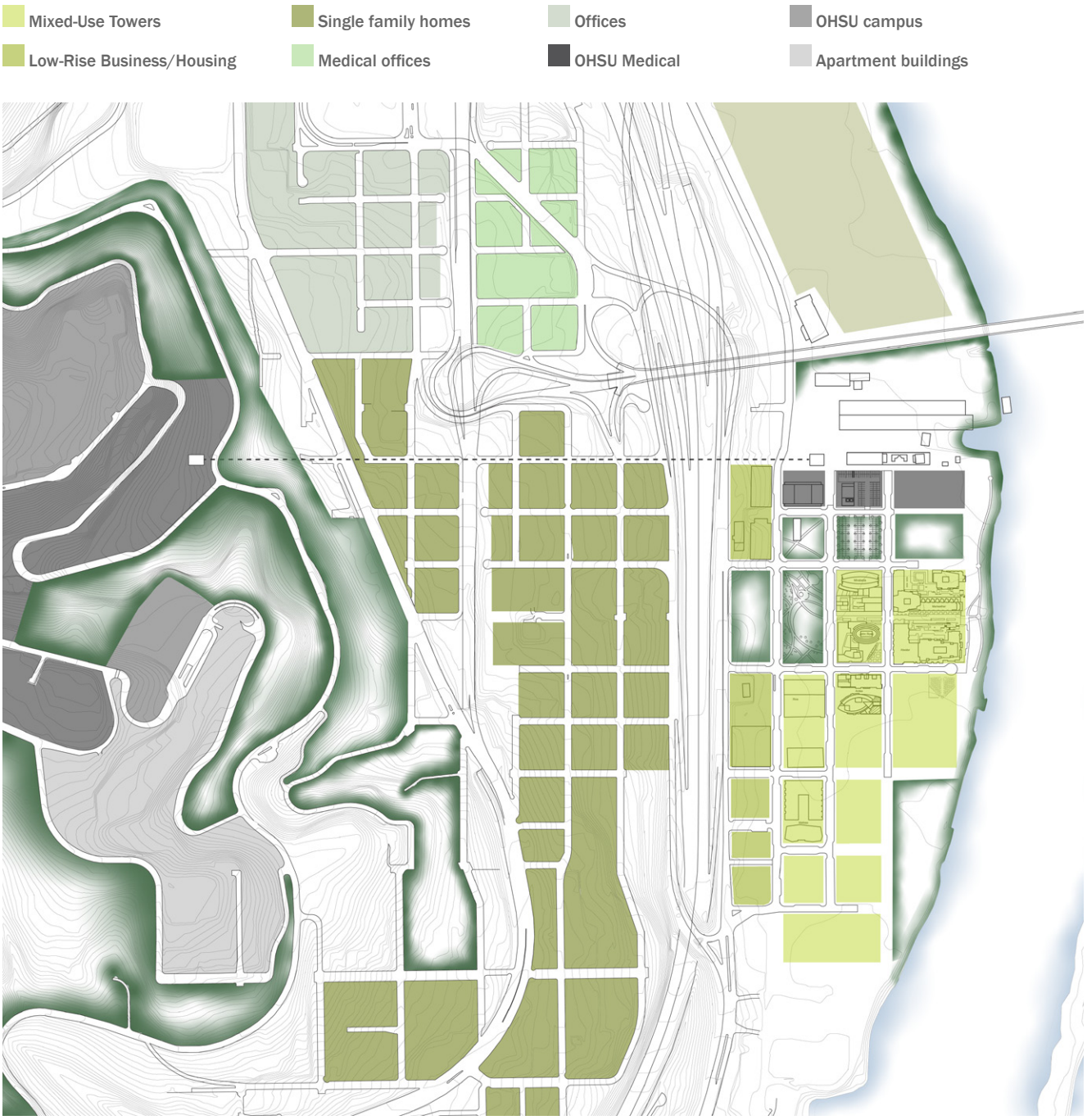


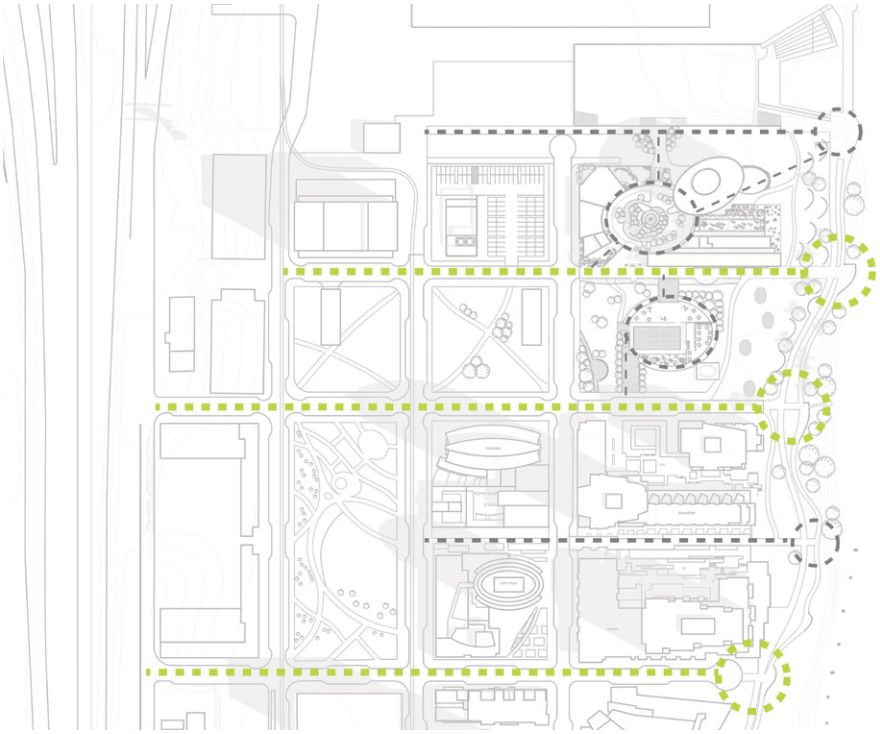




The proposed master plan for this project differs from the accepted masterplan by grouping OHSU in South Waterfront on the northern boundary of the site, providing a buffer from the public plaza adjacent on the north to the neighborhood on the south. Creating this buffer allows for a more private transition into the neighborhood, with the focus of entry along the river and from the tram at the north east corner. Unlike other plans, my proposal takes into account the existence of the neighborhood dynamic and how the community uses the fields where no buildings exist yet.

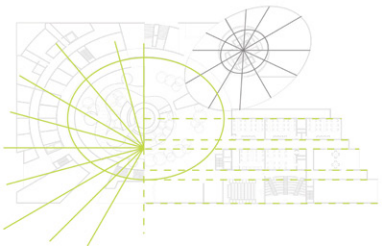
The current residents use all the nature they are allowed to, as a dog walking field, for frisbee, children just playing, and to just sit and read. Currently the only planned green space is the river paths, Elizabeth Caruthers Park, and a lawn over the existing parking for OHSU. Using green space is important to this neighborhood and therefore a green belt was used to create a connection from the existing park to the greenway along the river. The green belt also removes the imposing force of all the towers on the neighborhood, giving it breathing room and a sense of what was, before industry and rapid contemporary development overtook the site. Providing green space allows for the site to be healed, just as the project can heal potential inhabitants with a natural process.

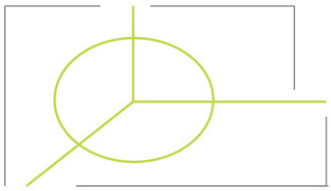


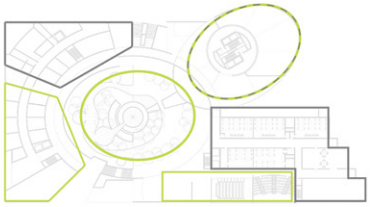


nodal access and view corridors

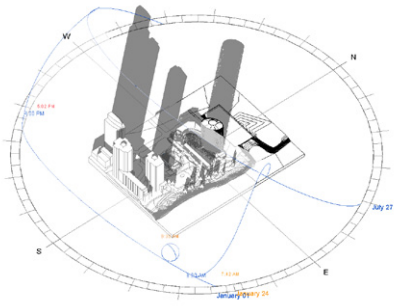
heights - stepping with context

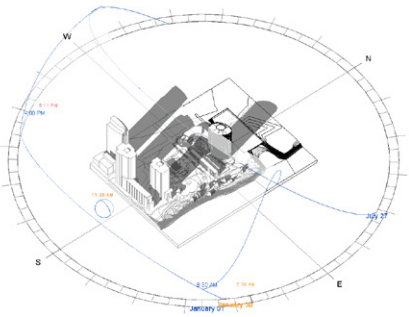


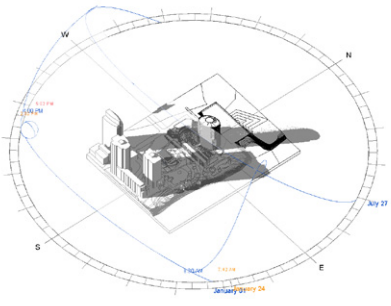




structure | entry | privacy zones







solar studies of rotated tower

Realized Program

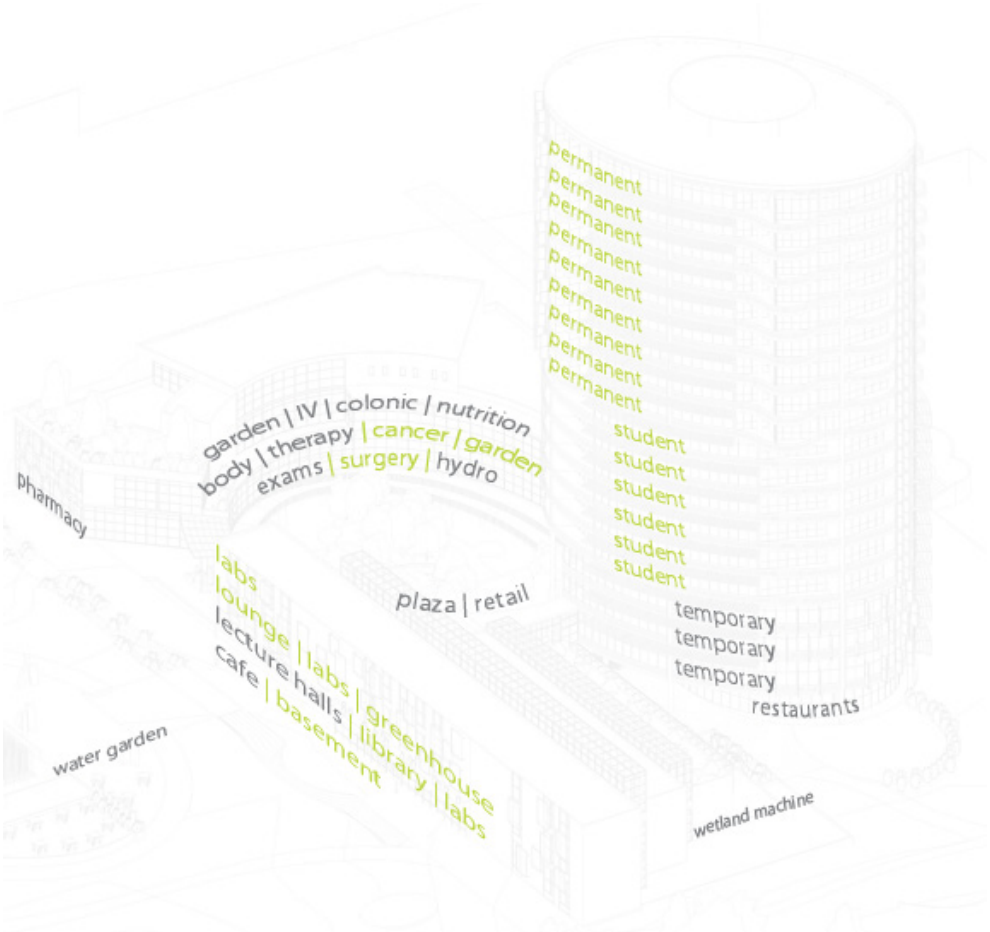
The program was divided into four pieces, a healing center, living tower, research laboratories, and landscape.

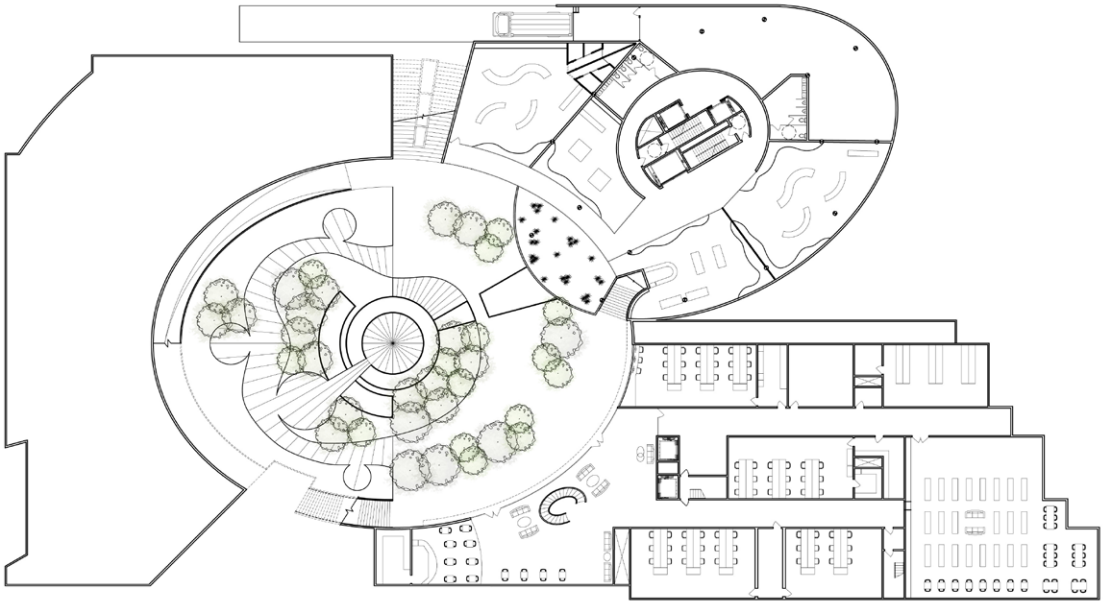
The healing clinic is 32,000 square feet is healing space on three levels. The ground floor is accessible from two entrances and is the most public. The ground floor contains a pharmacy for ease of access for exitting patients, as well as the reception and general entrance for the clinic. The second floor contains body and therapy rooms, inlcuding yoga, chiropractic care, and various massage therapies. The third floor has the most private areas for counseling and more private medical treatments that should be removed from the street's vantage point. The clinic features a sky bridge to allow patients easy access to the housing tower, as well as staff.

The research laboratory building is 56,000 square feet and contains 41,000 square feet of research space. The research space includes laboratories for natural pharmacology, botanical, herbalism, wet and dark, and biochemistry. Other parts of the research space include offices, a library, lounge space and kitchenettes. On top of three of the roofs are garden spaces that serve each laboratory adjacent to them, across a skylight bridge.

The living tower contains four different typologies of program, including restaurants and cafes, temporary stay rooms, student housing, and luxury apartments. The tower was rotated 30 degrees to maximize solar orientation and remove prolonged shadows on the urban plaza. Each floor of the tower is 12,600 square feet, with a service core of 4,400 square feet allowing for 8,200 square feet of living space. There are three floors of temporary stay units, six floors of student housing and ten floors of luxury apartments. The ground floor is less square footage as the building envelope is pulled in more to allow for protected walking space for all the restaurants that are accessed on the exterior primarily. Retail is placed on the urban plaza level with direct access from the neighboring plaza and river walk.

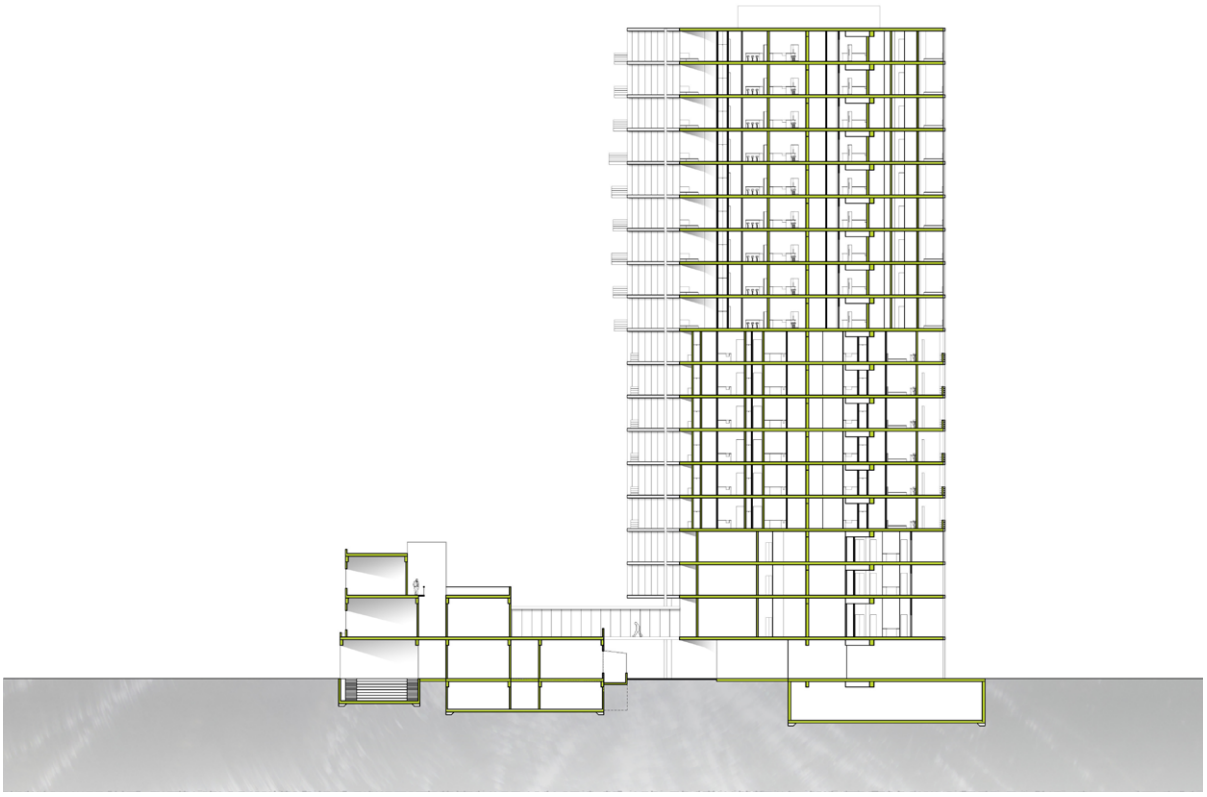
The landscape exists everywhere in the project and was looked at as an integral part of the project to create a feeling for the spaces. All rooms of the buildings look out onto the landscape, whether it be the undisturbed mountains and riverscape, the urban plaza in the center of the buildings, or the public park south of the laboratories. Gardens line the roofs and walkways, providing more to the community than known by most. Landscaping is prevalent in the neighborhood and was thought of in this project for that reason as an integral part to the success of this concept.





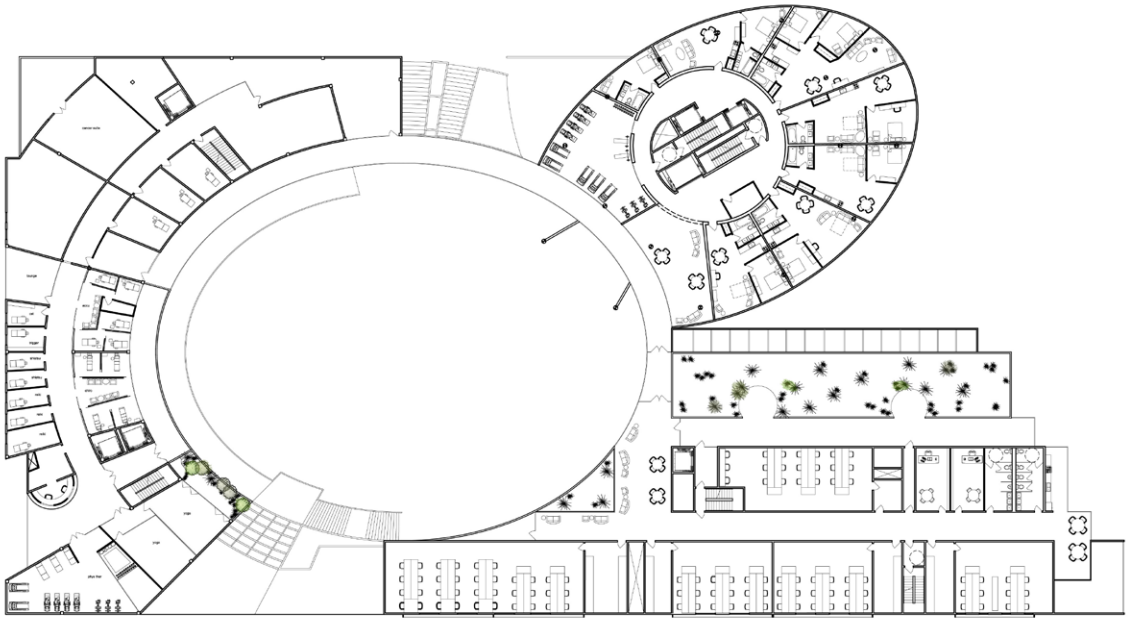
-12' - urban plaza floor plan

0 - ground floor plan

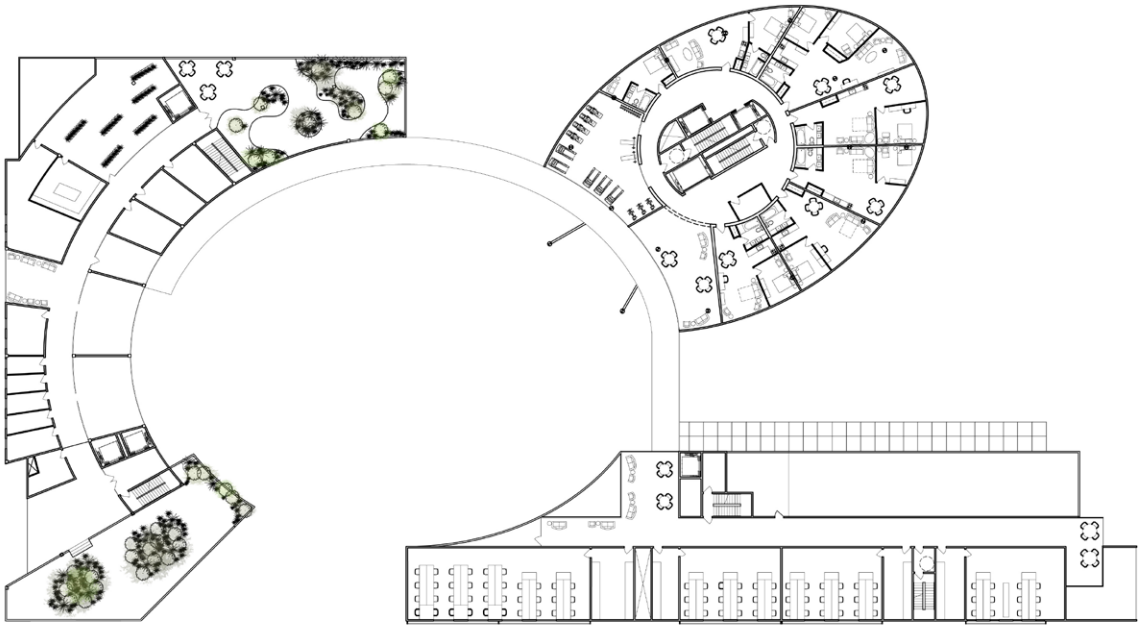


laboratory and tower section

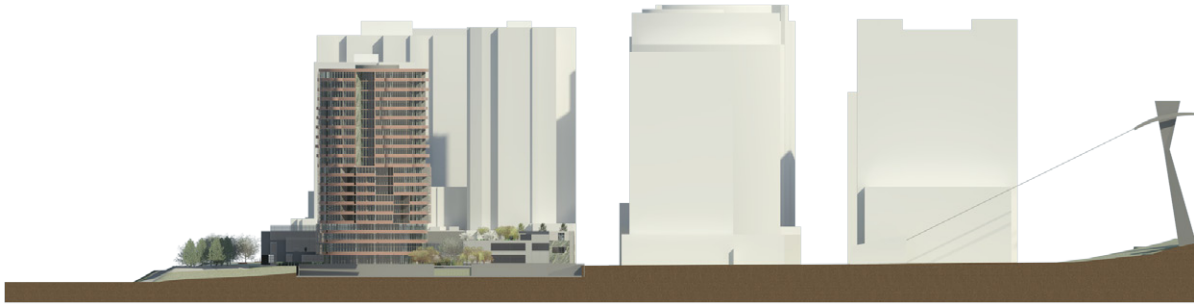
clinic and tower section



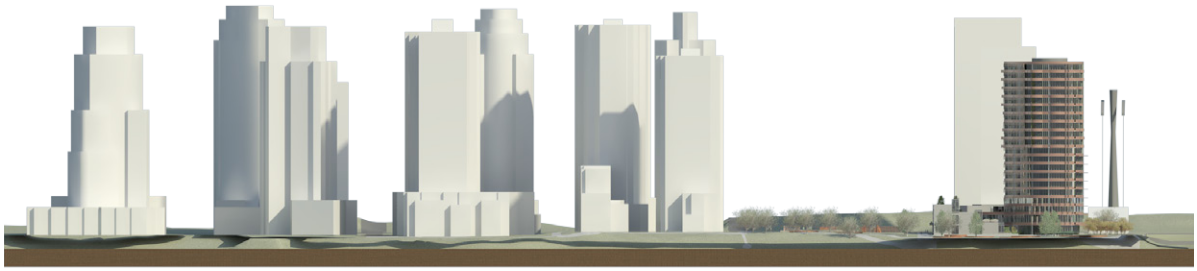
15’ - second floor plan



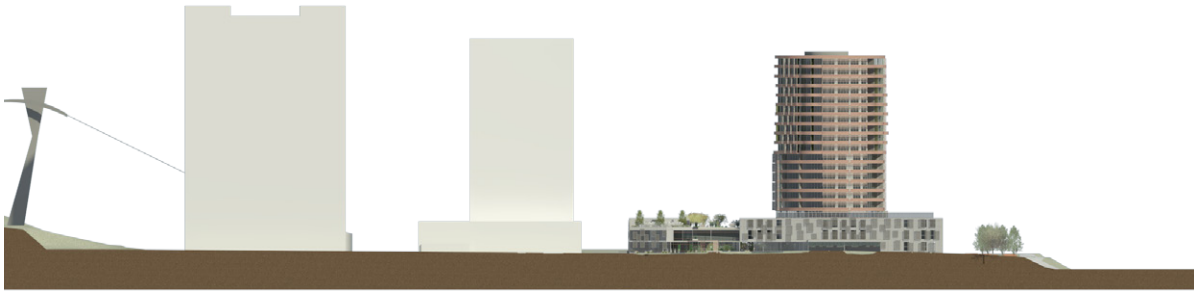
30’ - third floor plan



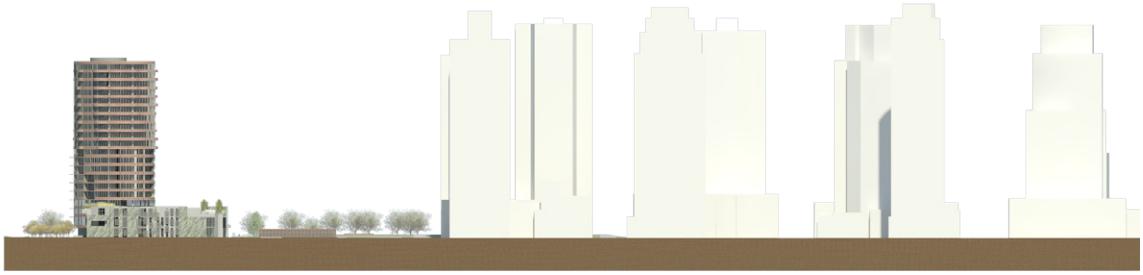
north elevation



east elevation

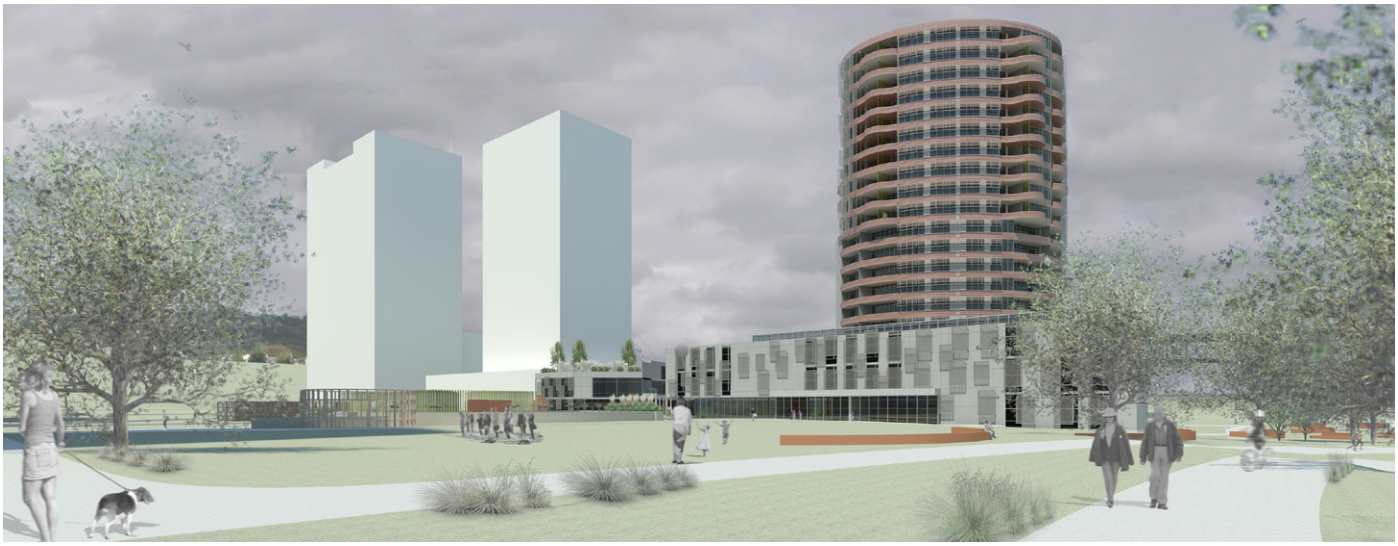


south elevation

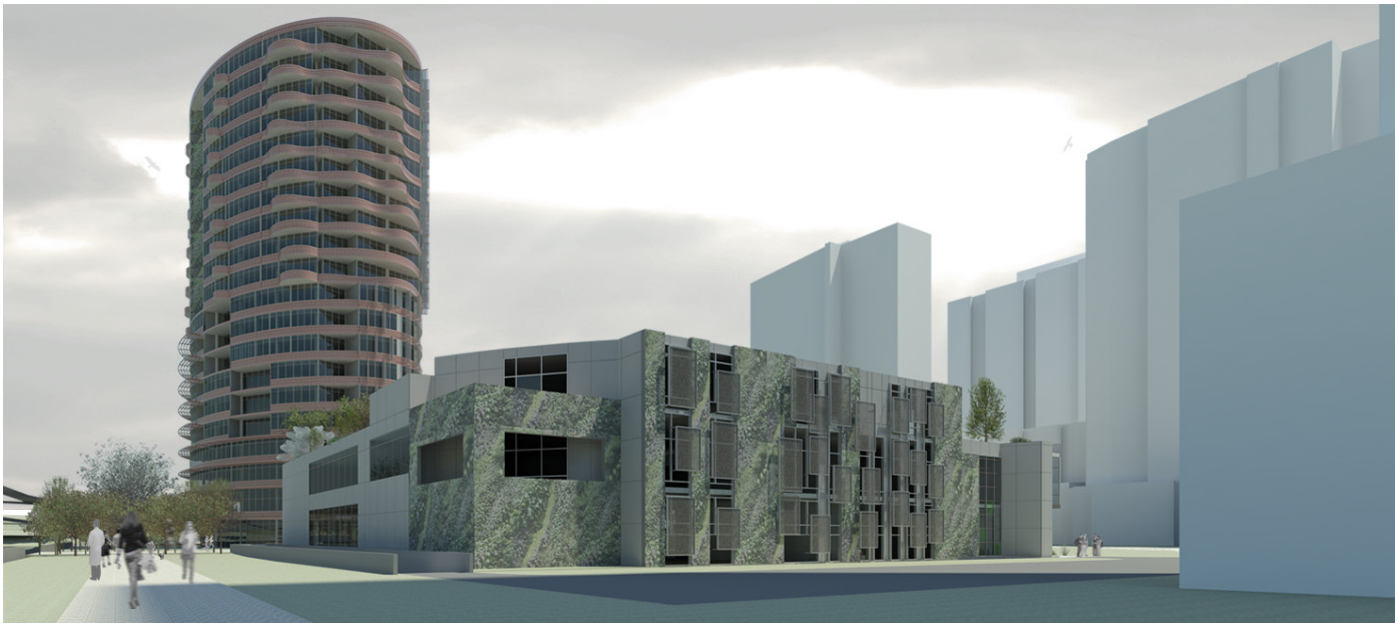


west elevation

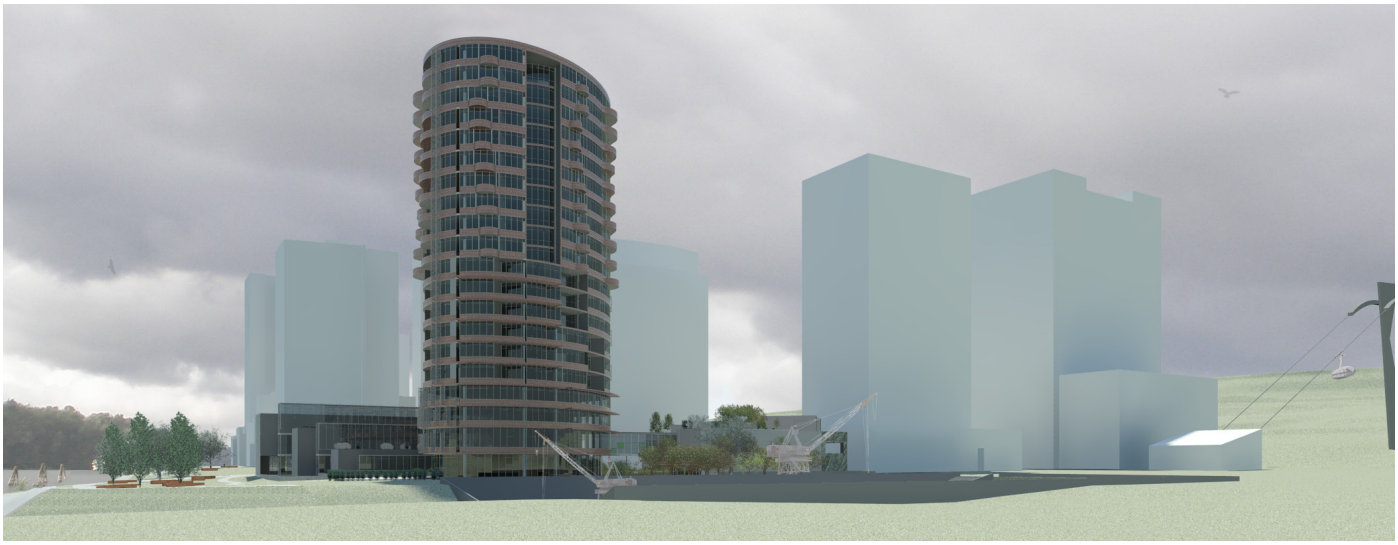

BIRKENSTOCK



greenway river walk



approach from OHSU tram



approach from downtown

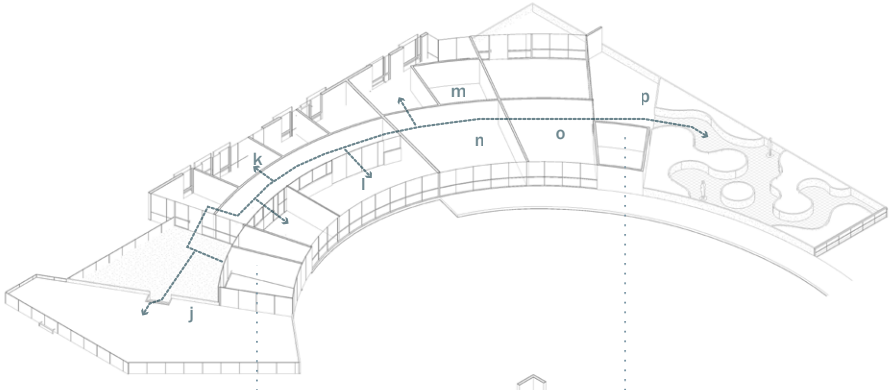
Healing Center

The healing center is a located along the neighborhood edge of the site to allow for primary access from the existing tram access and high visibility from the street. The clinic creates the hard edge along the street and acts as one tier of the low-rise buildings that anchor the tower to the site and the existing context.

The entry into the clinic can be accessed from two sides, the more public plaza on the north and the neighborhood on the south. The entry from the south is the more immediate entry into the clinic with almost direct access into the reception area (seen below). Upon entry, the clinic is clad on the interior with warm, natural materials to create a sense of comfort for patients. The floors are made of jarrah wood, a highly renewable wood from Australia that has a similar appearance to mahogany, giving the floors a richness and warmth. The walls are mostly a warm white to complement the use of concrete for some structural walls, bracing the column and beam framing system. Large amounts of glass are also used to provide natural light wash across the space and allowing the most unobstructed views of the surrounding nature. Bamboo plants and furniture add to the warmth and feel of the place, bringing nature into the space. To keep a color palette uniform throughout the entire the project, a soft green and white was used for fabric, wall art, signage, and murals.

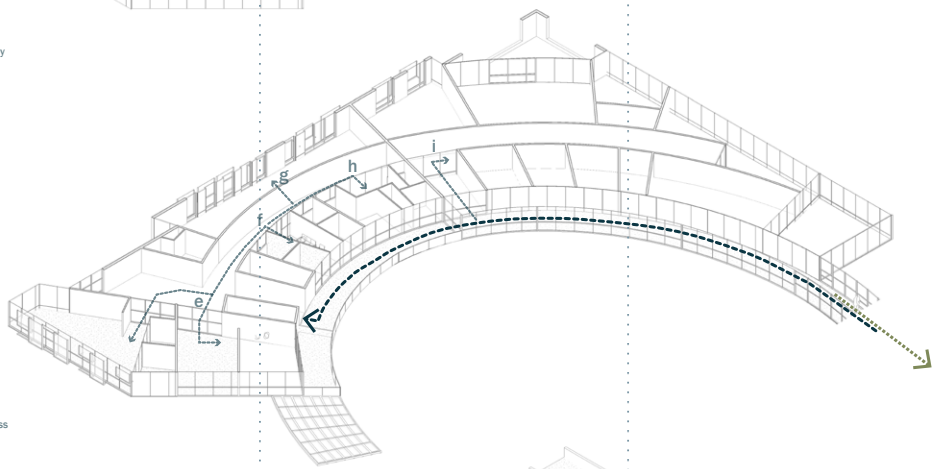
The healing center is composed of three levels of program, from more private on the ground level to public at the top. Unlike typical patient rooms however, each room has a selected view of nature, whether it be of the sunken plaza at the center or of the parks neighboring the building. As one ascends the clinic into the various areas, the view of nature changes from being in the nature to above it, allowing more views of the surrounding hills also. Gardens are placed along roofs as one ascends also, bringing an opportunity for nature to be experienced from multiple levels of the project. Some gardens are more private due to their location but all are accessible to patients.

reception lobby



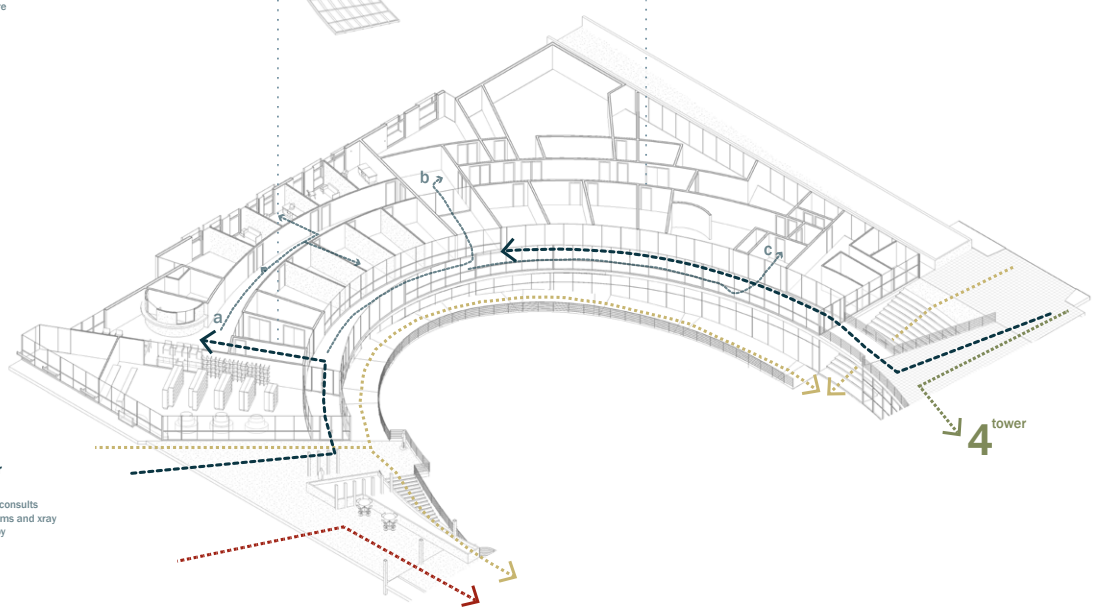
2 healing center

22 j_ wellness garden
k_ nutrition therapy
l_ counseling
m_ homeopathy
n_ lounge
o_ office suite
p_ healing garden



2 healing center

21 e_ physical wellness
f_ accupuncture
g_ chiropractic
h_ massage
i_ cancer suite



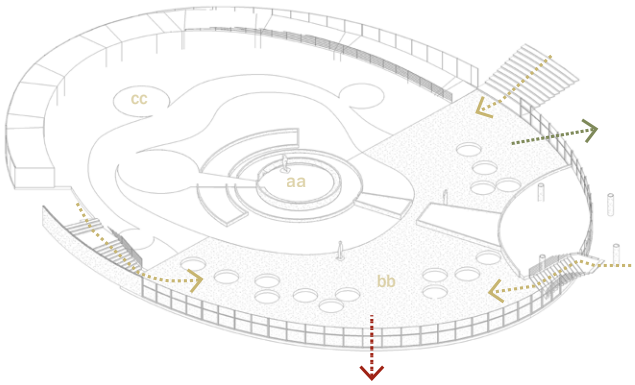
1 public retreat

2 healing center

20 a_ exams and consults
b_ surgical rooms and xray
c_ hydrotherapy

3 laboratories

4 tower



1 public retreat

1-1 aa_ meditation space
bb_ cafe space
cc_ forested grove

chiropractic hallway

exam room

recovery garden

fitness studio

Research Laboratories

The research facility is located at the southern edge of the site and form one of the only linear edges of the site. Given the extent of the laboratory requirements, this building needed to be structured and articulated differently than the other building pieces involved in this project due to the rigidity of the lab spaces. The building was therefore removed the radial structural pattern and supplemented with a gridded bay system of concrete columns to allow for some flexibility in lab sizes. All labs are pushed to the edges of the three programmatic bars to obtain natural lighting, whether it be southern or northern. Communal spaces, such as labs and lobbies are placed at the eastern and western points to create spaces ideal for morning or afternoon events, such as dining or lounging.

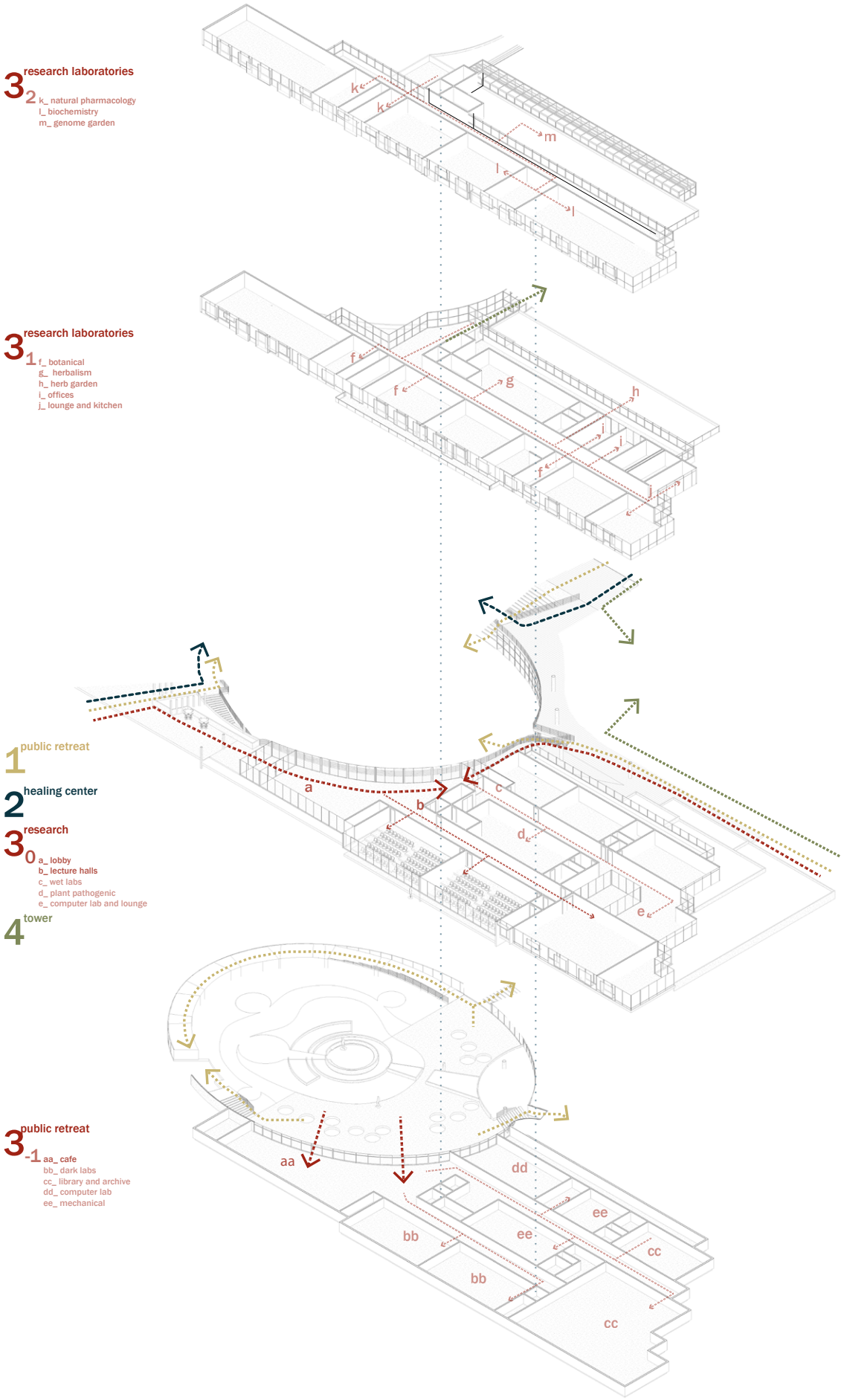
The lab building is not entirely private however as part of the facility is reserved for the public as a community outreach program to help educate students and the public about new herbal medicine and techniques. Access to the cafe on the urban plaza level is from the lobby, serving those with a quick need for coffee or snack between class or intermission. Three lecture halls are located on the ground floor and can be closed from daylight as needed with screens. The rest of the building is secured from the public for safety and security of research reasoning.

The lab bars are stepped to the south to allow maximum northern exposure on the roofs, greenhouses, and living machine. Each roof features a garden setting where herbs and other flora can be cultivated and monitored by the researchers for experiments or pharmaceutical use. The ground floor hosts the living machine, a built wetland system that processes water on site before reusing or discharging into the ground safely. The main treatment wetland is located with the greenhouse to control the system before it flows outdoors into the rain gardens.

public lobby

eastern entry condition from river

northern entry condition from public plaza


3 research laboratories
2 k_ natural pharmacology
l_ biochemistry
m_ genome garden
3 research laboratories
1 f_ botanical
g_ herbalism
h_ herb garden
i_ offices
j_ lounge and kitchen
1 public retreat
2 healing center
3 research
0 a_ lobby
b_ lecture halls
c_ wet labs
d_ plant pathogenic
e_ computer lab and lounge
4 tower
3 public retreat
-1 aa_ cafe
bb_ dark labs
cc_ library and archive
dd_ computer lab
ee_ mechanical

Housing Tower

The housing tower is the element of the project that is unique to this project, as it is the embodiment of the neighborhood. The community is a mix of people, from young adults to medical professionals to the middle-aged, and all share the space with each other. The tower itself if a mix of the seem people and even provides one more group, patients and their families. The tower is designed to house those that partake in the medical services offered at the clinic and OHSU and allow interaction in a way that does not divide the groups but create a camaraderie that exists no where else.

The tower is composed of four typologies that serve its users. All floors are wrapped in a jarrah wood and glass to create a dynamic language for the tower that can both blend and separate itself from the other towers.

1. The urban plaza and ground floor serve the general community and residents by providing retail and restaurants that feature stunning views of the constructed and natural landscape. Outdoor seating and covered walkways allow for easy transition from indoors to outdoors and with glazed walls, the shops seem to just sprawl outward.

2. The second, third, and fourth floors house the patients visiting the clinic or hospital. Room sizes are varied to allow for flexibility of occupants, ranging from studio rooms to two bedroom suites. The entire tower is flexible in room types as well as the walls are independent of the structure to allow for room growth or even functional change.

3. As the clinic is an extension of the OHSU campus, students will need housing for the extension of the school's curriculum. The tower provides six floors dedicated to student housing. The student housing is differentiated from the patient's temporary floors by the use of balconies and complete building footprint use as the oval projects into the urban plaza for the first time. Student rooms are designed as one bedroom apartments or shared suites for two to four people. All suites are independent of each other, with private baths and kitchenettes. Social spaces are provided on each floor and face north, providing each student with a direct connection to downtown and constant daylight.

4. The final ten floors of the tower offer permanent stay apartments and penthouses for the Portland area. The tower was arranged with hierarchy of stay in mind so all residents of these floors have the best views and greater floor space with extended balconies. The balconies again differentiate this type of housing from the others as they extend out of the oval, creating waves along the building facade.

4 tower
10-19
permanency
4 penthouses [2500 - 4000ft²]
45 two bedrooms [1200 - 1500ft²]
36 one bedrooms [800-1000ft²]

4 tower
4-9
OHSU student
18 singles [720-800ft²]
12 doubles [1000 - 1100ft²]
24 quads [1200-1400ft²]

4 tower
1-3
temporary
3 one bed [400ft²]
3 one bedroom [650ft²]
12 one bed and sleeper [700-850]
3 two bedroom [1100ft²]

fitness gym and lounge
laundry
computer

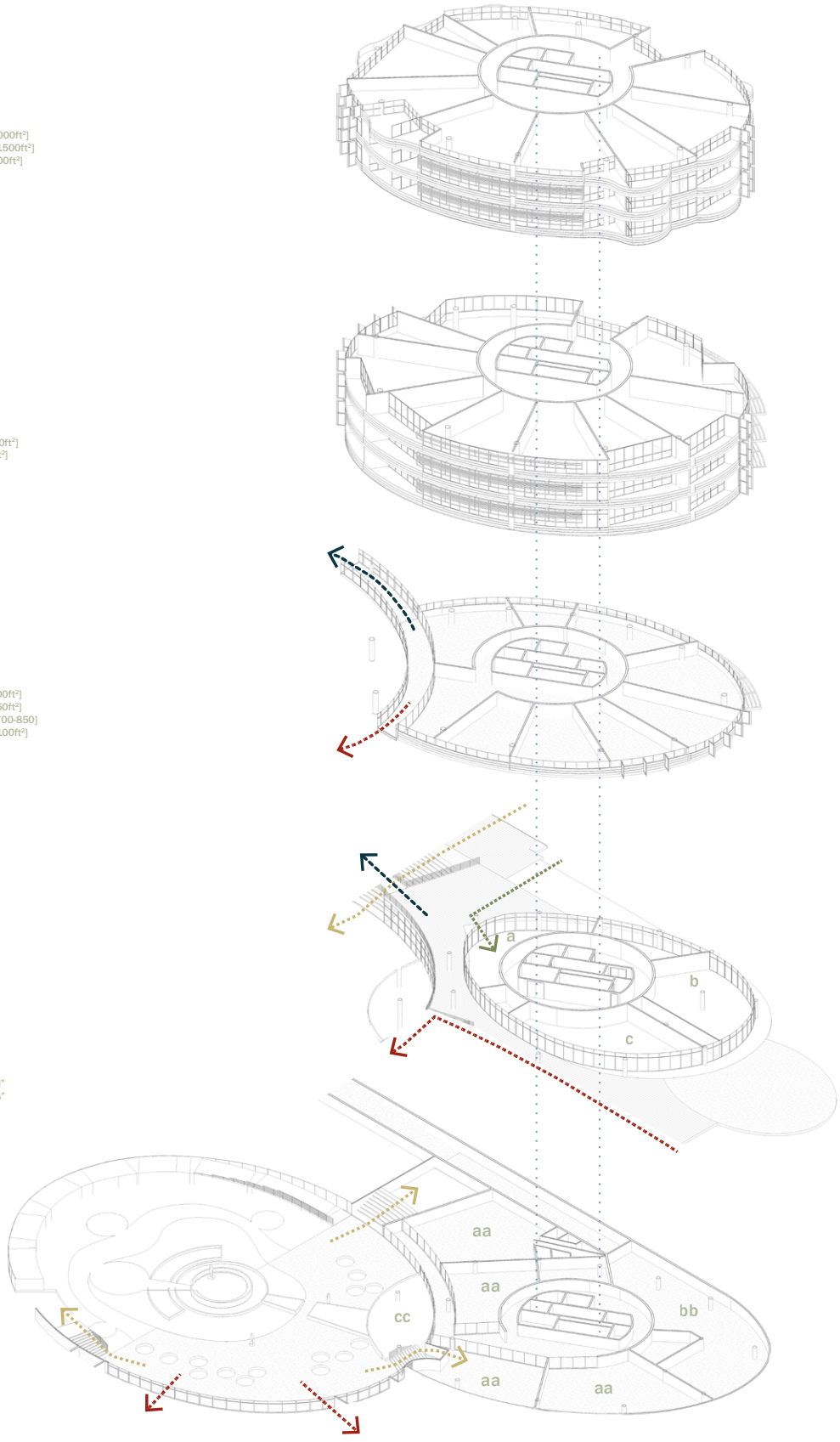
1 public retreat

2 healing center

3 laboratories

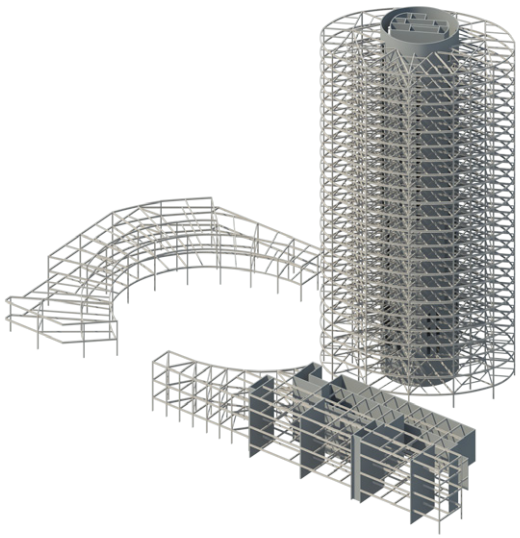
4 tower
0 a_ cafe
b_ restaurant "port OR land"
c_ restaurant "leaf organics"
d_ outdoor dining

4 public retreat
-1 aa_ various retail
bb_ loading dock
cc_ water garden

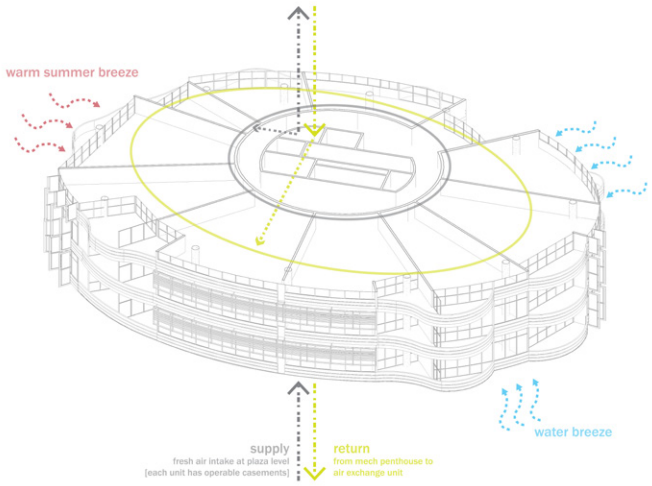


student apartment interior

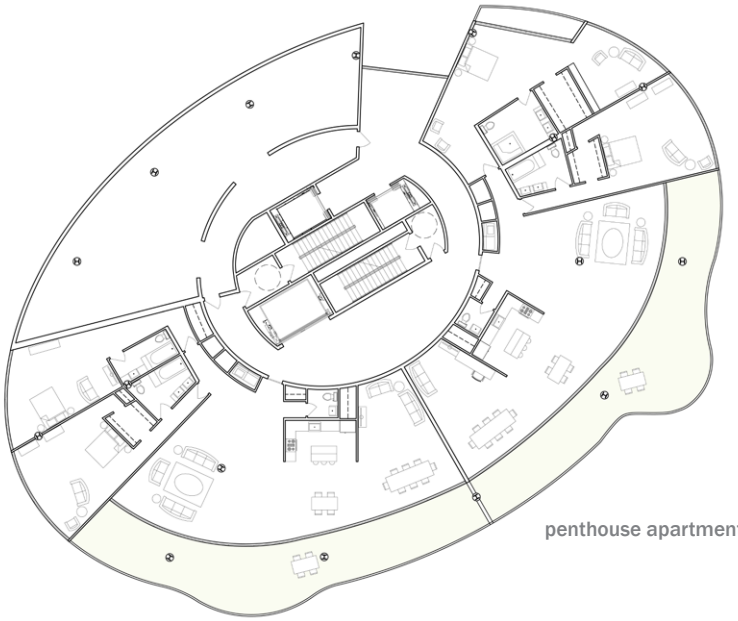
permanent apartment interior



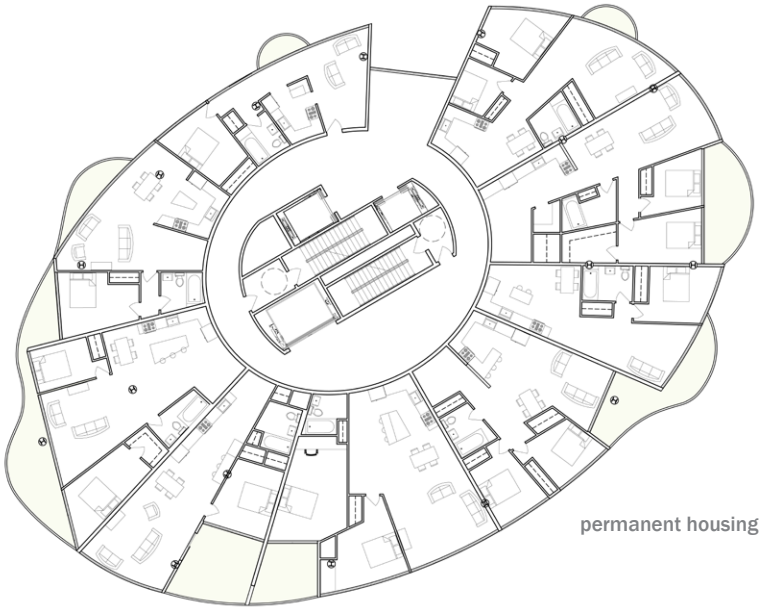
structural diagram



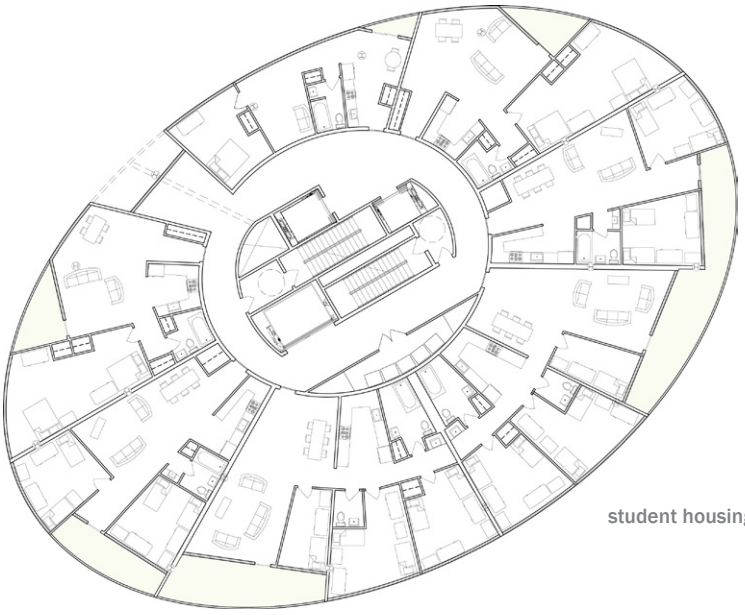
mechanical diagram



penthouse apartments



permanent housing



student housing

Landscape

The landscaping of this project came from a desire to create a building that utilizes the landscaping nearby to derive certain feelings and aesthetics for the project. The landscape design was looked at using two things, the existing landscape of the neighborhood and the planting strategy designated in the SoWa Greenway Design Plan. The former was much more influential upon my site visit, seeing how the existing buildings used landscaping features for proper site maintenance, including water infiltration, species of plants, water harvesting, and softscape/hardscape definition.

Upon visiting the area, it was immediately realized that Portland uses its parks all day, everyday for various activities, whether it be walking a dog, jogging, relaxing, or picnicking. Vegetation was thriving and seemed to be of little maintenance for the city as no irrigation seemed present. For this reason, I felt my concept of weaving a park and landscaping into the buildings seemed viable. Landscaping was integrated at multiple design levels, from masterplan to specific species selection for a healing garden.

The master plan called for only one park on the western edge of the site, removing the park's connection to the greenway that city was planning. This seemed opposite of the desired goal of allowing people to flow from green space to green space, so as stated prior, I created a green belt from the river to the existing park by removing one planned skyscraper and reusing a parking lot to create a green field with a parking structure below. Although not featured in my design primarily, a park was designed in the empty lot to be an extension of my buildings where meditation and healing can freely happen. A similar ellipse scheme was used for the garden design.

The neighborhood provided rich examples of landscape types that could be used to define the project as more than just a building with a few gardens. The examples showcased nature in a beautiful way, whether it be as a buffer for privacy, a bioswale for water infiltration, or a community garden space. All were done with exquisite detail in the sense of materials used that complemented the planting to amplify the beauty of each. Water was a common element also as it provided a sense of serenity and calming that contrasted the height of the towers well. People were seen eating outdoors in plazas, children playing in fountains, people walking in a constructed wetland or along the river path, and they always seemed as it was something special to have nature on your doorstep in a community of high-rises.

Landscaping of this project was used in a variety of ways. Some of the landscaping was done to remove excess water into the ground to reduce the need for sewer systems while others were designed to create a calming meadow amidst buildings on all sides. Some landscaping created private healing gardens while others filtered waste from the buildings in a wetland system. No matter how the landscaping was used, it was all done in a harmonious way to create influential spaces in the project.


crushed gravel path


rocks and grasses


waterfall feature


privacy screen


water as park element

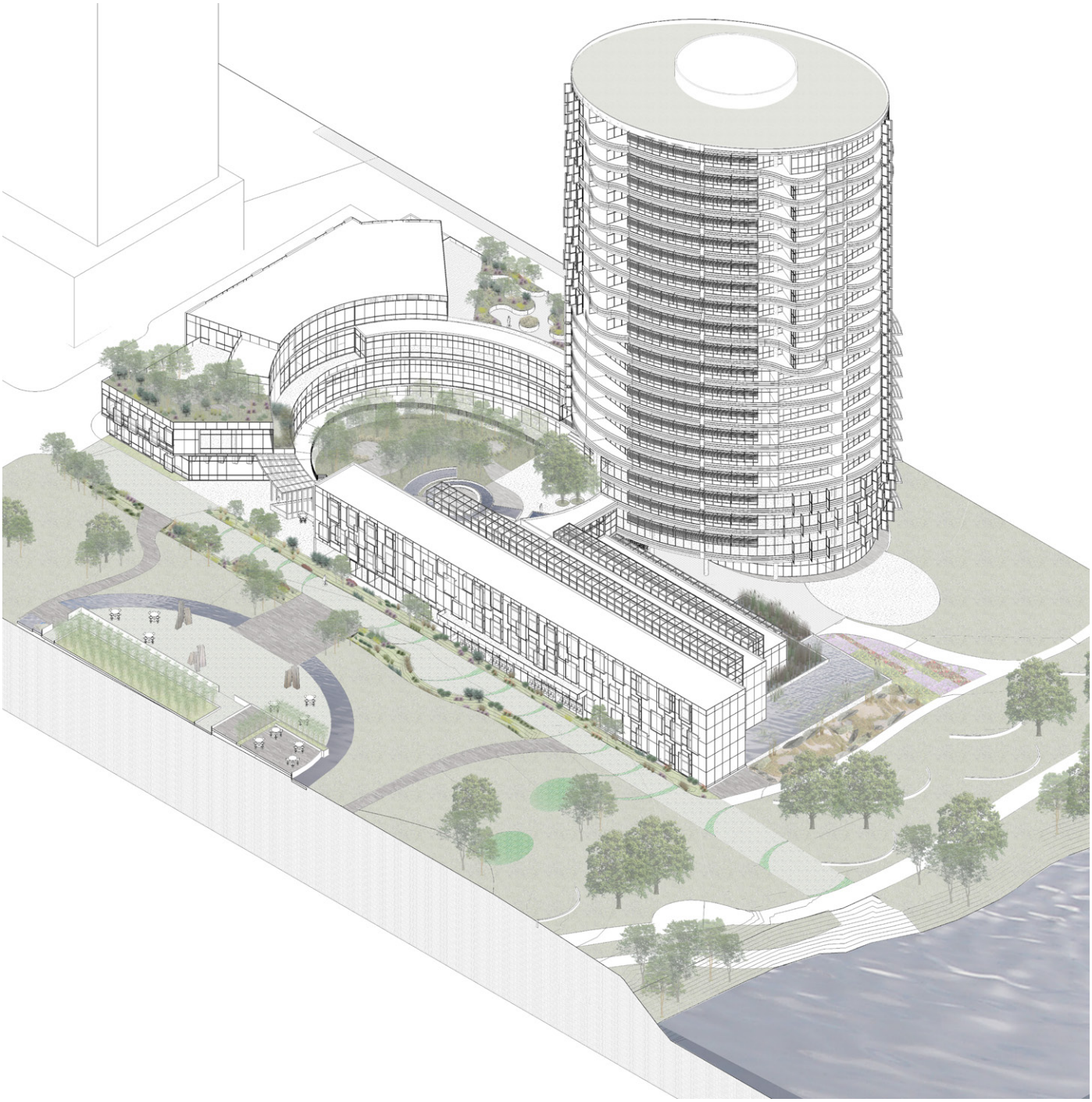

private sitting place


community garden


rain overflow garden


water control wall


constructed wetland



Native Plant Species

Bioswale

- mock orange
- tufted hairgrass
- low oregon grape
- mannagrass
- pacific ninebark

Wetland

- columbia sedge
- wapato
- pondweed
- bur-reed
- cattail

Emergent Foliage

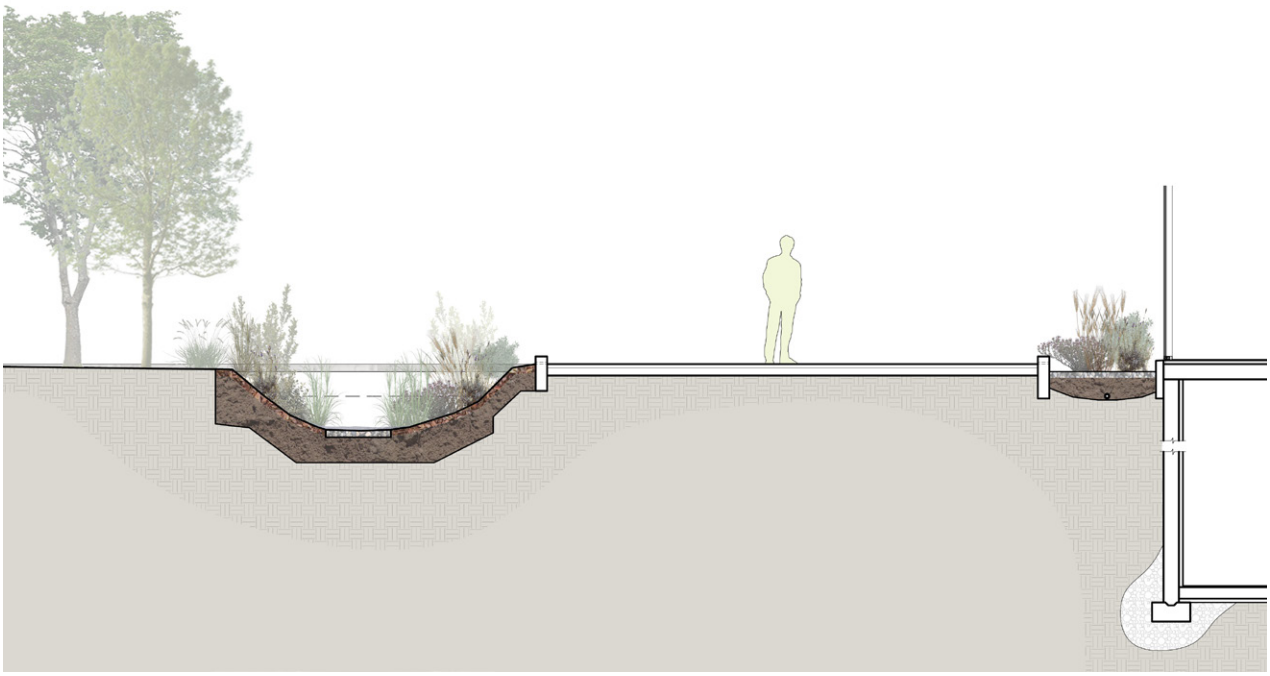
- pentsemon
- fireweed
- oregon stonecrop
- squashberry
- ocean spray

Emergent Foliage

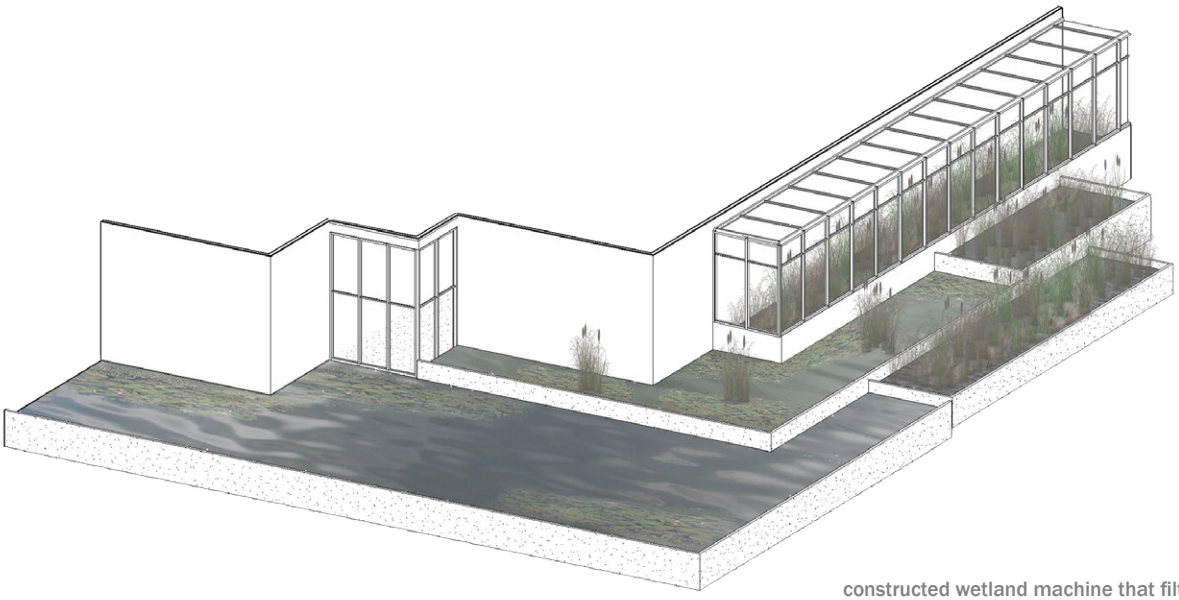
- sitka willow
- oregon white oak
- western white pine
- rocky mountain juniper
- bigleaf maple

Textures

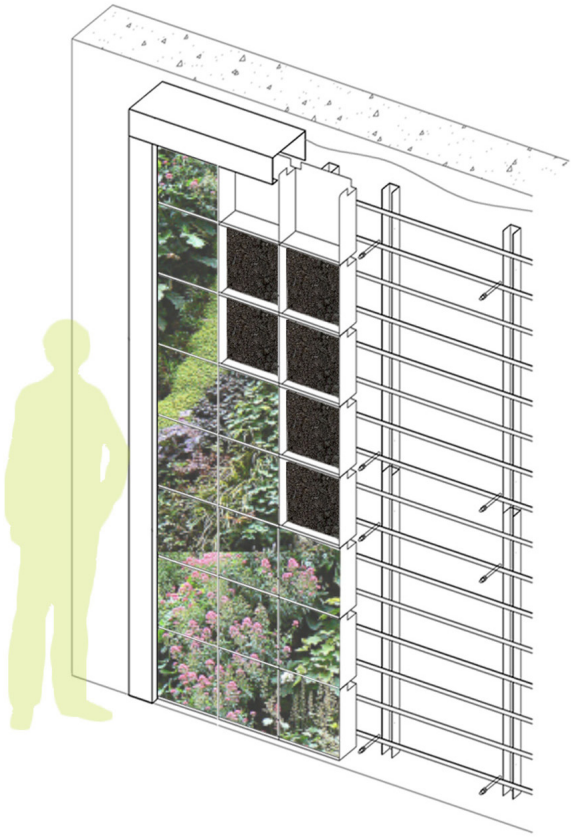
- reclaimed wood pilings
- reused granite blocks
- loose pavers for permeability
- weathered wood - reclaimed
- permeable paving with wild rye grass



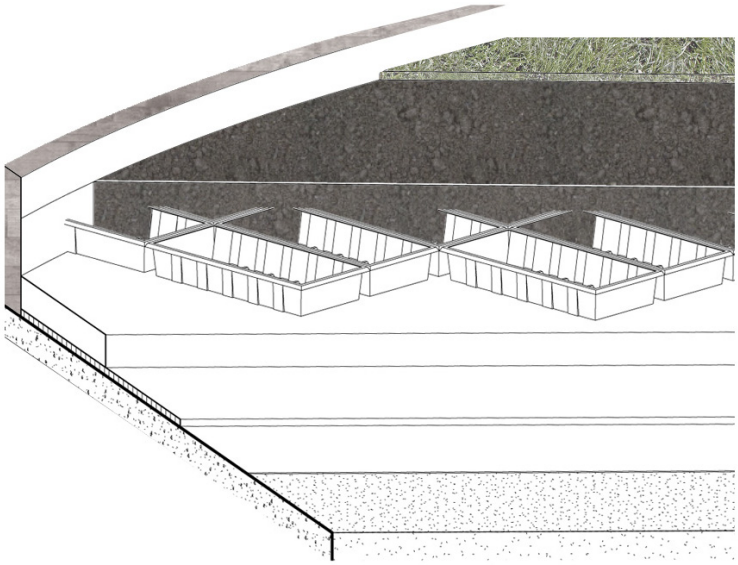
bioswale detail along major entry path adjacent
to the research lab and park space



constructed wetland machine that filters
black and gray water from buildings before
reuse and/or release into the landscape



vegetated wall detail. this wall typology is located on walls of the clinic and research laboratories

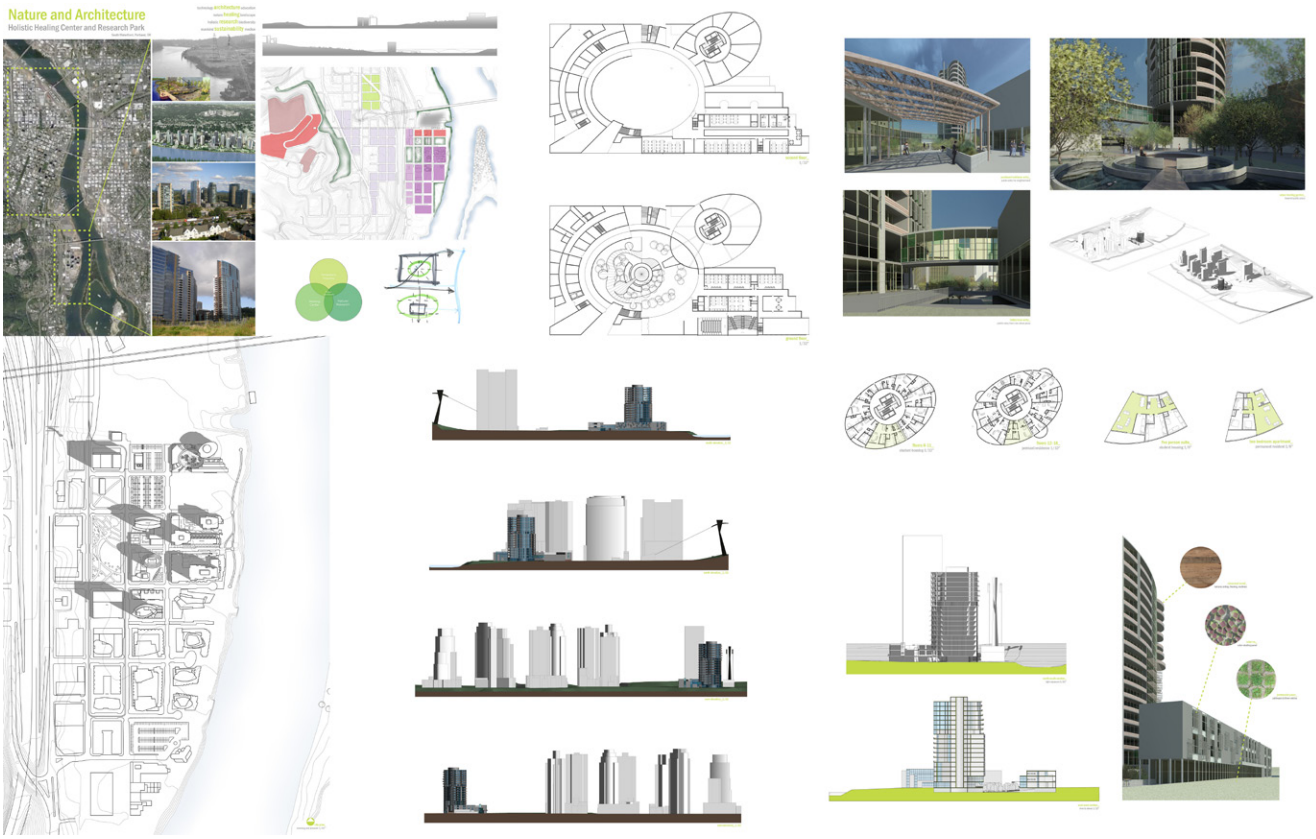


vegetated roof detail. this roof detail occurs on the research laboratories for easy transfer and replacement, as needed for experiments.

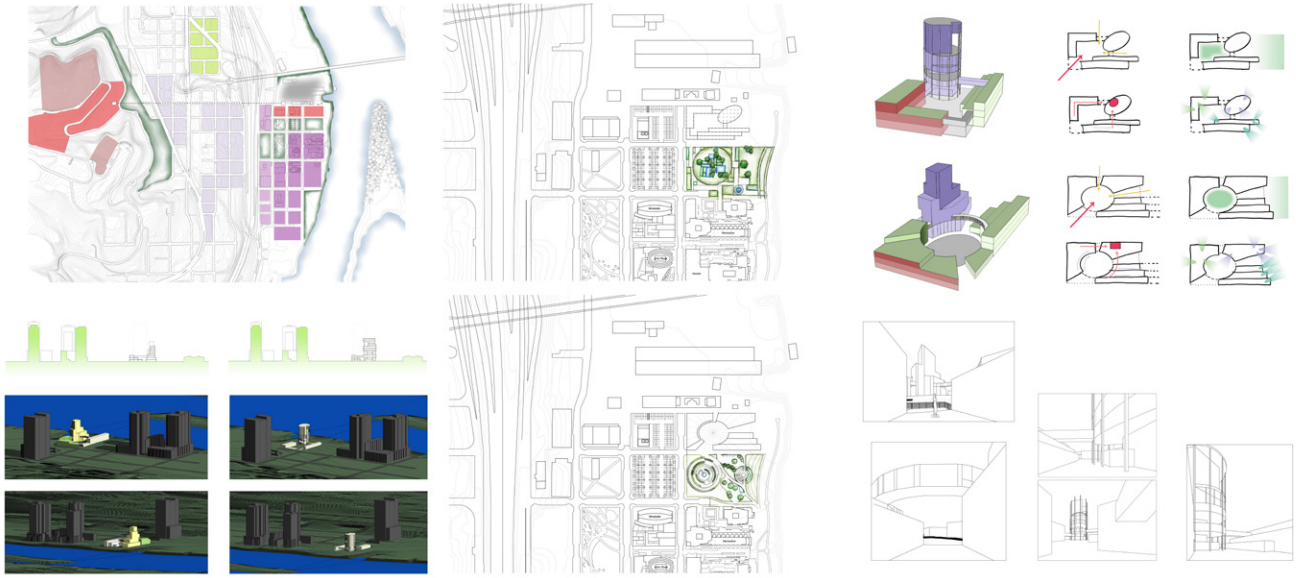
7 Appendix

Final Review Presentation. |Original size: 7' x 18'|

Gate Review Submission. |Half scale of final presentation to date. Original size: 3.5' x 7.5'|



Mid Review Presentation. |Original size: 5' x 8'|



Concept Review Presentation. |Original Size: 4.5' x 8.5'|

Bibliography

"0504 : RUEDA PIZARRO." Main : RUEDA PIZARRO. Accessed May 17, 2011. http://www2.ruedapizarro.es/index.php?/projects/0504/.

"About BRIT." www.brit.org. Accessed May 17, 2011. http://www.brit.org/about.

Adams, Sam. 2010. South Waterfront Design Guidelines and South Waterfront Greenway Design Guidelines. Portland Oregon: Bureau of Planning and Sustainability. Ordinance number 193518. (PDF version of the document downloaded May 9 2011).

Allen, Edward, and Joseph Iano. The Architect's Studio Companion: Rules of Thumb for Preliminary Design. Hoboken, NJ: Wiley, 2007.

"Architecture - Definition and More from the Free Merriam-Webster Dictionary." Dictionary and Thesaurus - Merriam-Webster Online. Accessed May 09, 2011. http://www.merriam-webster.com/dictionary/architecture

Autodesk Weather Tool Analysis. Portland International Airport. March 2011.

Balmori, Diana. *A Landscape Manifesto*. New Haven: Yale University Press, 2010.

Berg, Nate. "Deja Poo: The Living Machine Sewage System." Wired.com. Accessed May 17, 2011. http://www.wired.com/science/planetearth/magazine/17-06/st_sewagegrid.

"Bicycles." City of Portland, Oregon. Accessed May 17, 2011. http://www.portlandonline.com/transportation/index.cfm?c=34772.

Climate Consulant 5.0. Portland International Airport. March 2011.

Ethnicity/Population Map. The NY Times. Mapping America: Every City, Every Block. http://projects.nytimes.com/census/2010/explorer

"Gambling with Your Health (comic)." Independent News on Natural Health, Nutrition and More. Accessed May 16, 2011. http://www.naturalnews.com/025091_health_care_chemotherapy.html.

"Healthcare Center." Nord Architects Copenhagen. Accessed May 17, 2011. http://www.nordarchitects.dk/featured/healthcare-center/.

"Historic Portland." Portland History. Accessed May 16, 2011. http://www.pdxhistory.com/html/historic_portland.html.

Johnson, Marie. 2002. Zoning Code for South Waterfront. Portland Oregon: Bureau of Planning. Publication number 36111. (PDF version of the document downloaded May 9 2011).

"KPDX - Portland International Airport." AirNav. Accessed May 17, 2011. http://www.airnav.com/airport/KPDX.

"LAN - NEUE HAMBURGER TERRASSEN." LAN Architecture. Accessed May 17, 2011. http://www.lan-paris.com/project-neue-hamburger-terrassen.html.

Lee, Evelyn. "Laguna Honda, California's First LEED Certified Hospital." Inhabitat. January 24, 2011. Accessed May 17, 2011. http://inhabitat.com/laguna-honda-is-california's-first-leed-certified-hospital/.

"Maggie's Cancer Caring Centres: What Is a Maggie's Centre." Maggie's Cancer Caring Centres: Home. Accessed May 17, 2011. http://www.maggiescentres.org/about/introduction.html.

McCormick, Kathleen. "Realm of the Senses." *Landscape Architecture.* v85, no. 1 (1995): 60-63.

McDonough, William, and Michael Braungart. *Cradle to Cradle: Remaking the Way We Make Things*. New York: North Point Press, 2002.

"Medical Quackery (comic)." Independent News on Natural Health, Nutrition and More. Accessed May 16, 2011. http://www.naturalnews.com/021638.html.

Mens, Noor, and Cor Wagenaar. *Health Care Architecture in the Netherlands*. Rotterdam: NAI Publishers, 2010.

"National College of Natural Medicine: A Naturopathic School and Classical Chinese Medicine School Located in Portland, OR - NCNM Clinic," National College of Natural Medicine: A Naturopathic School and Classical Chinese Medicine School Located in Portland, OR - NCNM, NCNM Clinic, accessed May 09, 2011, http://www.nm.edu/ncnm-teaching-clinic/ncnm-clinic.php.

Nesbitt, Kate. *Theorizing a New Agenda for Architecture: an Anthology of Architectural Theory*, 1965-1995. New York: Princeton Architectural Press, 1996.

"Portland (city) QuickFacts from the US Census Bureau." State and County QuickFacts. Accessed May 17, 2011. http://quickfacts.census.gov/qfd/states/41/4159000.html.

"Portland International Airport - PDX Airport Information." Cheap Flights, Airline Tickets, Cheap Hotels, Rental Cars & Vacation Packages | LowFares.com. Accessed May 16, 2011. http://www.lowfares.com/airports/pdx-portland-international-airport.

"PortlandMaps Detail Report." PortlandMaps. Accessed May 16, 2011. http://www.portlandmaps.com/detail.cfm?action=Explorer.

"Science-Based Medicine » On the Nature of "alternative" Medicine Cancer Cure Testimonials." Science-Based Medicine. Accessed May 16, 2011. http://www.sciencebasedmedicine.org/?p=10.

"Solar Ivy Interesting Alternative Energy Design." PaulTech Network. Accessed May 17, 2011. http://gopaultech.com/blog/2009/07/solar-ivy-interesting-alternative-energy-design/.

Stephens, Suzanne. "St. Anthony Hospital | ZGF Architects LLP | Gig Harbor, Washington | Building Types Study | Architectural Record." Architecture Design for Architects | Architectural Record. Accessed May 17, 2011. http://archrecord.construction.com/projects/Building_types_study/healthcare/2010/St_Anthony_Hospital.asp.

"South Waterfront » South Waterfront Architecture Series." South Waterfront. Accessed May 16, 2011. http://www.southwaterfront.com/art_and_design/architecture/.

"Sustainable City." City of Portland, Oregon. Accessed May 17, 2011. http://www.portlandonline.com/index.cfm?c=43046.

"USGBC: What LEED Is." USGBC: U.S. Green Building Council. Accessed May 17, 2011. http://www.usgbc.org/DisplayPage.aspx?CMSPageID=1988.

"Walk Score of SW River Parkway Portland Oregon." Get Your Walk Score - A Walkability Score For Any Address. Accessed May 16, 2011. http://www.walkscore.com/score/SW-River-Parkway-Portland.