
PIER 62 | 63
seattle's urban water
an urban stormwater management design to bring people closer to the water...
zerek kroll
photo by: Zerek Kroll

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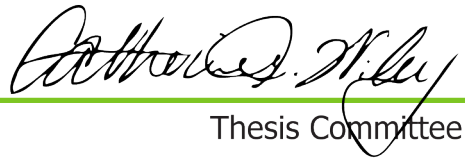
SIGNATURE PAGE

A Design Thesis Submitted to the
Department of Architecture and Landscape
Architecture of North Dakota State University by:

ZEREK KROLL

In Partial Fulfillment of the Requirements for the
Degree of Bachelor of Landscape Architecture

Primary Thesis Advisor



Thesis Committee Chair

May 2012
Fargo, North Dakota

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DATE: 5 / 10 / 2012

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abstract

PROJECT **TYPOLOGY:**

Urban Landscape
Stormwater Management
Waterfront
Landscape Architecture

photo by: Zerek Kroll

001

Problem statment

PROJECT TYPOLOGY

ABSTRACT

The issue of stormwater runoff is a major threat to the water supply of Seattle, Washington. Continual rain and great expanses of impervious surfaces cause contamination and pollution to riddle the waters of the Puget Sound. Millions of people rely on Puget Sound for its natural resources, transportation, and recreation. In developing a design solution for the waterfront areas of downtown Seattle, sustainable stormwater management practices are investigated. Specifically, the relationship between the natural environment, and how it is able to be incorporated into an urban city. Additionally, through sustainable design practices, a solution is established to develop interaction and education among individuals of Seattle.

In order to establish and maintain the integrity of Seattle, the negative impacts in regards to the current stormwater runoff policies and how they contribute to the contamination of Puget Sound, must be defined. From this point the implementation of sustainable stormwater practices can be put in place to promote a standard for a new era of urban waterfront and stormwater design. Contributions of this act will ensure the quality of Puget Sound and the consequences urban runoff illustrates in the future of Seattle.

In finding and researching successful sustainable stormwater practices from around the world, I will be able to develop a design solution addressing the stormwater issue in the City of Seattle. At this point I will implement a working and functional design, as well as a set of city standards for Seattle to apply to new construction and design concepts in the future.

statement

OF INTENT


SEATTLE AQUARIUM

005

PROBLEM STATEMENT

photo by: Zerek Kroll

"How can sustainable stormwater management practices be incorporated into an urban environment while also creating public awareness and involvement?"

PROJECT **TYPOLOGY:**

Urban Design
Sustainable

CLAIM

PROJECT **CLAIM:**

In order to ensure the quality, safety and wellbeing of the natural and built environments around us, urban stormwater needs to treated and diverted correctly with the use of sustainable stormwater management practices. And promote longevity of the ecosystems we rely on.

007

STATEMENT OF INTENT

ACTOR

ACTION

OBJECT ACTED UPON

ACTOR:

Landscape Architect
Community
Urban Designer

ACTION:

Designing sustainable streetscapes that would in return treat and purify stormwater before it flows into the Puget Sound.

THE OBJECT ACTED UPON:

Seattle Urban Streetscapes

premise

PROJECT **PREMISE:**

In the last century, the world's population has increased greatly. In addition, the number of people choosing to move from rural homes into larger cities has escalated greatly. These issues have cultivated a continuous demand for urban sprawl and development. In turn, the immense increase in buildings, sidewalks, roads and other impermeable surfaces has caused an ineffective solution to sustainably managing stormwater.

When it rains, stormwater runs off our streets, rooftops and lawns and saturates our water supply with automobile chemicals, fertilizers and other detrimental pollutants. Ultimately, these contaminants compromise ecosystems, degrade our water quality and jeopardize surrounding wildlife. In order to prevent the destruction of the natural environment, individuals must acknowledge the inefficiency and ineffectiveness of typical stormwater management solutions currently in place. Understanding the importance of sustainable stormwater practices will enable the implementation of designs that are conscious of both human and environmental health.

009

STATEMENT OF INTENT

PROJECT PREMISE

THEORETICAL

UNIFYING

Landscape Architects have an established knowledge of sustainable, environmental responsible stormwater management practices. Their design solutions have a direct impact on the implementation and successfulness of sustainable water treatment. The consequences of a Landscape Architect's work promote environmental stewardship and establish the intrinsic value of our water supply. By carrying out sustainable design methods, Landscape Architects can educate the public in regards to the impact our population has on our natural surroundings and resources. Additionally, executing quality, environmentally conscious designs, creates awareness and relevancy in communities and governments. Through their work, Landscape Architects can take on the roll of an educator, and instill the significance of sustainability in our society. In discussing Re-Representation of Urbanism, Gerdo Aquino, principal Landscape Architect, educator, and author of the book 'Landscape Infrastructure,' said,

"Educate through practice. Landscape Architects, Planners, and Urbanists need built precedents to demonstrate that a more integrated approach to landscape and urbanism is possible. Policy and planning does not spark a collective re-imagination of our future in the way that tangible, built work does."

(King, 2011)

PROJECT **JUSTIFICATION:**

Stormwater management practices are not only a significant factor in the health of the natural environment, but also in the health of cities and communities. The integrity of our limited water supply is directly affected by the choices and daily activities happening in peoples' lives. In Seattle, Washington, the issue of water quality is a continuous concern for the city.

As of 2010, over 608,000 people live in the city of Seattle ("Seattle's population & demographics ," 2012) This means that there are homes, commercial spaces, vehicles, roads, sidewalks, and other hardscapes to accommodate this large population. In terms of rainfall, Seattle ranks number 44 among cities in the United States. Cities like New Orleans, Boston, Houston, San Francisco and even Las Vegas receive more precipitation than Seattle. In fact, the average amount of yearly precipitation is only about 37 inches. However, the rain Seattle receives falls 50 percent of the time. About 65 percent of this rainfall occurs between the months of October and May. Continuous rainfall upon impervious surfaces results in a constant movement and exchange of water in the water supply (Whitman, 2011).

justification

011

STATEMENT OF INTENT

PROJECT PREMISE

THEORETICAL

UNIFYING

Seattle's overabundance of impermeable hardscapes causes a significant deficiency in existing green infrastructure. This makes the city's vast amounts of precipitation unable to be absorbed and filtrated by natural processes. The continuous rainfall prevents the water supply from reestablishing its integrity by filtering out toxins without interception, and the stormwater water flows through streets, down rooftops, and across parking lots, picking up debris and contaminants as it goes. As a result, vehicle runoff, pesticides, fertilizers, chemicals, and other foreign pollutants compromise the water supply. Additionally, prolonged contact with solid surfaces causes stormwater runoff to absorb the heat trapped within outdoor environments. The heated water runoff flows into bodies of water and compromises the balance of fragile ecosystems.

While there are currently some stormwater management solutions that have been implemented and established in Seattle, there are still large areas that do not have any type of stormwater runoff protection in place. Unfortunately, the areas where no management solution is established weaken the effectiveness of the areas practicing stormwater control. For this reason, it is in the best interest for the city of Seattle to create and maintain a city standard that would establish requirements surrounding stormwater management. It would regulate what is expected of downtown property owners in regards to retention and/or diversion of stormwater runoff. In addition, it would set a precedent for new building construction and outline the necessary considerations behind sustainability in water runoff management. The city standard would also develop an investment in instilling a knowledge base regarding stormwater management in the community. Providing the individuals of Seattle with relevant information about how stormwater runoff affects the natural environments surrounding them would establish an important awareness capable of improving stormwater quaility. In addition to citywide standards, the actions of the city's residents could positively counteract the detriments of various types of pollutants and toxins.

PROPO

013

PROJECT PROPOSAL

TITLE PAGE

project

OSAL

project

PROJECT **NARRATIVE:**

Stormwater is referred to as water that runs off the roofs, streets, lawns and other surfaces of a city following the event of a rainfall. As the water drains off these impervious surfaces, it washes off pollutants such as oil, fertilizers, chemicals, pet waste, and trash. Water containing the debris and contaminants of a city end up being deposited in the storm drain system. Ultimately, nearly half of this water drains directly to streams, lakes, or other water bonds ("Stormwater Management Program", 2011). The Environmental Protection Agency (EPA) has determined that stormwater runoff is the main cause of water quality and habitat problems in urban waterways ("Stormwater Program", 2011).

When considering the engineering of stormwater management, often it is viewed as collecting stormwater and simply diverting it to a nearby wetland. However, within an urban infrastructure it is difficult and sometimes impossible to obtain access to a wetland. There have been many implemented alternatives to solving this problem: for instance, boulevard plantings, bio retention swales, and green roof systems. Employing such methods enables the retention and filtration of stormwater runoff on site as opposed to necessitating access to a wetland. In addition, it is important to take into account that the relocation and transfer of stormwater to a wetland can usually be very costly. This process can require pipes and drainage systems, resulting in a compromise in sustainability and aesthetics.

NARRATIVE

Most individuals feel there is an inherent value in the quality of nature that surrounds them. Since the integrity of our water sources directly determines the condition of the surrounding environment, designing sustainable stormwater management practices is essential to promote and maintain the health, safety, and beauty of our natural surroundings. Sustainable design and practices regarding the preservation of nature instills a sense of fulfillment and accomplishment. The ability to create a merger between functional design and aesthetic quality is the goal of landscape architects. The positive consequences stemming from design based around stewardship create value while preserving nature and the environment we live in.

INTRO:

The Sustainable Stormwater Design Standard is intended for use by the City of Seattle, city developers, and designers or engineers practicing design within the city. The City of Seattle will own the standard, but city planners and commissioners must enforce the standard in order to protect the quality of the water supply.

RESIDENTS OF SEATTLE:

Residents of Seattle will be able to enjoy their community by having quality green infrastructure throughout and around their city. These green infrastructures will not only perform the service of cleaning the stormwater runoff of Seattle, but they will also enhance their community by providing them with a clean and healthy environment to call home.

ENVIRONMENTAL ENTHUSIAST:

Enthusiasts of the environment will be able to respect and learn what the city of Seattle has accomplished for its community, natural habitats, and surrounding ecosystems. Environmental enthusiasts will be able to glean a sense of pride by taking an active part in promoting and sharing their knowledge regarding the importance of sustainability.

VISITORS | TOURISTS:

Visitors and tourist of Seattle will be able to enjoy and admire the pristine and beautiful attributes vegetation has introduced throughout the green infrastructure and sustainable design. Also, if the City of Seattle starts protecting habitats surrounding Seattle, visitors will receive the chance to enjoy the unadulterated recreational activities Seattle has to offer.

EDUCATORS:

Educators and students of Landscape Architecture will be able to learn and explore what the city has proposed in regards to stormwater management, and become inspired to design sustainably for the potential of our environment.

USER

CITY OF SEATTLE, WA:

The City of Seattle will have all rights to this document. It will be its responsibility to ensure the protection of the environment by obligating developers and designers to abide by the Sustainable Stormwater Management Standards.

DESIGNERS:

Designers play a crucial role in this process, making certain that potential design solutions are up to the city's standard, and confrontation and setbacks can be avoided. Utilizing an element of environmental consciousness in designs will promote a greener, more sustainable practice within the city of Seattle.

DEVELOPERS:

It is necessary for developers to ensure they implement this standard when introducing a new development or building. As a result, it can be guaranteed that the proposed solutions in regards to sustainability will be executed properly to ensure the runoff from these developments can be cleaned.

C L I E N T

018

PROJECT PROPOSAL

MAJOR PROJECT ELEMENTS
STREETS AND SIDEWALKS
STROMWATER MANAGEMENT AREAS

MAJOR

STREETS AND SIDEWALKS:

In regards to city streets and sidewalks, the Sustainable Stormwater Management Standard I will be creating is comprised of several sustainable water retention techniques. Bioswales and urban planters will intercept stormwater runoff and allow it to be filtered before returning back into the water cycle.

STORMWATER MANAGEMENT AREAS:

The stormwater management areas I will be designing are located throughout the site in downtown Seattle. They will utilize stormwater retention by slowing down the flow of runoff and filtering the water through plants while providing aestical value type vegetation within the city. In addition, the design will educate individuals by incorporating an element of interaction.

ELEMENTS

WATERFRONT:

The site I have chosen is located along the waterfront of downtown Seattle and the shoreline of Puget Sound. This area is directly affected by stormwater runoff issues. When designing for this area I combine the concern of stormwater runoff with intent to educate the public about the sustainability of water management. With a park, boulevards, waterfront, and medians, the area will look appealing to the public eye and still be a sustainable, functional design that treats and filters stormwater runoff from the city.

GREENWAYS | GREEN INFRASTRUCTURE:

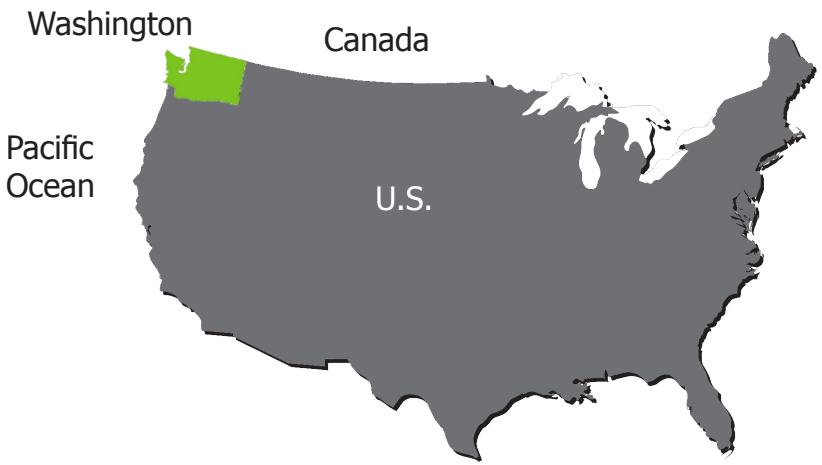
These greenways will be linear vegetation buffers that connect my site to the rest of the community. The greenways will treat stormwater while providing an enjoyable, living, green space serving as an aesthetically pleasing walkway for individuals.

020

PROJECT PROPOSAL

SITE INENTORY

SEATTLE, WASHINGTON



("Blank outline maps of the united states" 2011)

(Schubach, 2011)

("Seattle," 2011)

REGION:

The region for this project is located on the West Coast in the state of Washington. Bordering this state to the west is the Pacific Ocean, while north of the state is British Columbia, south is Oregon, and east is Idaho.

021

PROJECT PROPOSAL
SITE INVENTORY
SEATTLE, WASHINGTON

context map

PIER 62 | 63

SITE:

The location of my site can be found in the northwest quadrant of Washington in the city of Seattle. This city is found along the shoreline of the Puget Sound. This iconic body of water defines western Washington, but it is also a fragile ecosystem threatened by human activity.

022

PROJECT PROPOSAL

PROJECT EMPHASIS

023

PROJECT PROPOSAL

PROJECT EMPHASIS

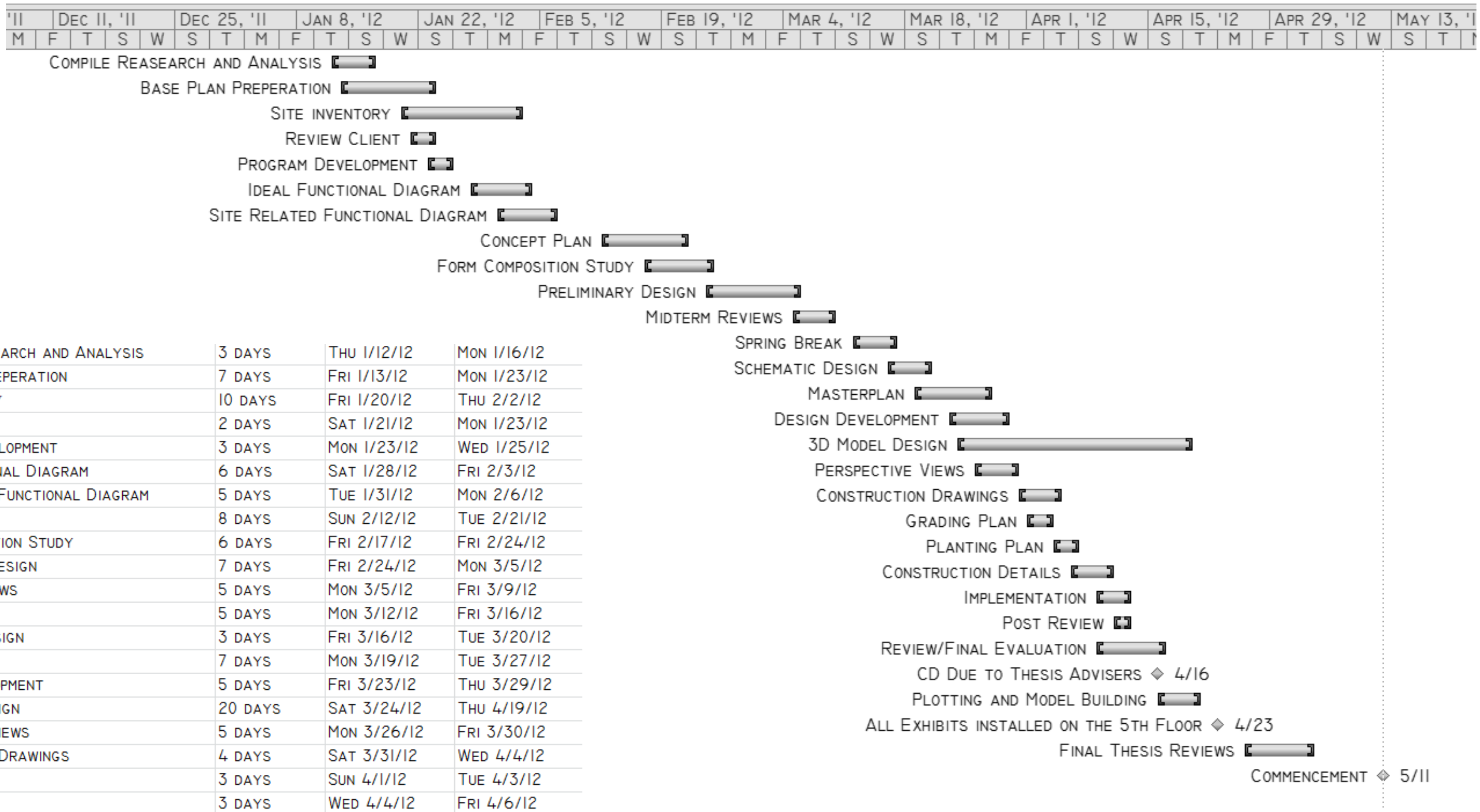
(SETIAWAN, 2007)

PROJECT EMPHASIS:

This thesis will evaluate the urban areas of Seattle, Washington, and current stormwater management practices that are in place. In this city the issue of stormwater runoff is a constant and unrelenting issue. This is largely due to the population density and the vast amount of impervious surfaces that are in place in order to accommodate the lives of so many individuals. In an urban setting, it requires more ingenuity and creativity to incorporate elements of the living environment in order to harness their natural processes and benefits. Through the implementation of nature in urban environments, problems of contaminated stormwater runoff will be addressed, and components of sustainability will be incorporated into the design solution. In addition, the newly developed urban area must create a seamless merger between nature and city life. If successful, the proposed solution will create a symbiotic relationship between a community and nature while educating the public on the topic of sustainability and watershed management. Green infrastructure reinforces sustainable stormwater management practices and minimizes the impact populations have on our water supply. By implementing sustainable stormwater practices, we are minimizing and avoiding the foundation of polluted stormwater. In addition, reducing environmental impacts on our local watersheds can lead to attaining greater synchronization with the water cycle in the watershed and potentially reducing municipal water pollution.

PROJECT PROPOSAL

PLAN FOR PROCEEDING



Compile Reasearch and Analysis	3 days	Thu 1/12/12	Mon 1/16/12
Base Plan Preperation	7 days	Fri 1/13/12	Mon 1/23/12
Site inventory	10 days	Fri 1/20/12	Thu 2/2/12
Review Client	2 days	Sat 1/21/12	Mon 1/23/12
Program Development	3 days	Mon 1/23/12	Wed 1/25/12
Ideal Functional Diagram	6 days	Sat 1/28/12	Fri 2/3/12
Site Related Functional Diagram	5 days	Tue 1/31/12	Mon 2/6/12
Concept Plan	8 days	Sun 2/12/12	Tue 2/21/12
Form Composition Study	6 days	Fri 2/17/12	Fri 2/24/12
Preliminary Design	7 days	Fri 2/24/12	Mon 3/5/12
Midterm Reviews	5 days	Mon 3/5/12	Fri 3/9/12
Spring Break	5 days	Mon 3/12/12	Fri 3/16/12
Schematic Design	3 days	Fri 3/16/12	Tue 3/20/12
Masterplan	7 days	Mon 3/19/12	Tue 3/27/12
Design Development	5 days	Fri 3/23/12	Thu 3/29/12
3D Model Design	20 days	Sat 3/24/12	Thu 4/19/12
Perspective Views	5 days	Mon 3/26/12	Fri 3/30/12
Construction Drawings	4 days	Sat 3/31/12	Wed 4/4/12
Grading Plan	3 days	Sun 4/1/12	Tue 4/3/12
Planting Plan	3 days	Wed 4/4/12	Fri 4/6/12
Construction Details	3 days	Fri 4/6/12	Tue 4/10/12
Implementation	4 days	Mon 4/9/12	Thu 4/12/12
Post Review	2 days	Wed 4/11/12	Thu 4/12/12
Review/Final Evaluation	6 days	Mon 4/9/12	Mon 4/16/12
CD Due to Thesis Advisers	0 days	Mon 4/16/12	Mon 4/16/12
Plotting and Model Building	5 days	Mon 4/16/12	Fri 4/20/12
All Exhibits installed on the 5th Floor	0 days	Mon 4/23/12	Mon 4/23/12
Final Thesis Reviews	6 days	Thu 4/26/12	Thu 5/3/12
Commencement	0 days	Fri 5/11/12	Fri 5/11/12

2ND YEAR

Kathleen Pepple
Intro to Landscape Architecture Studio
Teahouse and Garden- Fargo, ND
Halvorson Park- Battle Lake, MN

Mark Lindquist
Parks and Open Spaces Studio
Cold Smoke: Shelter For Winter Smokers- Fargo, ND
William Marshall Park Project- Winnipeg, MA
NP Avenue Streetscape Project- Fargo, ND
Pedestrian Flow- Fargo, ND

3RD YEAR

Stevie Famulari
Environmental Art and Site Design Studio
Defiant Gardens- Fargo, ND
Environmental Art Installation Project and Master Plan - Regent, ND

Kathleen Pepple/ Jay Kost
Community Design Studio
Roosevelt Neighborhood Master Plan and Urban Development- Fargo, ND
UTTC Technical College Master Plan- Bismarck, ND

4TH YEAR

Jay Kost/ Niki Carlson
Urban Design Studio
Duluth Urban Development and Master Plan - Duluth, MN
St. Mary's Park and Storm Water Retention Area- Duluth, MN

Stevie Famulari
Environmental Remediation and Plant Design Studio
Phytoremidiation and Wetland Development for Interstate 29 - Harrwood, ND

5TH YEAR

Catherine Wiley
Environmental Planning Studio
Red River Valley Flood Mitigation- Red River Valley, MN ND SD

progra

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027

PROGRAM DOCUMENT

RESEARCH
CASE STUDIES
HISTORICAL CONTEXT
SITE ANALYSIS

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MENT

INTRO

RESEARCH

Water is the material basis of man's relationship with his environment. It is the essential key to all living beings. Water creates a delicate link between humanity and the water supply of the earth. Water is in a state of permanent exchange in relation to warmth, climate, air, soil and gravity. Growth, metabolic change, and vital functions are inconceivable without water. As a resource, water sustains forests, provides a habitat for abundant fish and wildlife populations, and makes life possible for billions of humans. On Earth, water may seem to be an abundant resource, but in reality, less than one percent is drinkable by humans ("Statistics: Graphs and Maps," 2011). Additionally, the drastic growth of the world's population has radically altered the natural systems that help to manage rainfall through transpiration, infiltration, and gradual runoff into surface waters. This issue has led to disasters from poor water quality to flooding, severe erosion, and even droughts. Inconsistencies in water availability, quality, and quantity would significantly influence not only the natural environment, but also the lifestyles of people all over the world.

Water is continually being recycled through a process called the hydraulic cycle. Water is stored in lakes, rivers, oceans, and other bodies of water until it evaporates back into the atmosphere. From here, water falls in the form of precipitation, supplying virtually all of the Earth's freshwater supply ("Natural processes of ground-water and surface-water interaction: The hydrologic cycle and interactions of ground water and surface water." 2008). When precipitation lands on the Earth's surface, some of the water is absorbed into the ground and directed to the underground water table. The water that isn't absorbed flows across the landscape until it is able to be stored in a body of water. This concept is known as stormwater runoff.

DUCTION

RESEARCH

When precipitation falls in cities or urban environments, the natural processes of the hydraulic system are compromised in a variety of ways. Rain falls upon the city's sealed impermeable surfaces, such as roofs, streets, or parking lots. Instead of being absorbed into the ground, the water is forced to flow across hardscapes and into drains until it reaches a body of water for storage. This water has been returned back into the hydraulic system with little or no filtration to maintain a level of water quality. As stormwater runoff in cities becomes a part of the hydraulic cycle, the quality of the water becomes adulterated. These issues stem from the impacts and activities of the human impact population. The solution to his dilemma lies in comprehensive stormwater management, which offers tremendous rewards to local economies, the environment, and quality of life ("Why," 2012). The purpose of managing stormwater is to reduce the risks to the safety and health of the water in our ecosystem. Rather than directing rainfall into the general sewage system, it is more sensible, financially and ecologically, to keep it on the ground where it fell and direct it back into the natural water cycle by means of evaporation or infiltration (Axel, 2008). By eliminating areas where water is discarded and replacing them with a green infrastructure, we can increase the usability of the landscape and promote a level of quality within our water system.

Today, stormwater management has moved past engineered, industrial solutions and has taken on a more natural approach. Most commonly known as green infrastructure, these approaches of stormwater management would be proposed as environmentally sustainable, economically feasible, socially relatable, and ecologically enhanced. Green infrastructure is understood to moderate runoff and filtrate the water, with the use of plants, soil, wetlands, and open space. Green infrastructure reinforces sustainable stormwater management practices and minimizes the impact populations have on our water supply. By implementing sustainable stormwater practices, we are minimizing and avoiding the foundation of polluted stormwater. In addition, reducing environmental impacts on our local watersheds can lead to attaining greater synchronization with the water cycle in the watershed and potentially reducing municipal water pollution.

SO

SOCIAL GAINS OF STORMWATER:

As human beings, we are magnetically attracted to water. Throughout history, pools, ponds, lakes, streams, and fountains have been indispensable ornamental elements in gardens, and more recently the presence of water has been essential to gardens that aim to attract and provide pleasure for people (Rain gardens, 2007). Naturally, humans are drawn to interact with one another. Green infrastructure utilizing stormwater management has the ability to provide a space of interest and social gathering for the city of Seattle.

Throughout history, water has ensured survival and symbolized life. Water projects are perhaps so desirable because they express a profound longing for life in all its vigor (Waterscapes: Planning, building,, 2001). Water is not just a vital element of our lives; depending on the circumstances the motion of water can symbolize different moods, ideas, and feelings. For instance, possessing an accumulation of water indicates a sense of richness wealth. It can communicate the feelings of tranquility, refreshment, or liveliness.

cial

SOCIAL GAINS OF STORMWATER:

Another benefit water can provide is through the ambience it is able to infuse throughout a space. The resonance of organically flowing water would be beneficial by attracting patrons that are looking for a relaxing environment. The calming sound of naturally flowing water can prove to be relaxing and therapeutic. In a big city such as Seattle, stressful atmospheres are prone to happen. By having areas that would be relaxing, rejuvenating, and lessen stress levels would not only be beneficial to the landscape but to the individual as well. Accoding to the book Waterscapes: Planning, building, and designing with water, "Sound is nature's most delightful way to herald the presence of water. The mellow rumble of the ocean, out of site beyond sand dunes or the gentle gurgle of a trout stream foretells what is ahead" (Waterscapes: Planning, building,, 2001). When developing green infrastructure throughout the city you are in return producing areas for social interaction. By having a clean and healthy watershed in return, you are offering recreational opportunities. By having activities for city residents, one promotes a healthy lifestyle for people and can be favorable to the regional economies. Recreation and parks would generate collective relationships between the residents and build public health while establishing a sense of community.

ECONOMICAL BENEFITS OF STORMWATER:

Annually, Seattle and the State of Washington spent over $100 per resident on stormwater projects (Visitacion, Booth & Steineman, 2009). With the rising cost of living and the scrutiny of the economic world we live in today, it is hard for stormwater management to become a priority for building costs. Prices for water and sewage services have risen considerably, even more than the cost of living in recent years. Additionally, new sustainable water culture will not get any cheaper (Waterscapes: Planning, building,, 2001). Harnessing the various attributes of stormwater management can prove to be advantageous to individuals in communities in various economic ways. Additionally, cleaning polluted water can promote positive values for everyone by ensuring a safe and healthy water supply. The cost for a modern-day water treatment plant is expensive. Purifying water from various contaminants can amount to a notable expense to cities and tax payers that is notas necessary. By most estimates, the nationwide value of these essential "ecosystem services" runs into billions of dollars a year ("Ecosystem services," 2012). By having the landscape provide the service of cleansing stormwater it not only purifies our water, also provides healthy ecosystems which we live off of. When these landscapes are capable of providing public services in addition to maintaining their own homeostasis, a sense of endearing resilience is instilled throughout the community.

E C O N O M I C

ECONOMICAL BENEFITS OF STORMWATER:

Financially, utilizing natural systems to treat stormwater has many advantages. A wetland or a stormwater management area can not only treat wastes, also reduce flooding while improving habitat and aquatic species. By diminishing stormwater runoff, we can avoid expensive investments in water treatment. This in return would concentrate better stormwater treatment on human and commercial waste to protect our new stormwater management methods. Also by having individuals saving money by implementing Best Management Practices (or BMPs) and replacing pipes, basins, and other infrastructure, they minimize cost by not having land clearing and grading cost, and by using less land than traditional basins do. ("For the economy," 2012).

When developing stormwater management areas throughout the city, the public in return, embed a green infrastructure into the cityscape. Creating this amenity for the community, one enhances the value of the landscape throughout downtown Seattle. Stormwater creates many valuable elements to citizens by instilling value in the landscape. Throughout history, water in a landscape has always seemed to assess value to the site. Creating stormwater management practices, in return, would add a type of entertainment to an individual as well. Wetlands can provide a source of substantial economic benefits to neighboring communities due to their large numbers of visitors (France, 2003).

ENVIRONMENTAL BENEFITS OF TREATING STORMWATER

Seattle is vulnerable to frequent rain showers making the development of stormwater management a necessity. Sustainable stormwater management has many environmental benefits, such as helping provide a clean habitat, reducing energy use and pollution.

Earth is often called "The Water Planet" because oceans cover 71% of its surface. Of all the water on Earth, only 2.7% is fresh water—and of that, most is frozen in glaciers and ice caps. Less than one half of one percent of all of the world's water is fresh water thats actually available for living things to use. Its no wonder that water quality is a constant concern or that the negative impacts of stormwater have become such a big deal (To improve water quaility, 2012).

Maintaining a clean environment means taking measures to preventing pollution. Stormwater management practices can help reduce the water pollution Seattle forces on to Puget Sound. Many people move to Seattle because of the beautiful natural environment the state of Washington has to offer. The water quality in Puget Sound is an outcome of natural habitat in the watershed.

ENVIRONMENTAL BENEFITS OF TREATING STORMWATER

Thirty years ago, it seemed like treating stormwater was not even a consideration. Today, most of the professional field not only uses stormwater management practices because it's the right thing to do, but also most of the time city governments have ordinances or standards that enforce it. When stormwater gets directed into our rivers, streams, and lakes without getting properly treated, it can be very detrimental to our wildlife and our ecosystem. It affects areas that we not only live off of but areas that we love and enjoying when doing recreational or any outdoor activity.

Stormwater management would have miraculous benefits for our environment in an ecological manner. By implementing stormwater management practices one establishes a process that first slows down the flow of the water and treats it in a wetland of basin. Accoding to Stormwater PA, a community online resource to help treat stormwater, they state that by reducing imperviousness and maintaining wetlands, grasslands, and other vegetated areas helps buffer the effects of stormwater runoff. Plants, roots, soil, and leaf litter trap sediments, debris, and particulates that would otherwise make their way into waterways. Trees and other plants act as water filters by absorbing nutrients and other dissolved impurities through their roots and converting them into plant tissue, which helps maintain healthy aquatic ecosystems for wildlife, recreation, and aesthetic enjoyment (Ecosystem services, 2012).

Filtration of pollutants is a major ecological benefit of any site located near a large body of water. A stormwater management program located around or near a watershed corridor can protect the ecosystem of that watershed as well as the quality of water that we potentially use.

ECONOMICAL BENEFITS OF STORMWATER:

With the projected increase of urban development in the Puget Sound region, a corresponding decrease in natural drainage will occur, leading to greater amounts of stormwater flowing into vital receiving waters. As a result, the Washington State Pollution Control Hearing Board has recently directed the Washington State Department of Ecology to implement low impact development in its National Pollution Discharge Elimination System permit requirements. This directive has created an opportunity for new policies and mitigation strategies to be developed within local jurisdictions (Churchill, 2010).

Humans are inescapably dependent on their ecological resources. Communities need to be developing and implementing stormwater management practices to start saving their ecosystems and to help set a model for individuals and other neighborhoods around the world. If we don't do something soon we could very much loose something we take for granted.

RESEARCH CONCLUSION

From my research, I have determined that stormwater management is best achieved through utilizing the natural processes of the environment. Sustainable stormwater management strives to achieve a standard for water quality while maintaining an economically viable approach to the stormwater management issues in the city of Seattle. It develops and designs the landscape to naturally slow, filter and absorbs the water into the ground. Sustainable stormwater management is capable of reducing pollution, bringing down the water runoff volume, decrease the temperature of stormwater, help protect wildlife and increase the aesthetics by creating a more interesting landscape for individuals to enjoy. In order to be successful in implementing stormwater management techniques, we must treat stormwater on our site before it is too late and we need to do it downstream.

photo by: Zerek Kroll

(Perry, 2005)

GREEN STREET

PORTLAND, OR

Green Street is a landscaped infiltration boulevard that collects stormwater run-off from the street and allows water to be filtered back through the soil. These Green Street projects demonstrate different methods to treat stormwater run-off in an urban environment. These 12 inch curbcut channels properly collect the stormwater from the street, treat it on-site using vegetation in the public right of way, and then release it back into the storm drain. Green Streets are acknowledged as an important in-flow control strategy to address combined overflows, backups, and other imperfections as well as watershed health needs. These planters are designed to handle approximately 8,000 square feet of stormwater run-off.

Depending on the amount of rain, water flows along the curb and enters into the first planter. The stormwater will then pond to a depth of 6 inches. If flows exceed this capacity, the stormwater will continue to flow downhill from planter to planter until all the planters are full. This process will continue until the stormwater planters exceeds their maximum intake capacity and excess water is discharged into the storm drain.

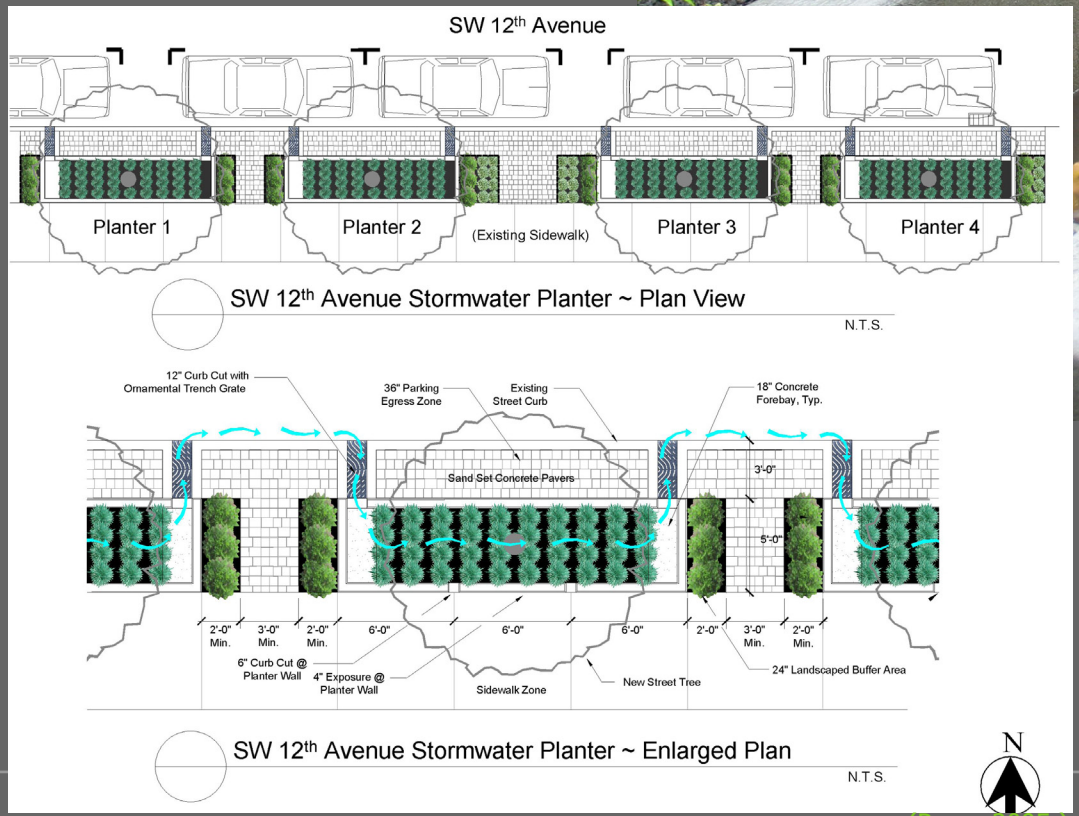
Many jurisdictions have implemented new stormwater resources on education and public outreach to offer awareness and promote stormwater management. Many cities are planning more vegetation-based approaches or are replacing regular pipe drainage ("Sw 12th avenue,").

("Sw 12th avenue," 2006)

CASE STUDY

039
CASE STUDIES
GREEN STREETS

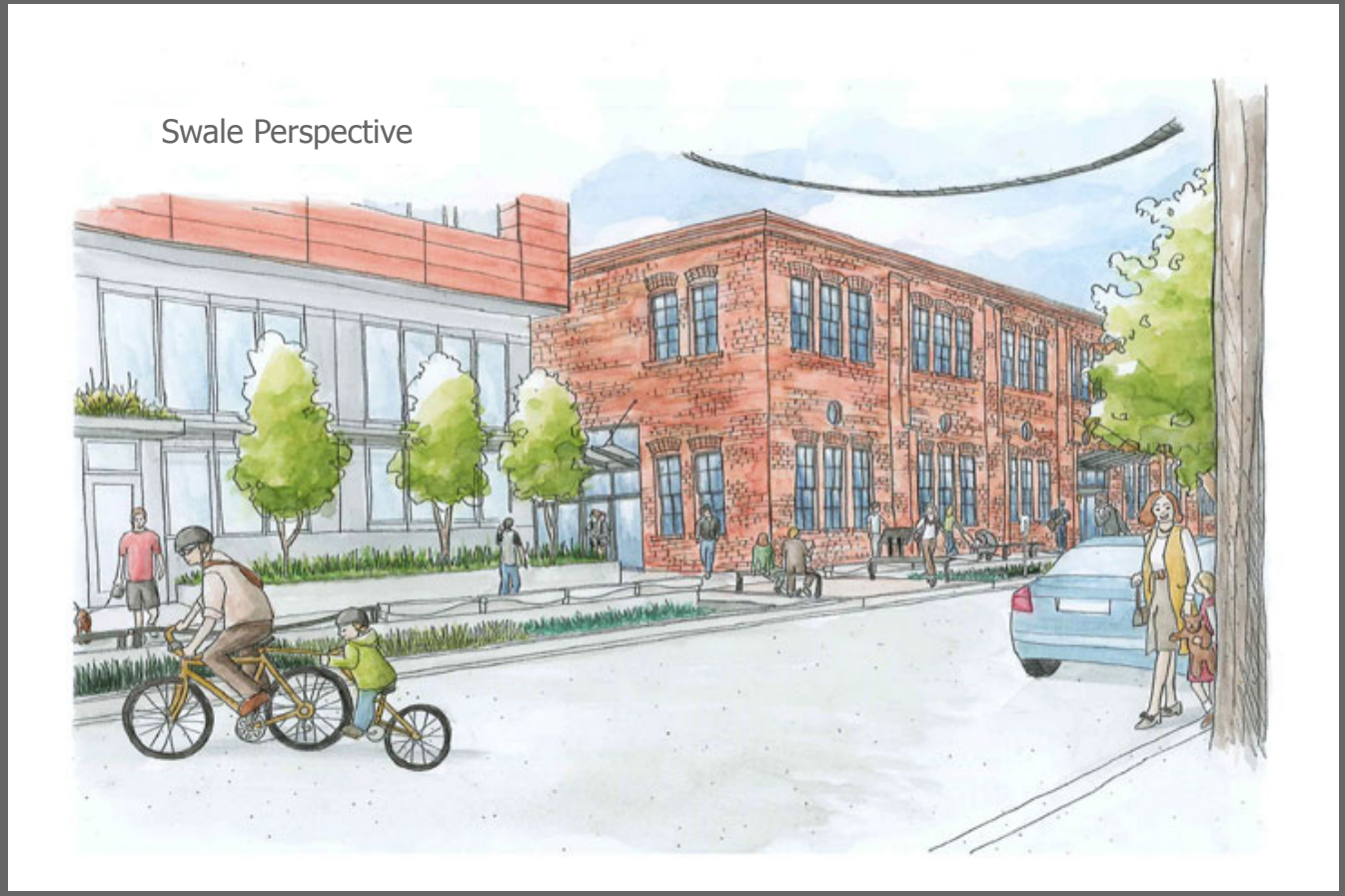
(Perry, 2005)



(Perry, 2005)

GREEN STREETS:

Project Type: Stormwater Rain Garden
Location: SW 12th and Montgomery, Portland, OR (near Portland State University)



Perspective sketch of how the proposed swale looks along Yale Ave N with the current (3/2011) design for the proposed future development. ("Swales on yale," 2011)

SWALES ON YALE:

Project Type: Stormwater Swale
Location: Capitol Hill into Lake Union, Seattle, WA

SWALES ON YALE

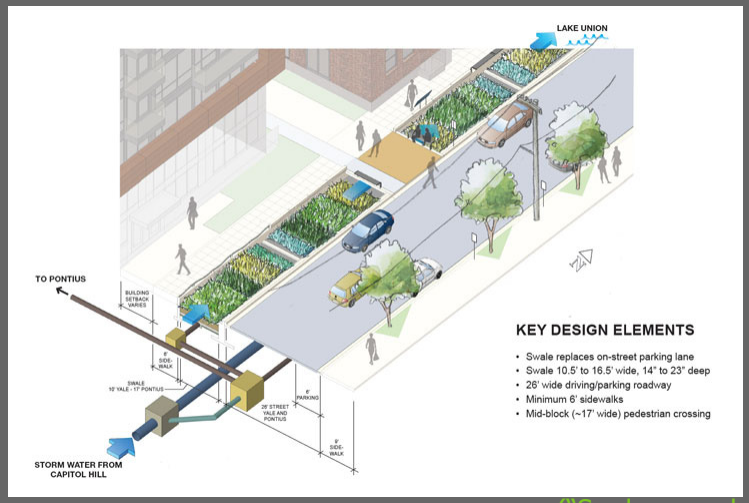
SEATTLE, WA

The Swales on Yale applies Natural Drainage Systems techniques to redeveloping a high-density commercial area north of downtown Seattle, Washington, called Capitol Hill. Capitol Hill is a highly populated and developed area, with lengthy paved surfaces. This project will treat an average of 190 million gallons of stormwater annually flowing from Capitol Hill into Lake Union, greatly reducing the amount of pollution. Presently, stormwater flows across the streets of upper Capitol Hill, collecting silts, oils, heavy metals, and other pollutants before being piped downhill and into the lake. As a result, pollutants flow downhill over solid surfaces and do not infiltrate naturally into the ground. Ultimately, the inability for water to be absorbed into the ground causes the compromise of the water supply. During a rainstorm, untreated stormwater from more than 630 acres of Capitol Hill drains directly into Lake Union. Intercepting the stormwater runoff and slowing down the flow by diverting it into swales would permit the opportunity for pollutants to filter out beforehand.

The Swales on Yale has been developed to treat the greatest amount of stormwater in the area. Each block will be able to take absorb runoff from more than 50 acres of the Capitol Hill watershed. These naturalistic, biofiltration "swales" are designed to slow the stormwater flow and remove pollutants before they reach the lake. This process allows for infiltration into the earth and protects the integrity of Lake Union

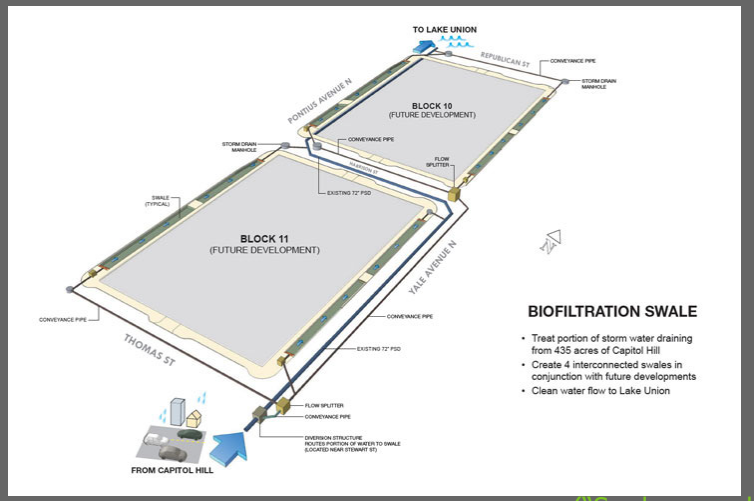
Conclusion

By implementing methods of stormwater management, one can be inspired to implement, promote, and develop for the potential future. By utilizing the technologies of stormwater management we have today, we can create a new standard for landscape architects to follow and promote for the world of tomorrow in a sustainable way ("Swales on yale," 2011).



("Swales on yale," 2011)

"Bird's Eye View" of the biofiltration swale on Yale Ave N, showing the stormwater piping that will take a portion of the Capitol Hill stormwater and carry it to the swales to cleanse the water.



("Swales on yale," 2011)

Overview of the four biofiltration swales on Yale Ave N and Pontius Ave N with the underground piping system that carry the flow from the main pipe to the swales.

("North park square,")

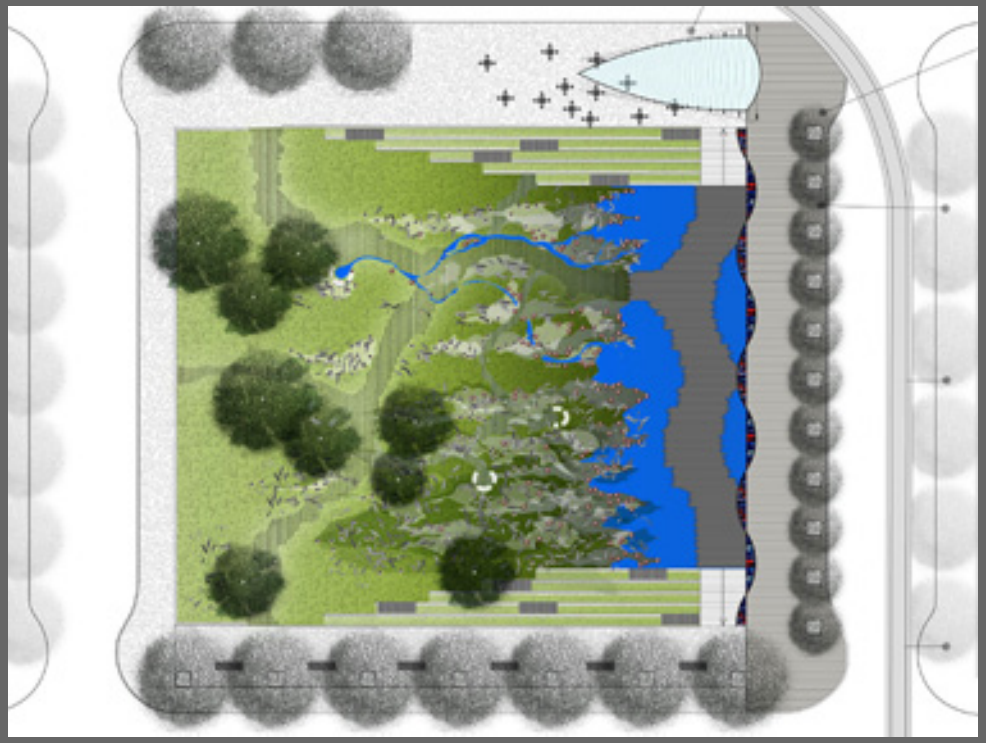
TANNER SPRINGS PARK:

Project Type: Stormwater Park/ Green infrastructure
Location: Pearl District, Portland, Oregon
Landscape Architect: Atelier Dreiseitl and Greenworks P.C

TANNER SPRINGS PARK:
PORTLAND, OR

This park sits on a .92-acre city block and is an interconnected establishment of green spaces. What was once a wetland and lake fed by streams, is now an urban infrastructure of vegetated paths in a walkable community. Tanner Springs extends through downtown Portland, and creates a strong relationship between the industrial and residential communities.

A sense of tranquility saturates this wetland-based park. A feeling of peace is communicated throughout the park, giving it a significant presence in the community. Tanner Springs Park is not a park where are goes to play; it serves as a space for quiet reflection where one can retreat in order to take time away from the world and its demands. The relaxing atmosphere is largely attributed to the processes of stormwater management in the area. Water runoff in the area is directed to Tanner Springs Park where it is filtered through the dense vegetation that establishes the park. Then traveling through the natural filtration system, the water is redistributed into the Willamette River though an underground pipe system ("Tanner springs park," 2003).



("Tanner springs park,")

TANNER SPRINGS PARK

PORTLAND, OR

Conclusion

Tanner Springs Park creates a successful connection between individuals with the use of stormwater management. This park creates an opportunity to promote awareness of sustainability and encourage individuals to embrace the natural processes of stormwater filtration. This park enables individuals to see the importance behind sustainable stormwater management practices through a serene and beautiful environment. The quality of stormwater from urban runoff can ultimately influence individuals in a spiritual way. Tanner Springs is an example of how sustainable stormwater management practices can be powerful methods of relieving stress in chaotic environments.

(Miller , 2010)

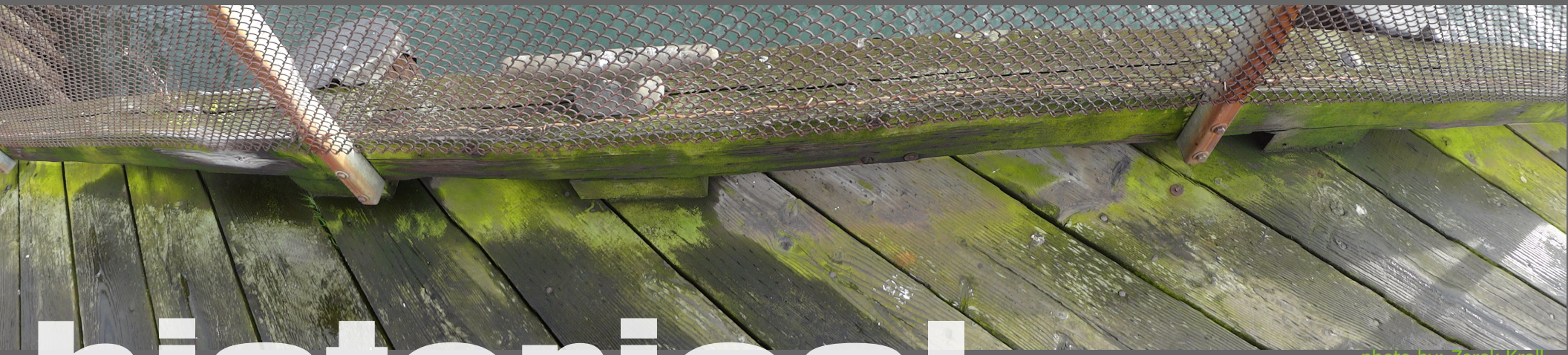


photo by: Zerek Kroll

historical CONTEXT

HISTORICAL CONTEXT

SEATTLE, WA
Water Issues

Seattle lies on a narrow strip of land between the salt waters of Puget Sound and the fresh waters of Lake Washington. Beyond these bodies of water lie two rugged mountain ranges, the Olympics to the west and the Cascades to the east. Seattle is a city built on hills and surrounded by water. With a mild marine climate, prolific vegetation and abundant natural resources thrive.

Throughout history, Seattle has maintained a long-lasting relationship with water. Seattle was founded in 1852, most of the shoreline around Puget Sound consisted of tide flats and steep bluffs. This proved to be beneficial for the local economy because it meant there was deep water nearby the shore which proved to provide good fishing spots.

In early Seattle, abundant forests lead to much of the town being built from wood. This is a significant contributing factor in the fire of 1889. The fire destroyed vast amounts of the town, clearing out 66 blocks of buildings. As they rebuilt, the reality of the fire forced the city of Seattle to address some necessary changes in the foundation of their city. The city decided to re-grade the roads of the town due to the steep slopes of the mountains. In some areas, transportation routes were so steep that often times, people could not even ride their horses up the road. The project to grade the street involved filling in the ravines, beveling off the tops of bluffs, and building up the bases of the surrounding hills. At the same time, it was a priority to make the grade high enough to resolve issues with flooding and stormwater. As Seattle slowly started building up its network of roads, business owners became increasingly impatient and decided to start rebuilding their businesses. However, these over-eager business owners did not know how high the new streets would be built, and how that would affect their storefronts. As the city's grading progressed, so did the business owners' construction. By the project's completion, it was realized that they had businesses with the first floor ten feet lower than the surface of the road.

ACADEMIC:

My academic goals for this project are to display a beneficial and knowledgeable understanding in regards to the environment and social interaction of sustainable stormwater management in urban landscapes. This will be initiated by exploring and understanding sustainable stormwater practices in urban communities and developing conclusions on what systems succeeded. In developing this document, I am composing a publication that comprehensively summarizes my thoughts, ideas, and research so that they may be available to educate and inspire individuals in their own endeavors.

PERSONAL:

My personal goals for this publication examine, explore, and present new expertise and proficiency in landscape architecture. Through developing this document I will be able to understand, implement, and design, using skills I have acquired in my education. I will strive to portray my accomplishments as valuable and relevant to the professional field, so it will help assist me in my future career in, landscape architecture.

PROFESSIONAL:

My professional goals for this project are to accomplish a complete thesis publication which can motivate and inspire professionals in the landscape architecture field. Setting a standard of quality will encourage others to accept the responsibilities of their design, in regards to sustainable stormwater management. The product of this thesis documentation must consist of professional patterns to model sustainable stormwater management practices with the use and recognition of the professional practice of landscape architecture.

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GOALS

ACADEMIC

PERSONAL

PROFESSIONAL

photo by: Zerek Kroll

G O A L S

photo by: Zerek Kroll

SITE ANA

049

SITE ANALYSIS

SEATTLE, WA

photo by: Zerek Kroll

ALYSIS

Introduction

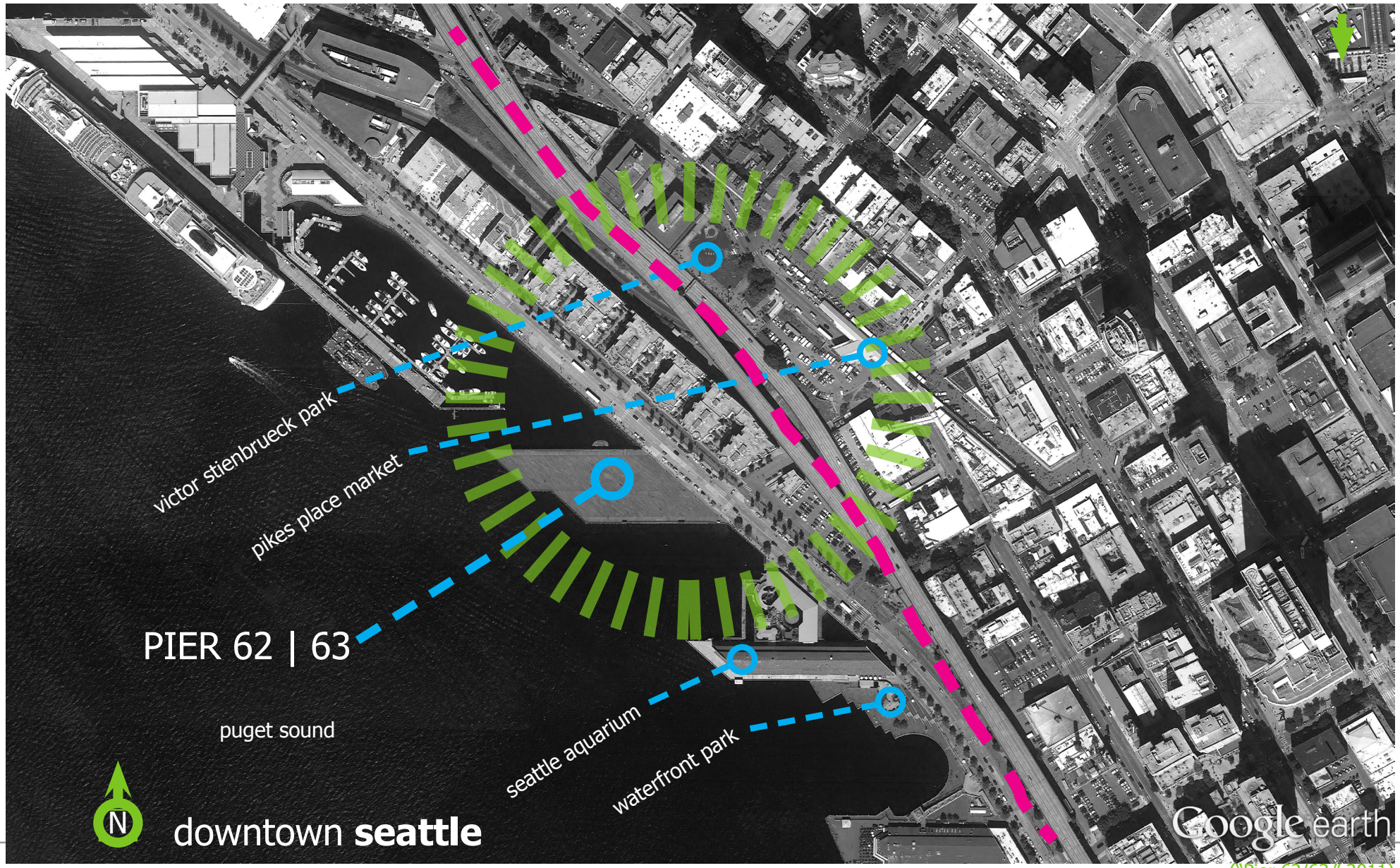
photo by: Zerek Kroll

PIER 62 | 63

INTRO:

Pier 62/63 was voted the number one favorite peir in Seattle according to the city. I believe this is because of its great views of puget sound and also the Seattle skyline. It is an empty flat surfaced pier with rough wood planks. It is a traditional pier that needs an upgrade.

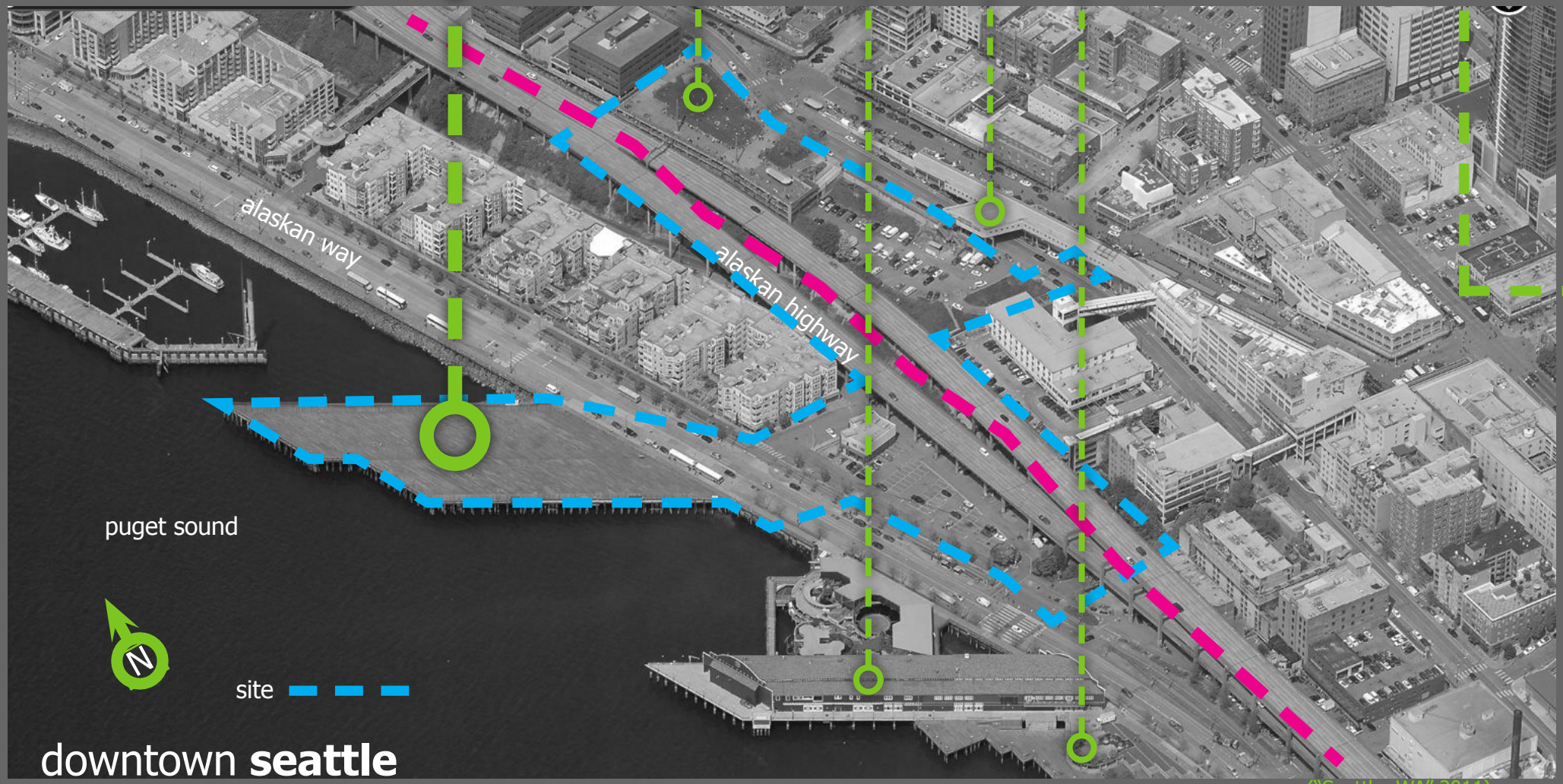
CONTEXT



("Pier 62/63," 2011)

CONTEXT

PIER 62 | 63



("Seattle, WA" 2011)

053

SITE ANALYSIS

SEATTLE, WA

photo by: Zerek Kroll

Seattle's continuous rainfall prevents the water supply from reestablishing its integrity by filtering out toxins without interception, the stormwater water flows through streets, down rooftops, and across parking lots, picking up debris and contaminants as it goes.

+

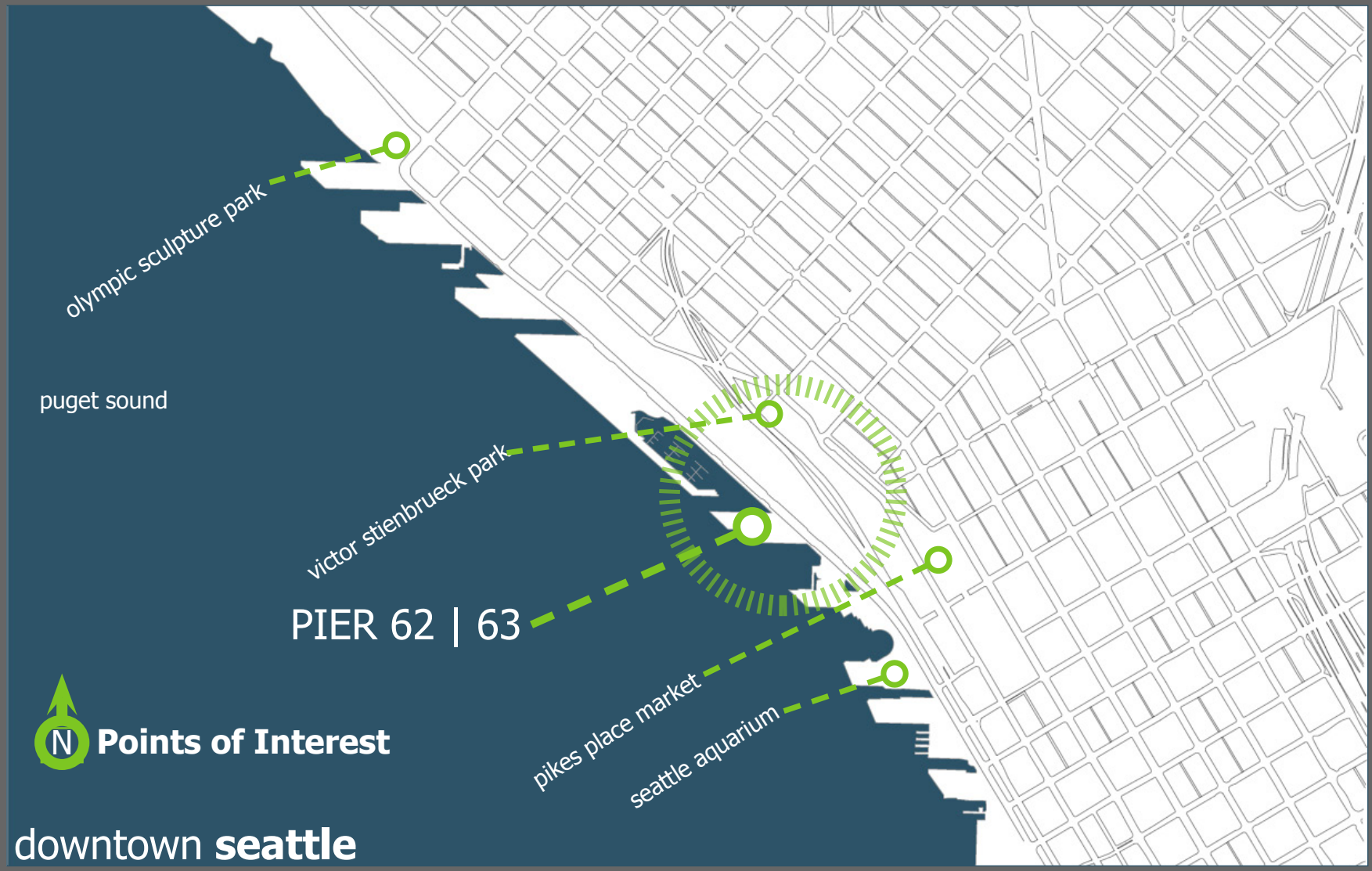
Seattle's over abundance of impermeable hardscapes cause a significant deficiency in existing green infrastructure. This makes the city's vast amounts of precipitation unable to be absorbed and filtrated by natural processes.

=

STORMWATER. foreign pollutants compromise the water supply.

photo by: Zerek Kroll

Points of **interest**



Transportation

downtown **seattle**

SITE ANALYSIS

SEATTLE, WA

photos by: Zerek Kroll

facing north toward pier 62/63

facing northwest on pier 62/63

facing north on pier 62/63

facing south east toward pier 62/63

057

SITE ANALYSIS

SEATTLE, WA

facing north toward victor stienbrueck park

facing east toward pikes place market

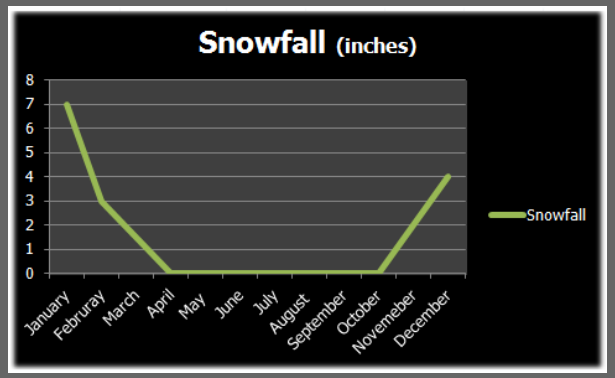
facing south at victor stienbrueck park toward the Seattle aquarium

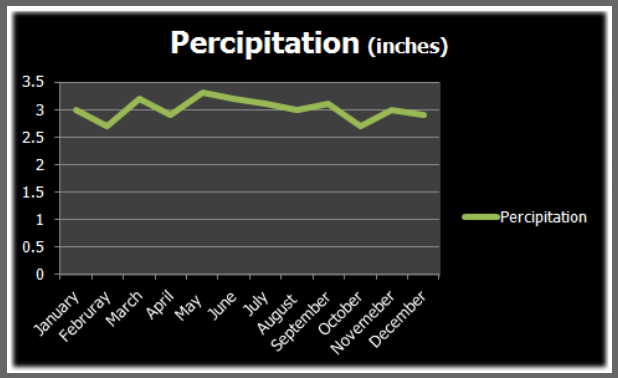
facing north underneath the alaskan highway

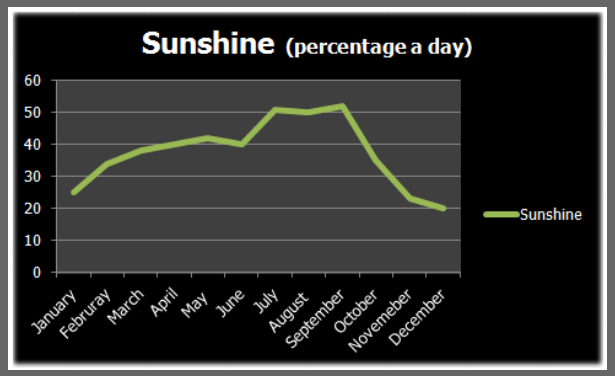
photos by: Zerek Kroll

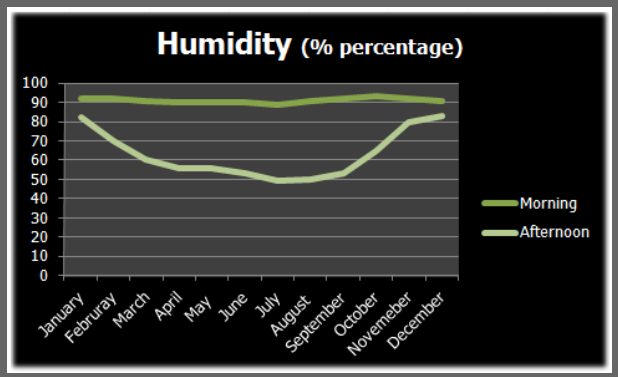
weather:

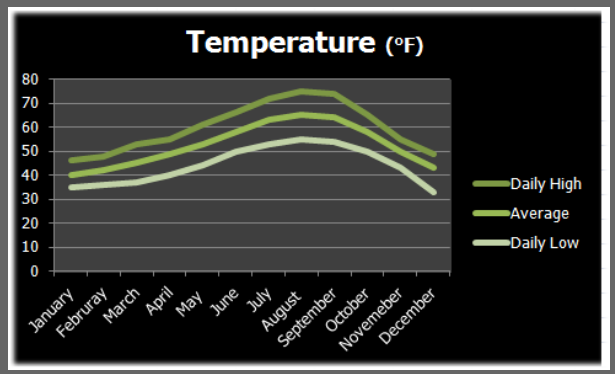
Here displayed are the yearly weather reports of Seattle. As you can see this area has a high percipatation and high humidity levels with in return produces large amount of rainfall.

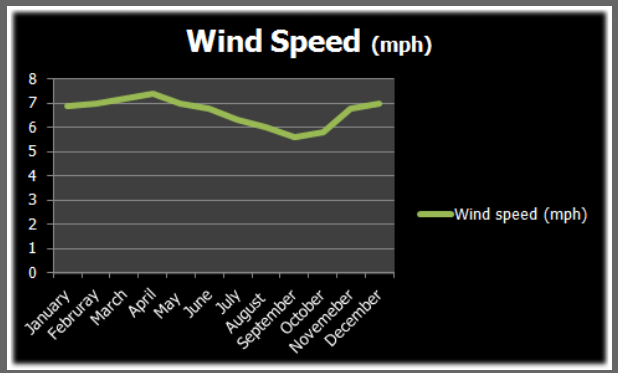












("Seattle, washington," 2011)

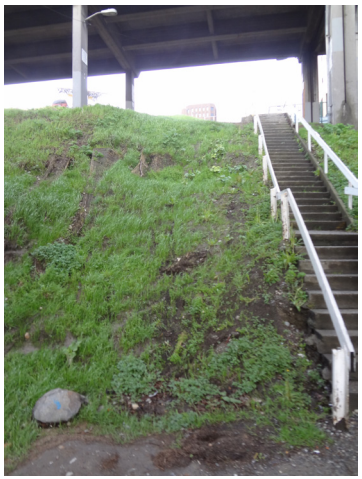
Park systems:

Here listed below are a list of all of the Park systems structures located throughout Seattle. This will give you an idea of what Seattle has and what it needs.

Park System Structures

24	Community centers
10	Swimming pools (including 2 outdoor), 27 wading pools
1	Waterfront aquarium
1	Zoo: 90 acres, 45 major exhibits and buildings
1	Stadium
1	Indoor tennis center (10 indoor courts and 4 outdoor courts)
151	Outdoor tennis courts (71 with lights)
185	Athletic fields
33	Playfields
5	Golf courses, including pitch/putt (449 acres)
2	Boating and sailing centers
4	Nature interpretive centers (Carkeek Park, Seward Park, Discovery Park, and Camp Long)
6	Performing and visual art facilities
7	Historic buildings
90	Comfort stations
16	Residences and cabins
80	Picnic shelters and houses
12	Concession facilities
24	Administrative offi ces and headquarters
2	Museums
4	Amphitheaters
52	Miscellaneous facilities (including storage, maintenance, warehouses, chapel, visitor centers, beach/bath facilities, a rifl e/pistol range and a police horse patrol barn, viewpoints and nature trails)

("City of seattle," 2011)



photos by: Zerek Kroll

contour drop:

With a major contour drop going through my site it cuts off downtown Seattle with the waterfront of puget sound.

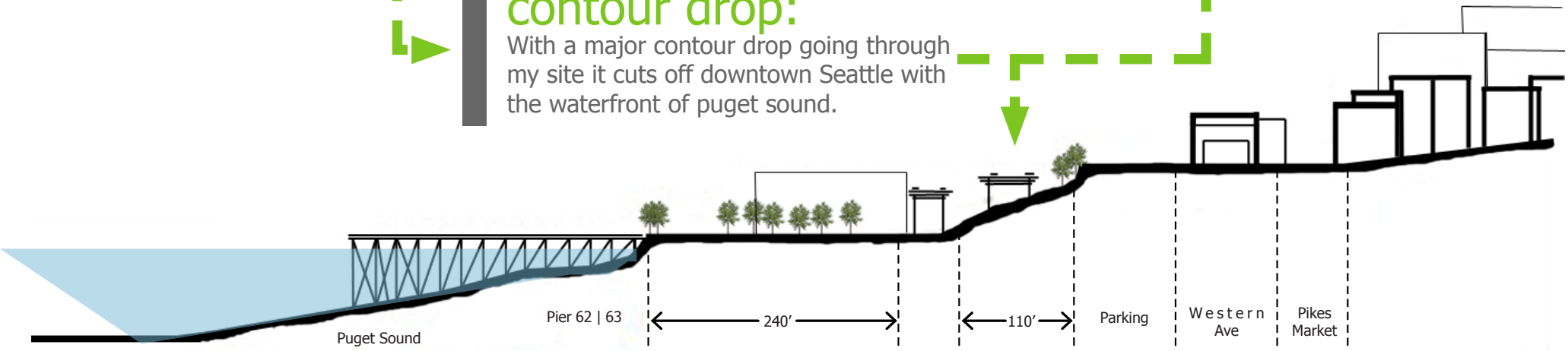


photo by: Zerek Kroll

Highway

As you can see by the diagram on the right the flow of the city is haulted by the Alaskan Viaduct highway. This causes a big disconnect from the city to the waterfront. The only way down to the waterfront as small stair ways that are out dated, non inviting and hidden in some cases.

photo by: Zerek Kroll

Elevations

This diagram on the left give you an idea of the different elevations that are involved here on my site. As you can see just from pier 62/63 to Pikes place Market there is close to an 80' Ft. difference in elevation.

photo by: Zerek Kroll

Erosion

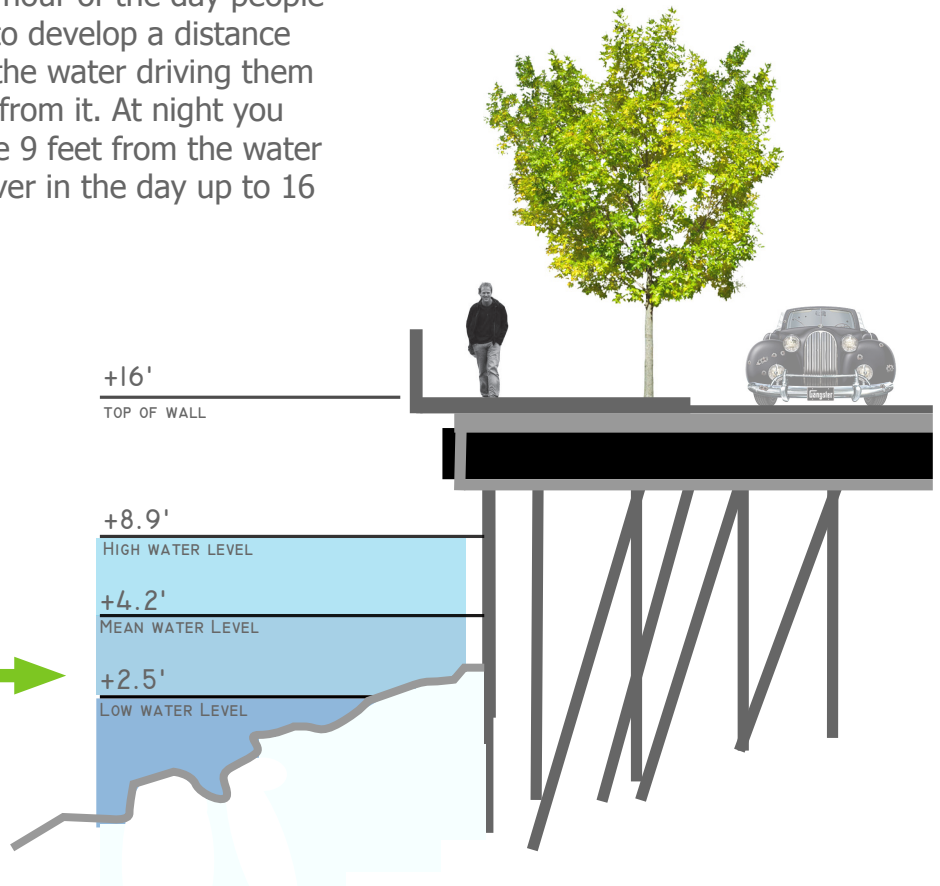
With large amounts of rain and a vast contour change one must always have an understanding of an erosion problems on site. Desminstrated on the right you can see where are erosion issues are located.

photo by: Zerek Kroll

photo by: Zerek Kroll

water levels:

With tide levels changing every hour of the day people start to develop a distance from the water driving them away from it. At night you can be 9 feet from the water however in the day up to 16 feet.



$q = CiA$

q = Peak runoff rate, in cubic feet per second
C = Dimensionless coeffient
i = Rainfall intensity inches per hour
A = Area of drainage

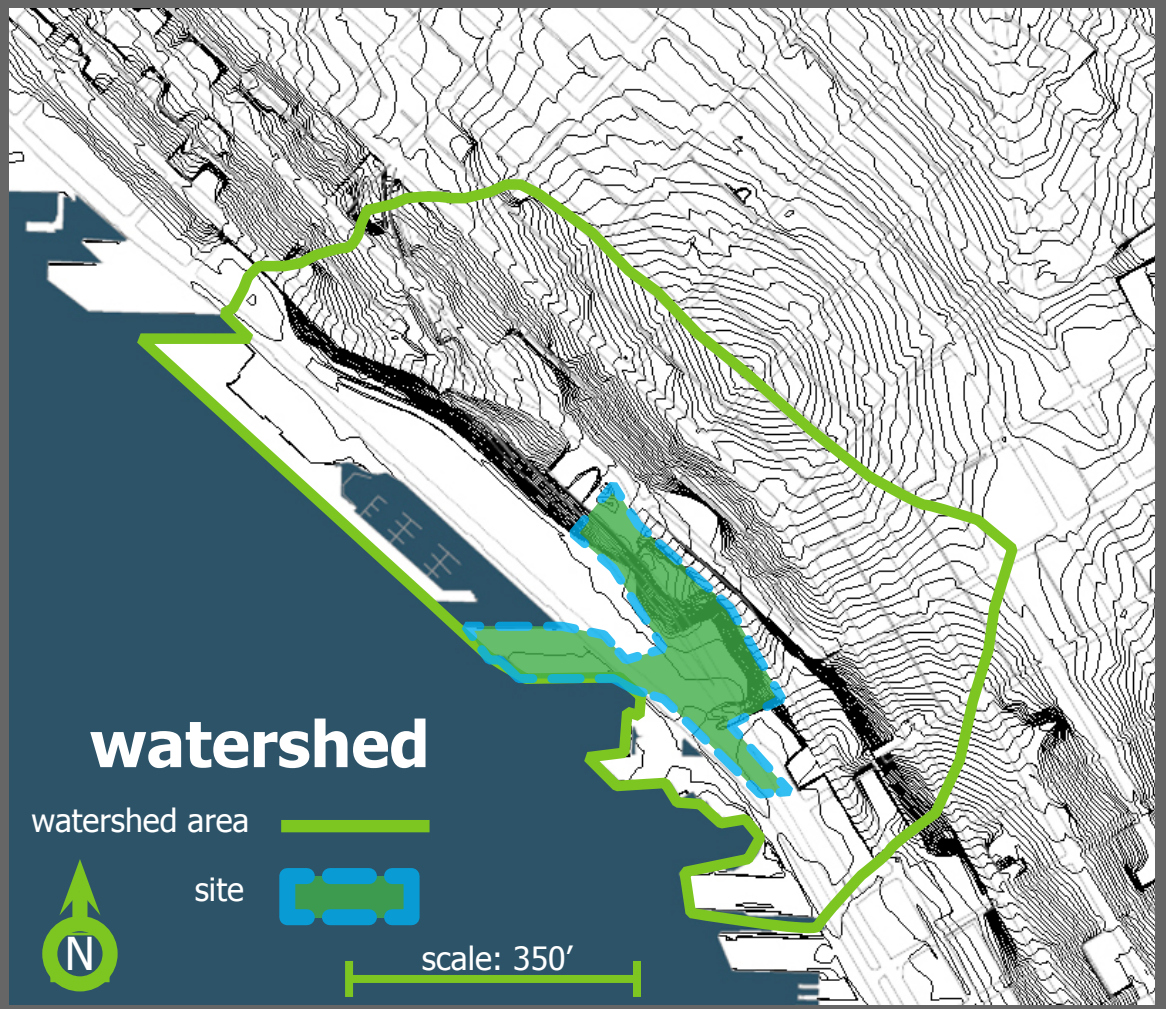
$q = (.90)(.5)(6{,}417{,}500) = 2{,}887{,}875\ ft^3/s$

Peak Runoff Rate = 2,887,875 ft^3/s

Flow time= 3.25 minutes

Watershed

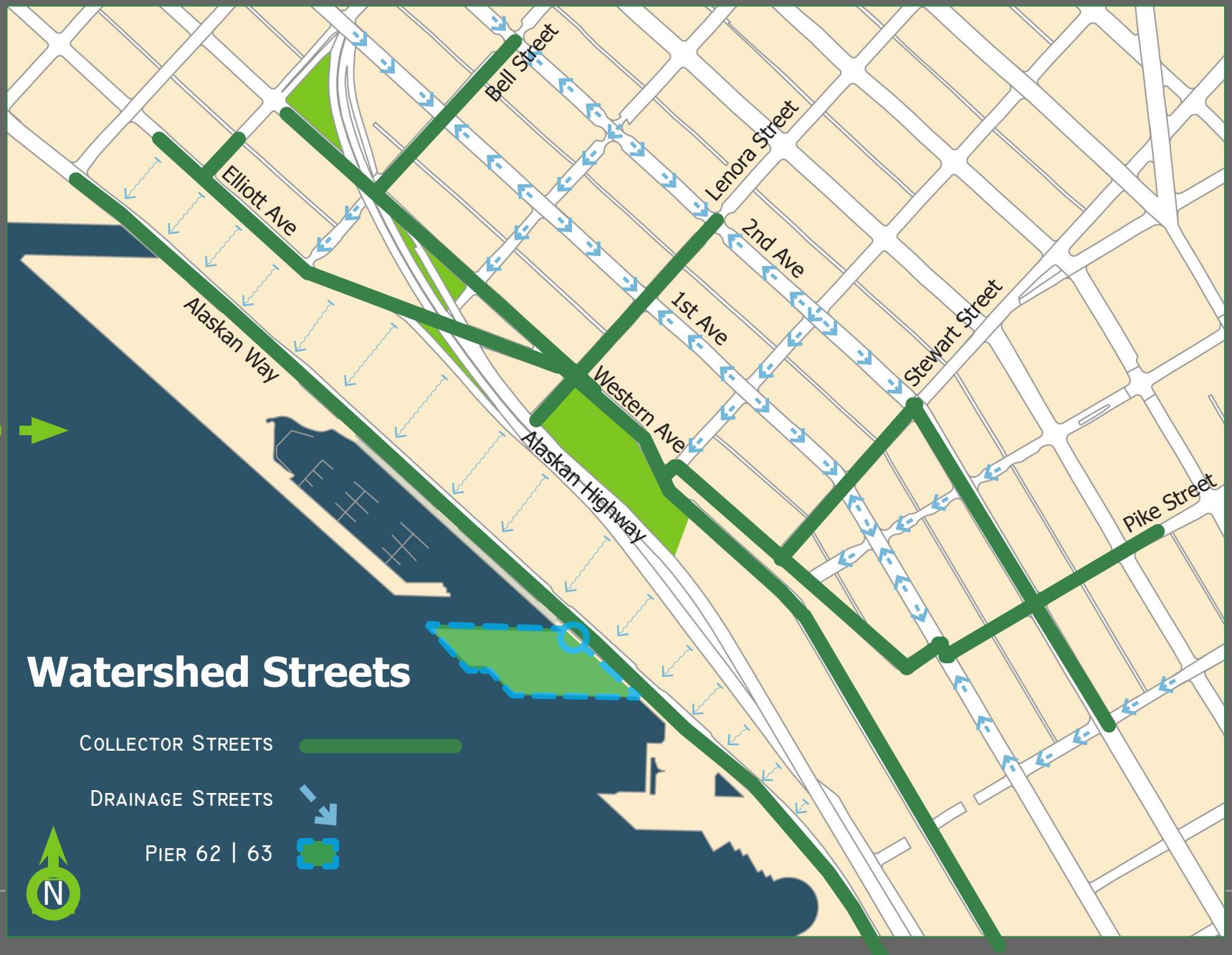
Highlited in green the image on the right shows the watershed I will be collecting stormwater from. This area is important to know so you can start to see how much water we are dealing with.



Watershed

text

photo by: Zerek Kroll


Bell Street
Elliott Ave
Lenora Street
2nd Ave
1st Ave
Alaskan Way
Western Ave
Alaskan Highway
Stewart Street
Pike Street
Watershed Streets
COLLECTOR STREETS
DRAINAGE STREETS
PIER 62 | 63
N

068

SITE ANALYSIS

SEATTLE, WA

photo by: Zerek Kroll

Bike Path

The figure on the right shows the one and only bike path on my site. I want to be able to connect this bike path towards the downtown of Seattle and create a better connection to other parks located throughout Seattle.

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Site analysis

SEATTLE, WA

Pedestrian

This diagram shows the pedestrian friendly paths and the walkable areas in and around my site that I want to incoprporate in my design. As you can see in red the existing paths that already exist.

photo by: Zerek Kroll

plan

Moving on:

Moving forward from the site analysis I can start so see my connections I want to make. Connecting some of the main attractions such as Pikes Place Market, Seattle Aquarium, Victor Stienbrueck Park, Pier 62/63, and the Olympic sculpture park this would not only make this area more desirable it would make it a functional and effeicent park.

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Site analysis

SEATTLE, WA

Conceptual

073

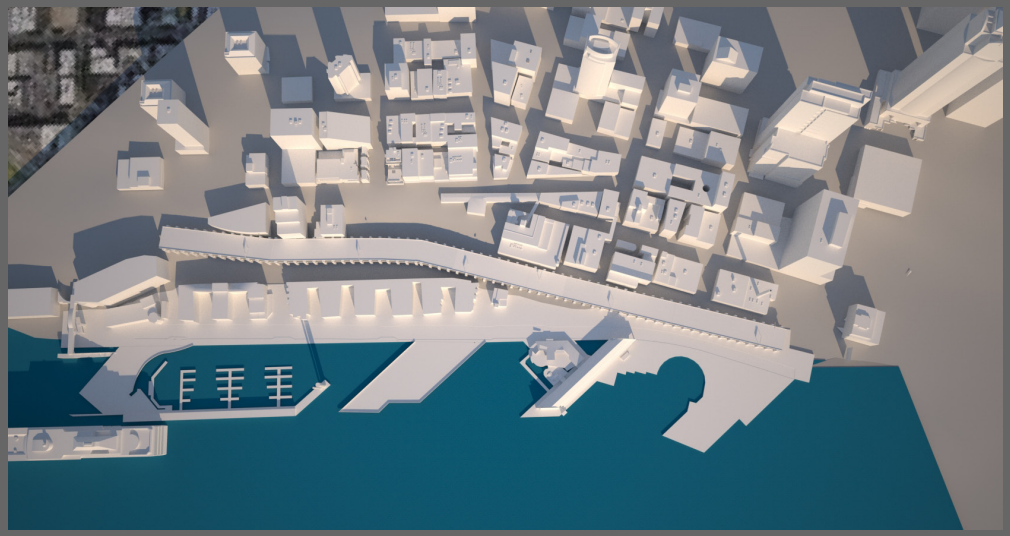
CONCEPTUAL DESIGN

TITLE PAGE

DESIGN

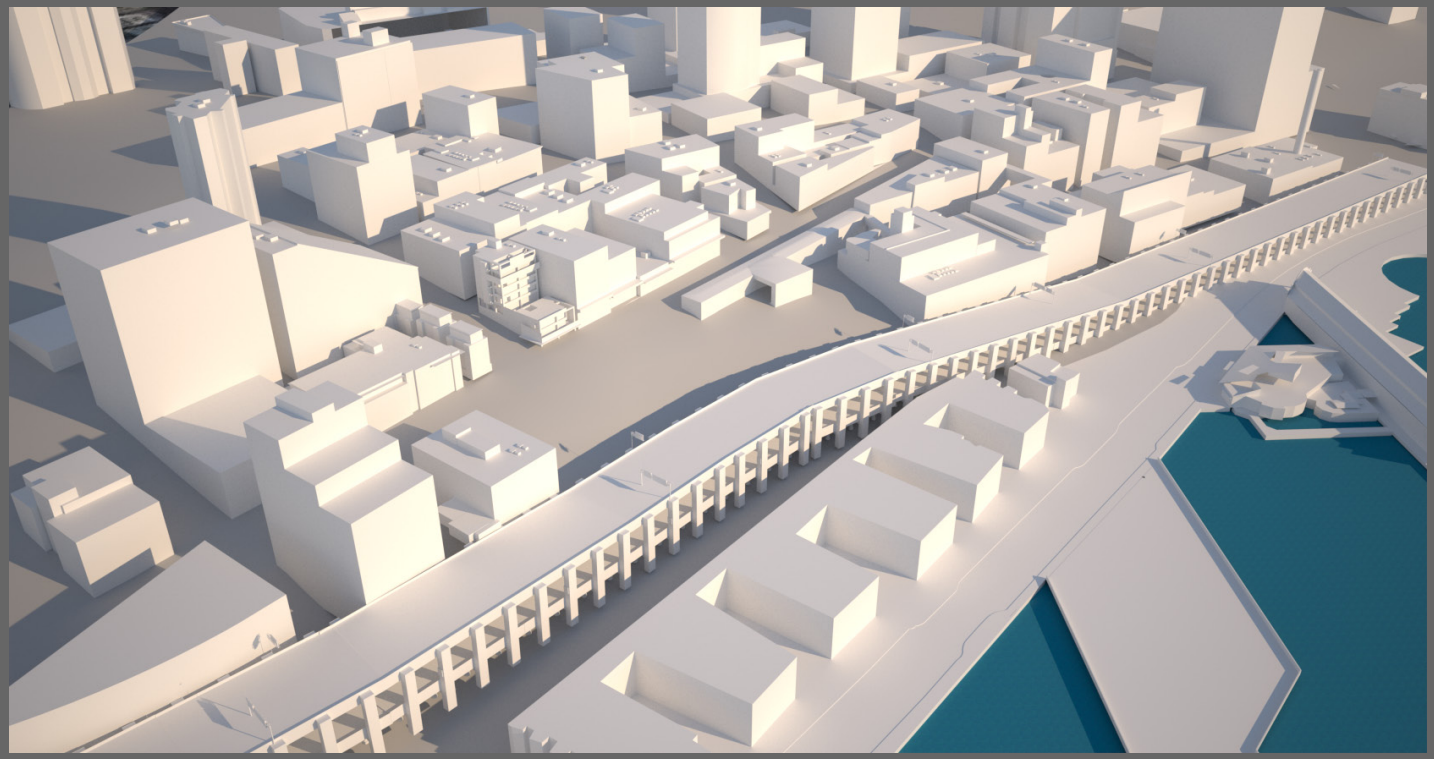
CONCEPTUAL DESIGN

SEATTLE, WA



Model:

To get a better understanding for my site I was able to make a 3d model of the site and the buildings around it. Because my site is located in Seattle and me in Fargo, ND, this will allow me to get some spacial understandings of the site.

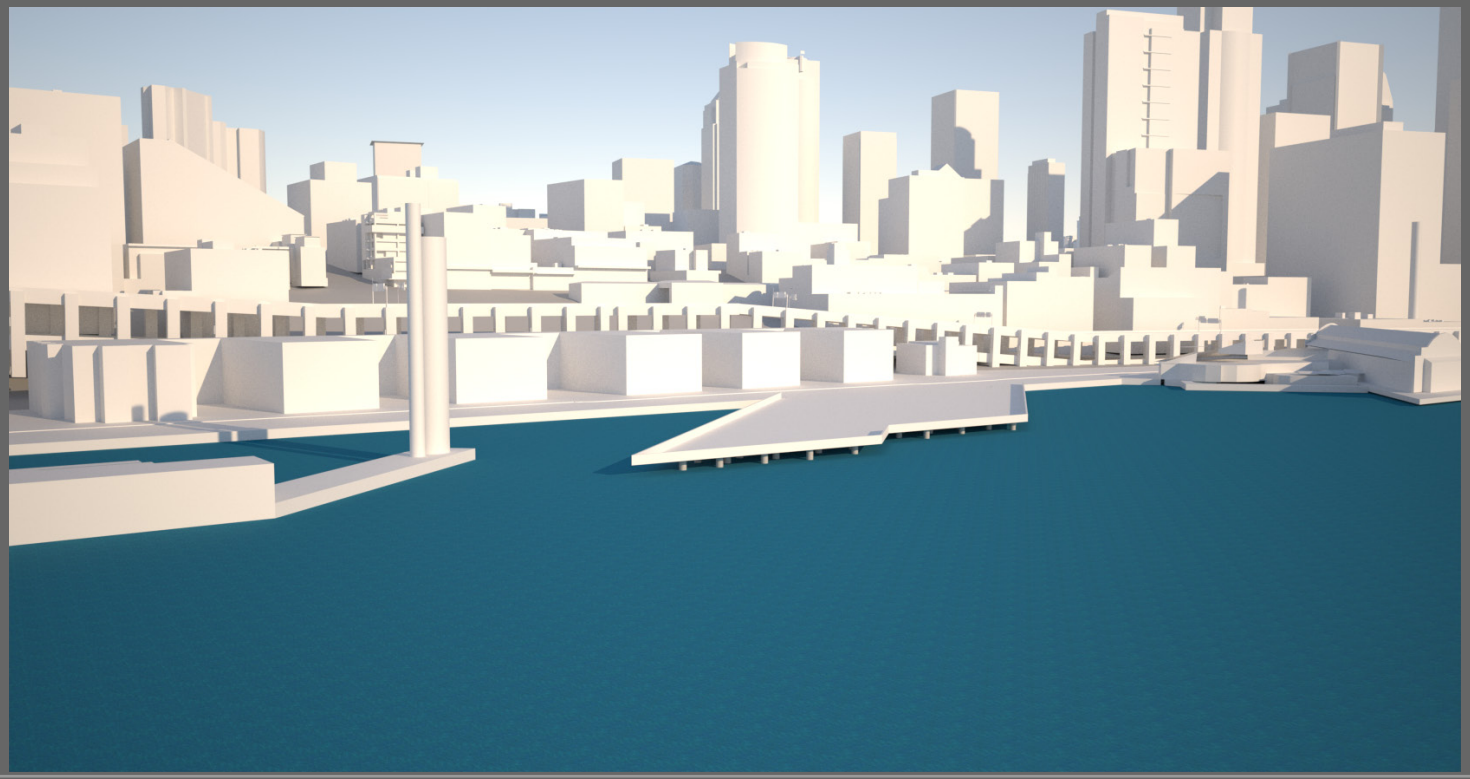


075

CONCEPTUAL DESIGN

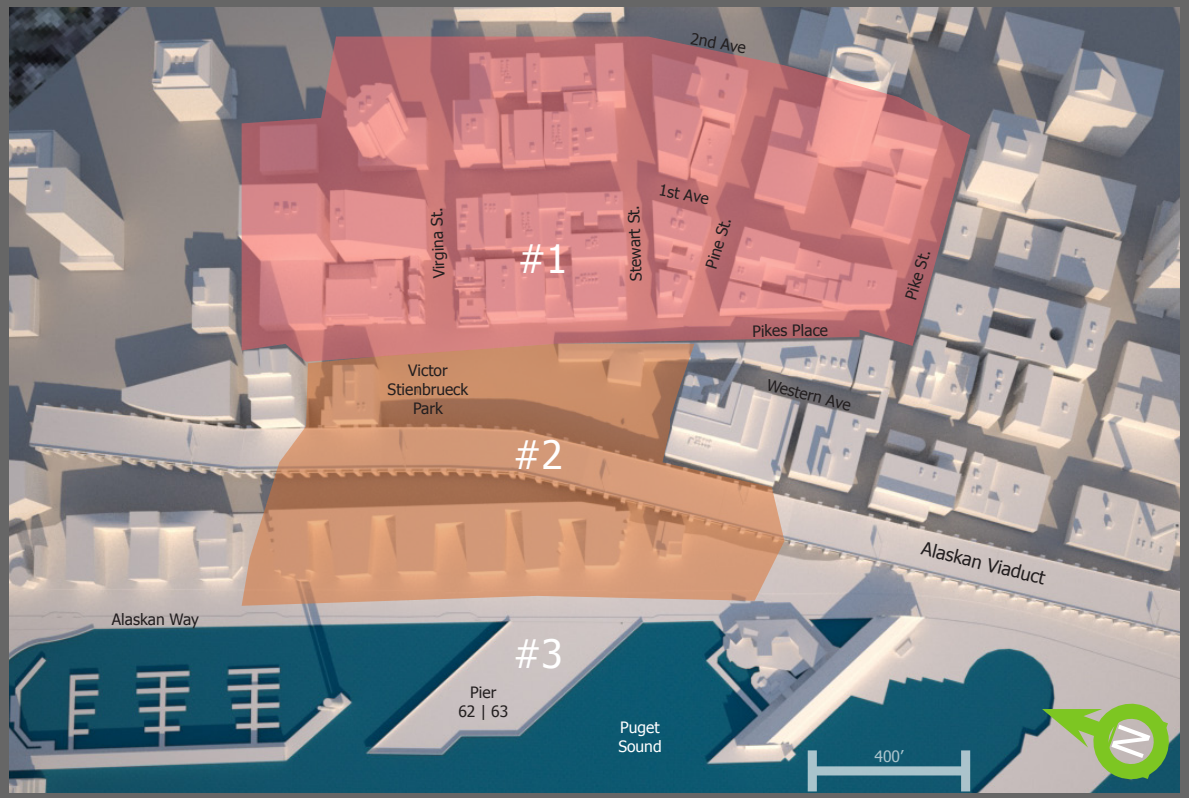
SEATTLE, WA

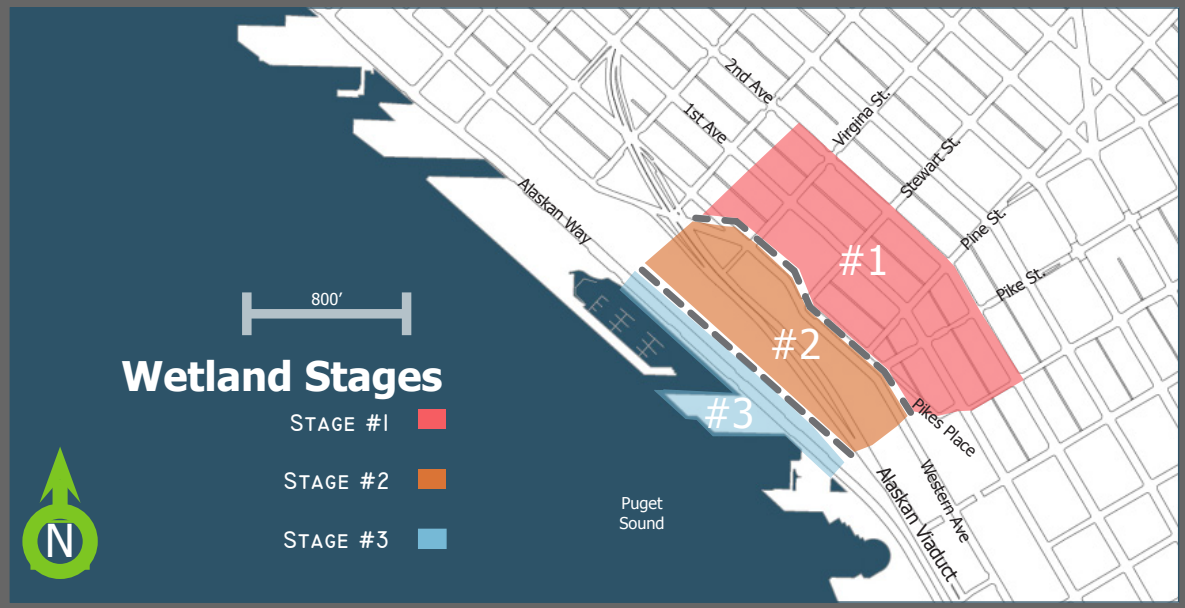
stages...

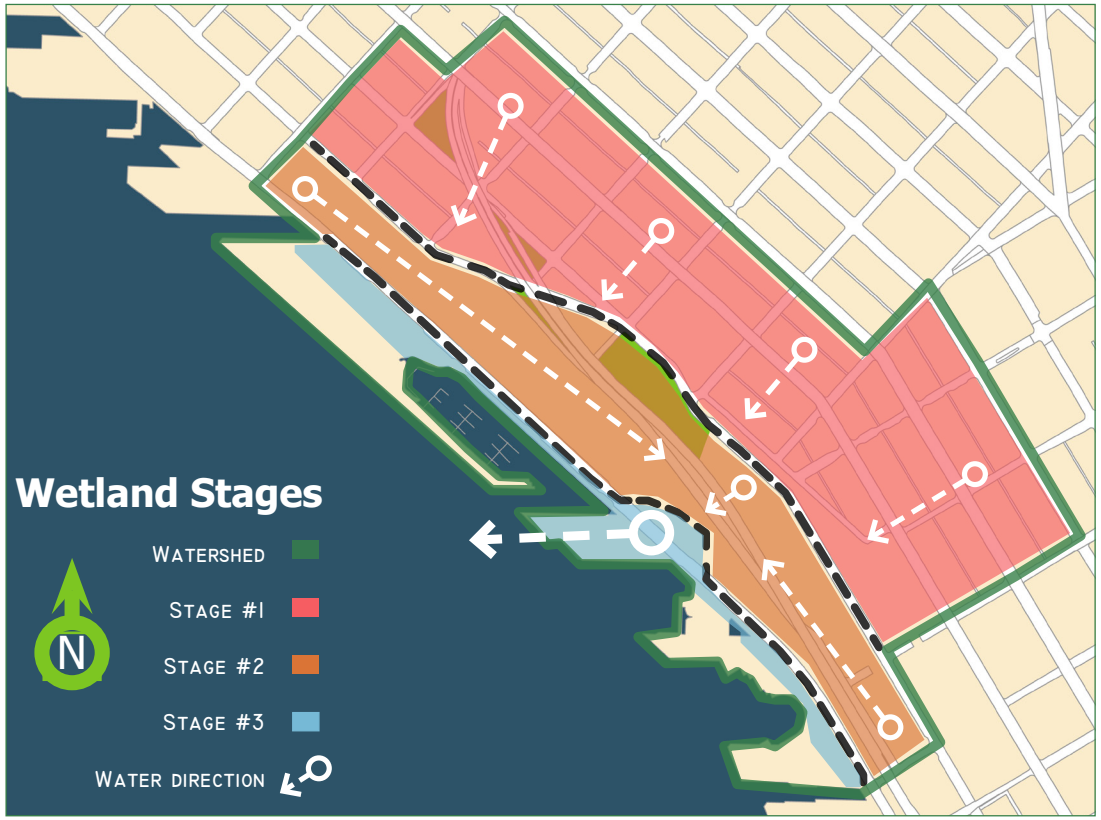


Wetland stages

After trying to figure out how I am going to clean the water in my watershed I figured out that instead of taking one large area and cleaning stormwater that way. It would be easier if I broke my site up into three stages. A three stage wetland is a very common practice for collecting and cleaning stormwater in a wetland process and I wanted to replicate that in my design.

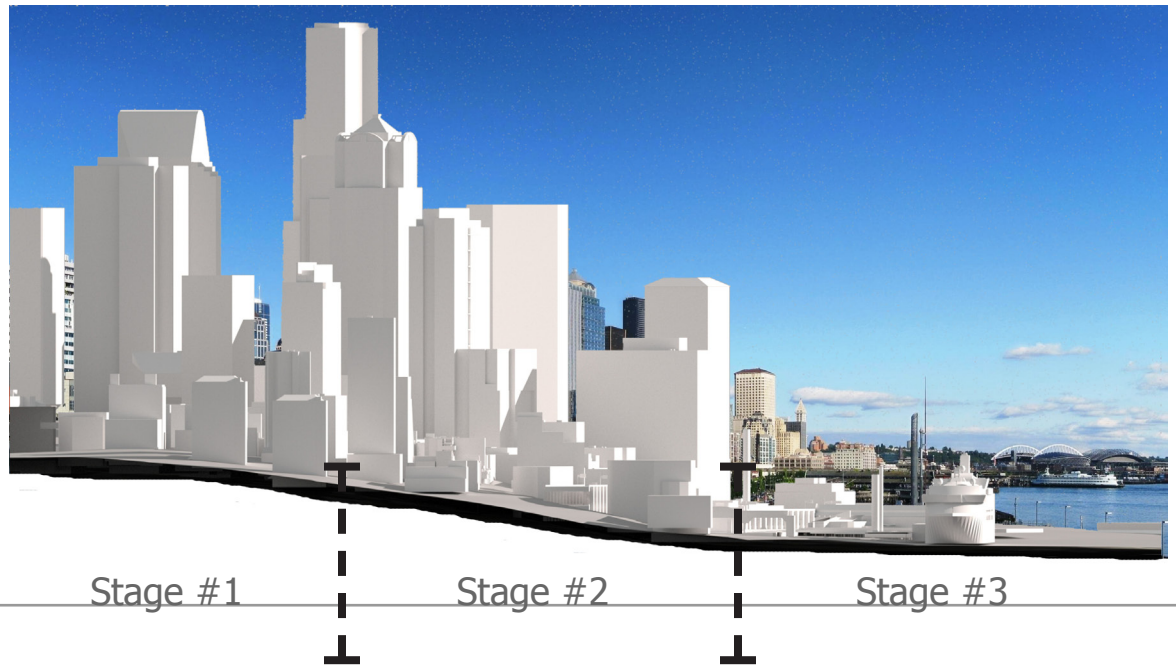


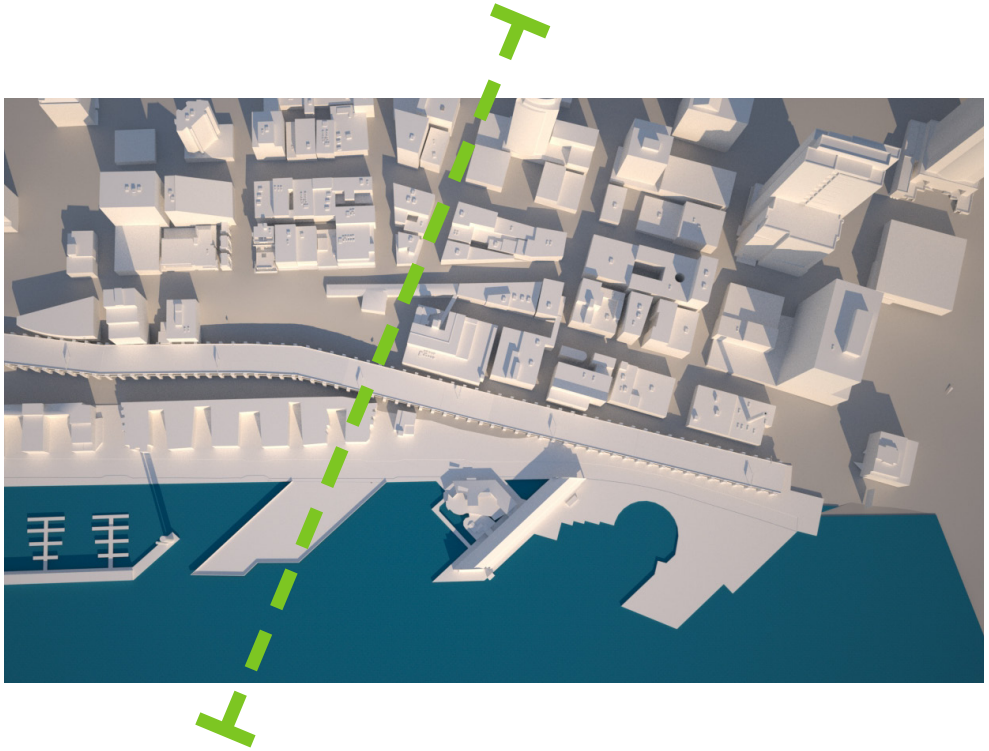




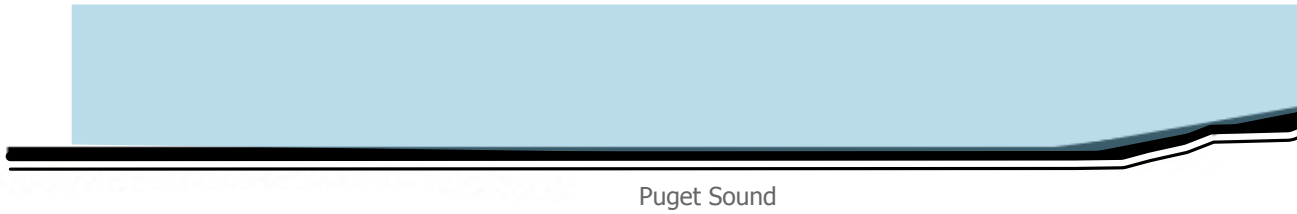
Wetland stages

Understanding that this design will be broken up into three stages we can start moving forward. This diagram starts to show you how this wetland stages would start to work. By having one stage collect the water on stage clean the water and another stage releasing the water it will start to simplify my design development.





Pike Street Section



section

As you can see in the section below, there is a massive drop in elevation from the main part of downtown to the waterfront. This is one thing I want to fix in hopes of bringing people closer to Puget Sound and granting them easy access to greenspace and free views of the wonderful Puget sound and the Seattle skyline.

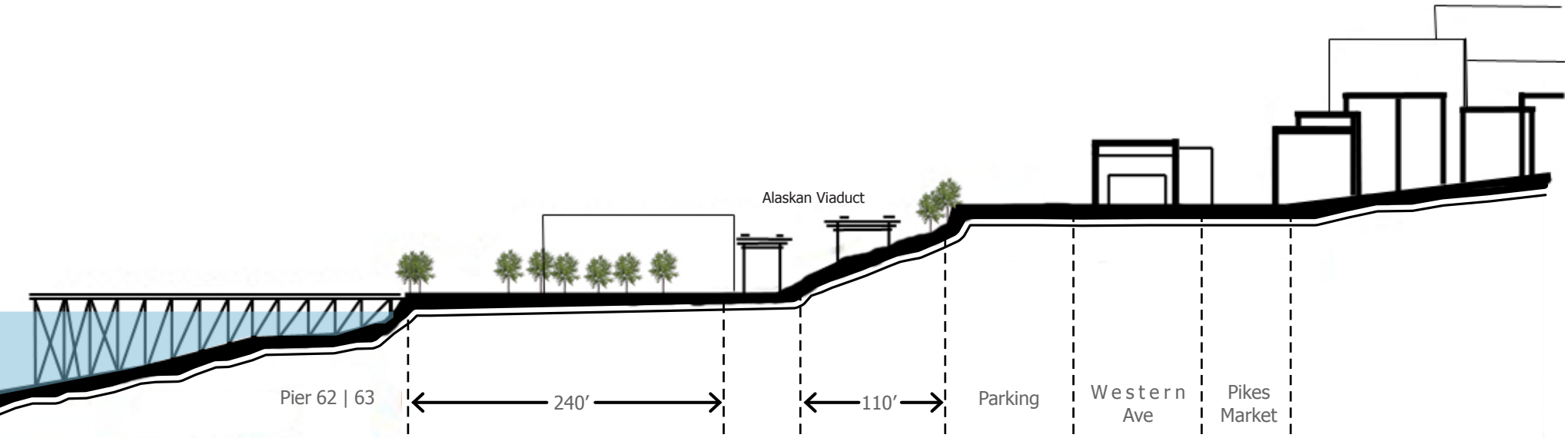


photo by: Google earth

conceptual design:

Going into the conceptual design phase I found myself really passionate about expanding the pier of 62/63 and creating a better connection to pikes place market that wouldn't be so exhausting for pedestrians.

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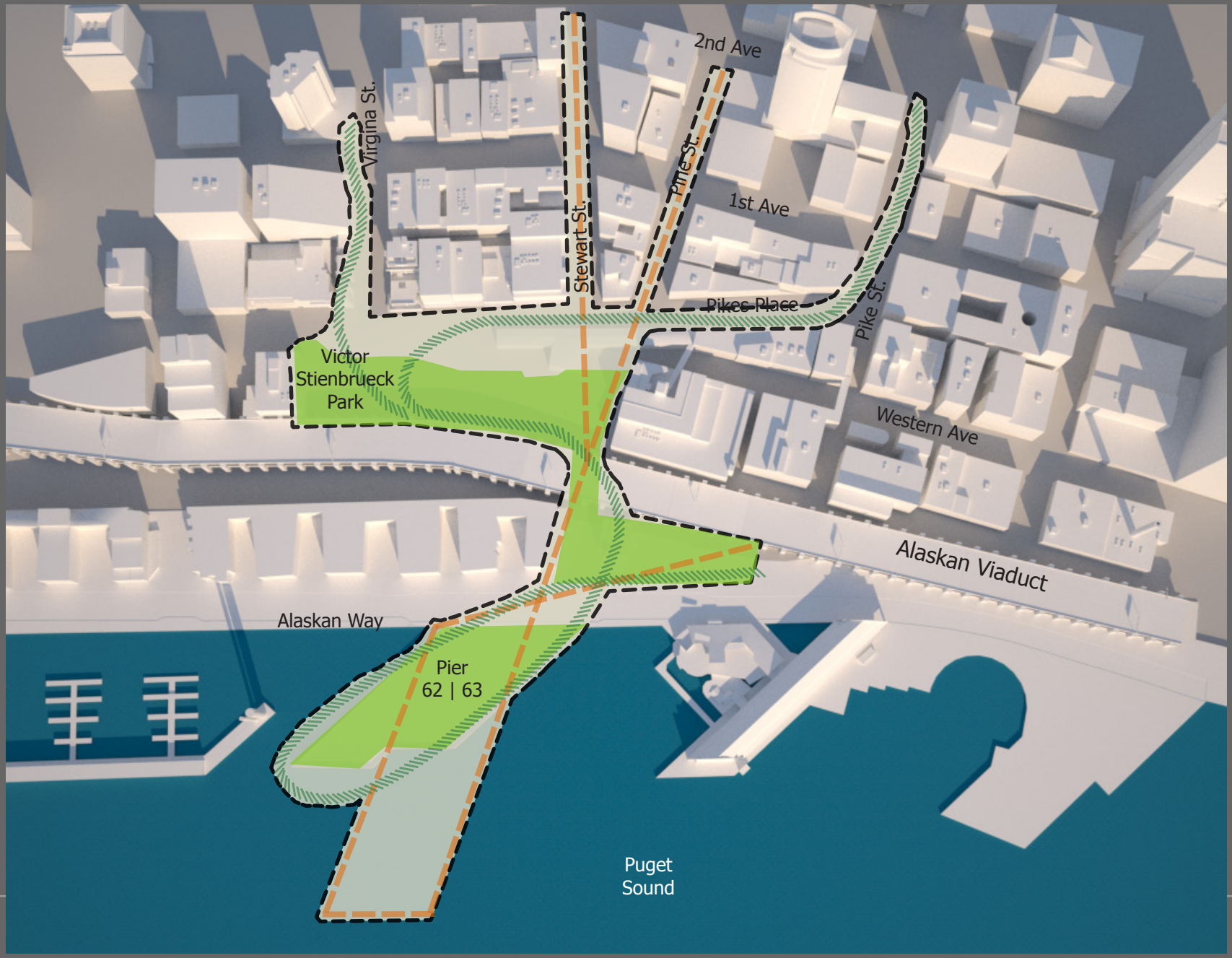
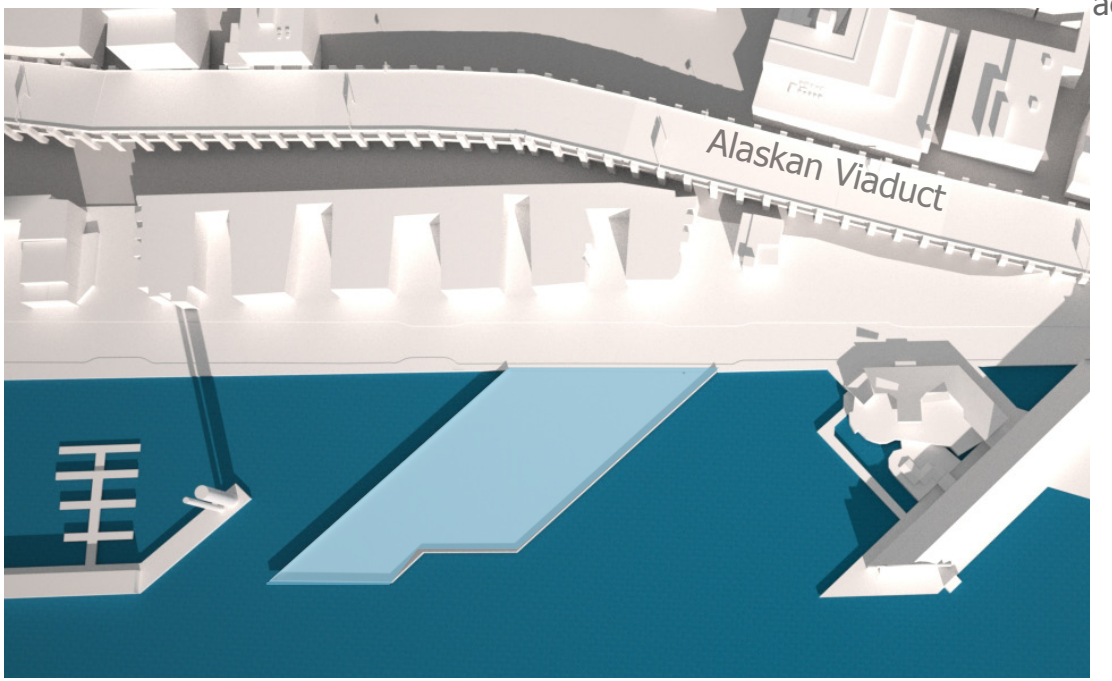
CONCEPTUAL DESIGN

SEATTLE, WA

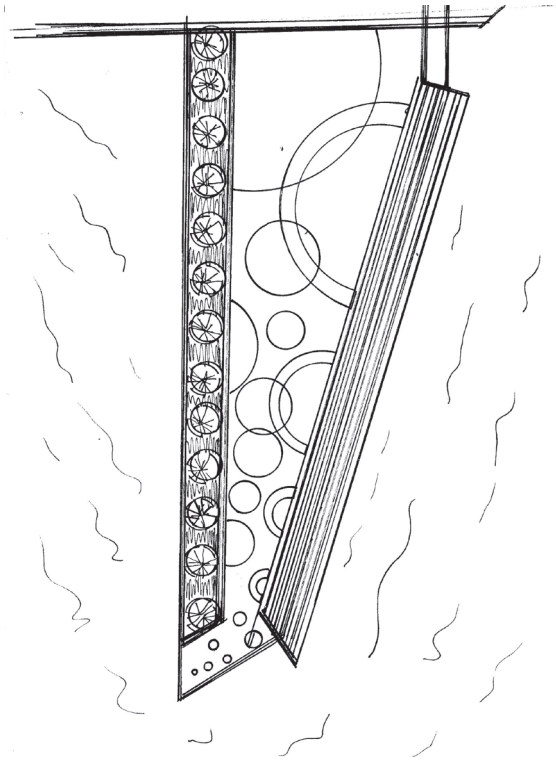


pier design:

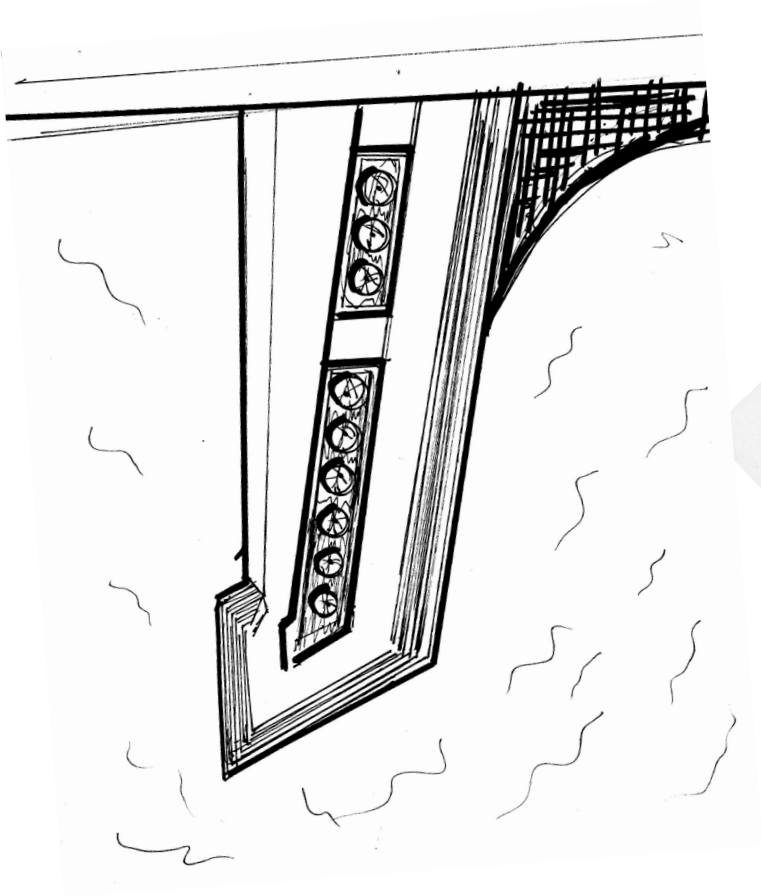
Here below are some conceptual drawings I had to redesign pier 62/63. As you can see I was thinking literally and not to drastic. In a sense I was being really conservative with the design by not expanding the pier or taking it to a new level. By not getting that "wow factor" I continued in my design development to new levels of aesthetics.



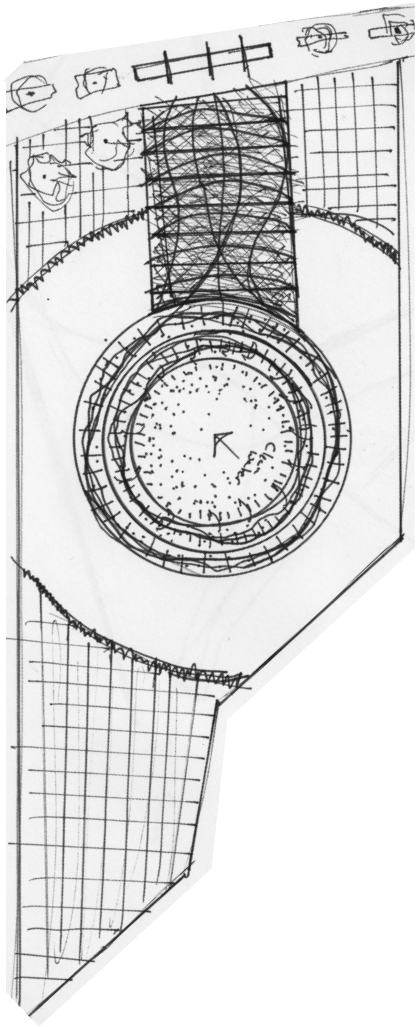
Design #1



Design #2



Design #3



CONCEPTUAL DESIGN

SEATTLE, WA

photo by: Zerek Kroll

PIER 62 | 63
Downtown Seattle Waterfront

Public access

Pollution

Green

Waterfront

PIER 62 | 63
Downtown Seattle
Waterfront

Public access
Create a public access by knocking down barriers from the city to the waterfront. Make the waterfront more inviting and enjoyable

Waterfront
Redevelop seattles waterfront as a better place for citizens to come and enjoy the water and views of the great puget sound

Pollution
Create a treatement program that not only treats the stormwater before it enters puget sound buteducate the surroundings on stormwaer managemnt

Green
Create a green infrastructure in downtown seattle, with connections for pedestian uses with the use of stormwater management practices.

development----

Design development:

The site I have chosen is located along the waterfront of downtown Seattle, and the shoreline of Puget Sound. This area is directly affected by stormwater runoff issues. The site design for this area combines the concern of stormwater runoff with intent to educate the public about the stormwater management. By creating this park, boulevards, waterfront, and medians, the area will connect the city back to its waterfront while making it appealing to the public eye, and still be a sustainable functional design that treats and filters stormwater runoff from the city.

087

CONCEPTUAL DESIGN

SEATTLE, WA

photo by: Zerek Kroll

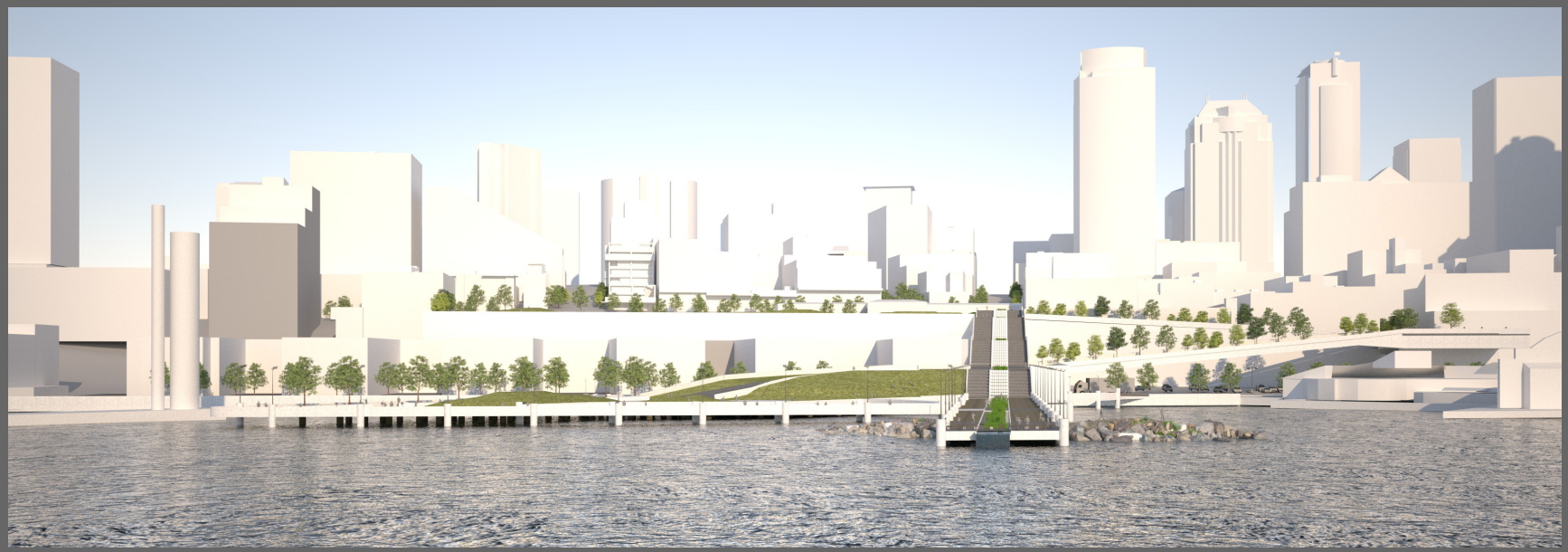
- sustainable stormwater management practices are investigated.
- relationships between the natural environment, and how it is able to be incorporated into an urban setting.
- solution to develop interaction and education among individuals and water.

project

089

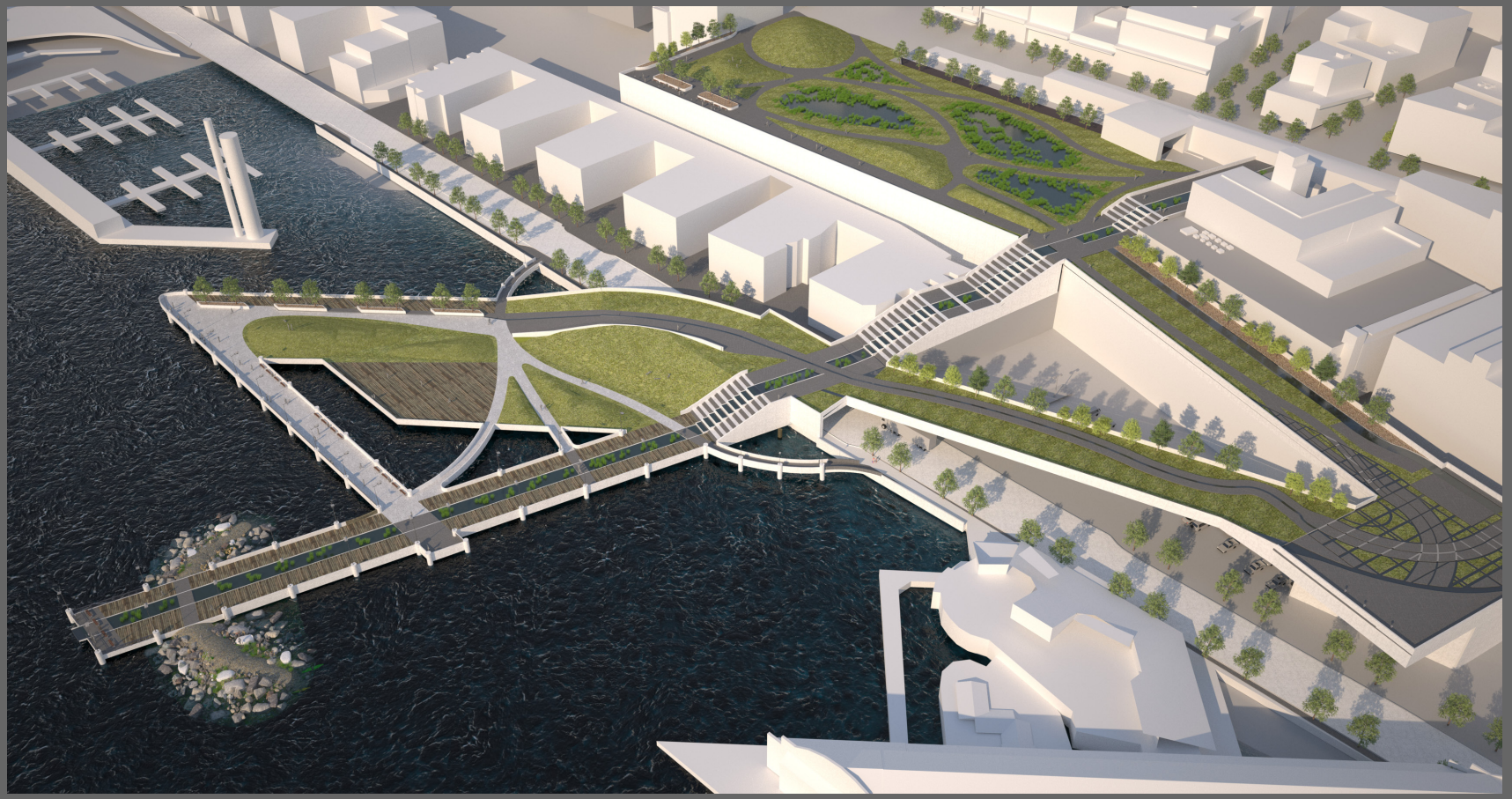
DESIGN

SEATTLE, WA



DESIGN

DESIGN
SOLUTION



design solution:

This design solution provides a method of incorporating nature into a vast expanse of cityscape, and connecting the Puget sound with the city of Seattle, WA. The integration of parks in the space allows users to relax, play, and enjoy this area while providing an environment to learn from the natural processes of their surrounding environment. The stairway provides quick and direct access to Puget Sound while incorporating reservoirs with plants that naturally clean the water being pumped back into the sound. The meandering pathways provide an alternative route for leisurely experiencing the space, and what it has to offer. Various observation areas allow for a relaxing experience and reflection. The overall solution provides greens space in an urban setting where users can be social and interact with the environment.

solution


virginia st
western ave
pikes place market
stewart st
pine st
alaskan highway
pike st
puget sound
seattle aquarium
scale: 250’
N
01
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16

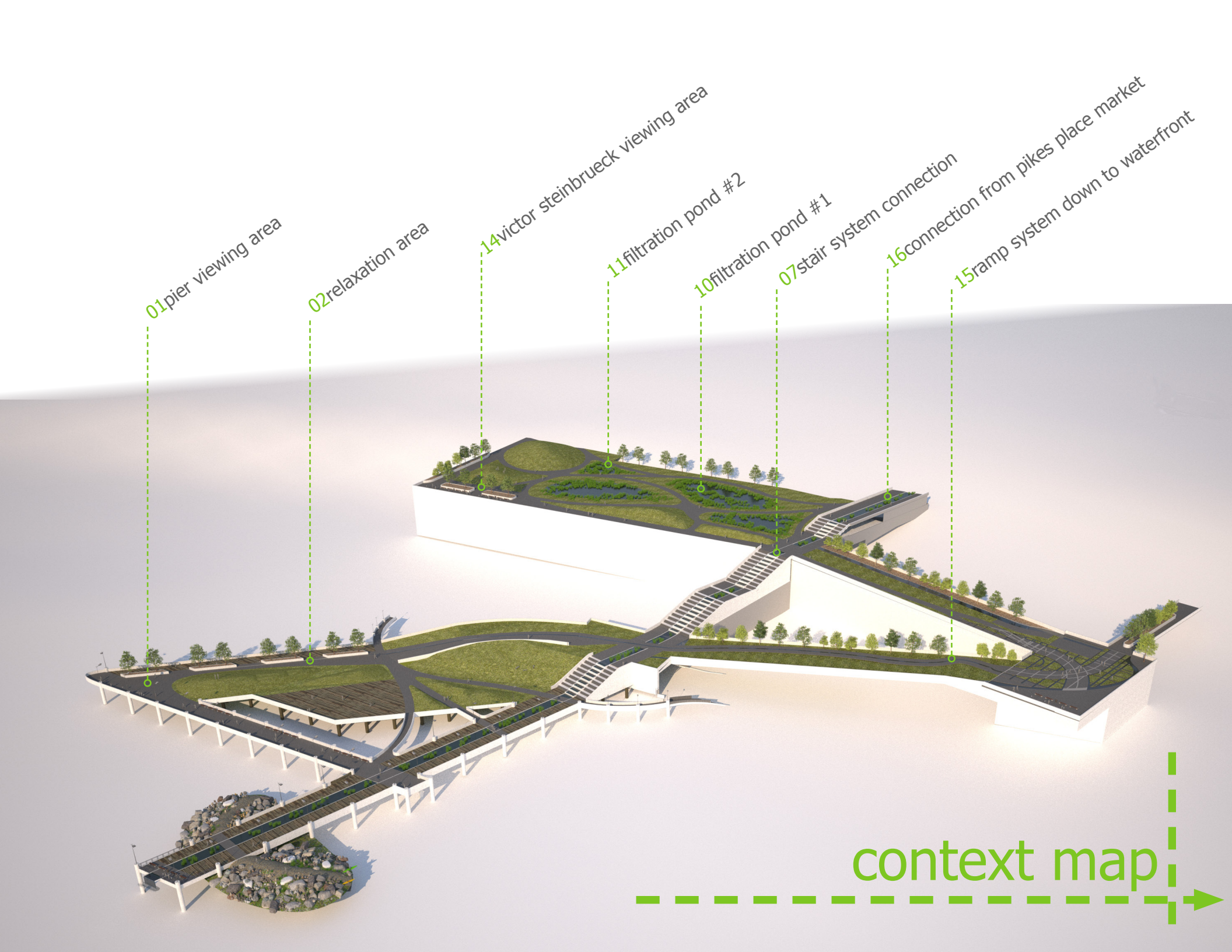
master plan

01 pier viewing area
02 relaxation area
03 hilltop viewing area
04 low flow water cleansing
05 end of pier viewing area and water release
06 pedestrian water interaction area
07 stair system connection
08 south side viewing area
09 entrance from pike street
10 filtration pond #1
11 filtration pond #2
12 filtration pond #3
13 filtration pond #4
14 victor stienbrueck viewing area
15 ramp system down to waterfront
16 connection from pikes place market

Masterplan:

Here is my master plan of the site. Numbered are labels of different features I have implemented into this design to make it a functional and aethetically please area and park to be around.

masterplan


01pier viewing area
02relaxation area
14victor steinbrueck viewing area
11filtration pond #2
10filtration pond #1
07stair system connection
16connection from pikes place market
15ramp system down to waterfront
context map

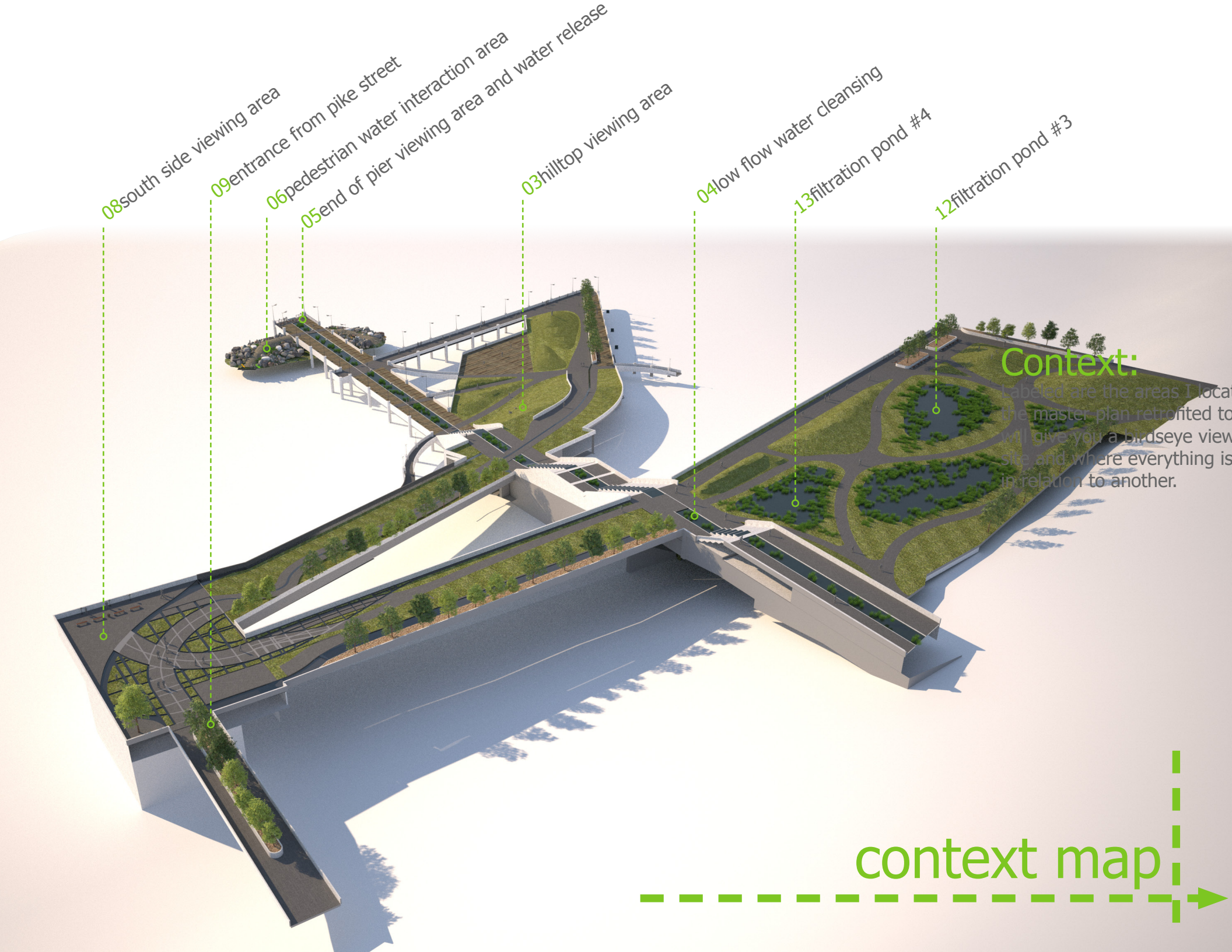
context map

01 pier viewing area
02 relaxation area
03 hilltop viewing area
04 low flow water cleansing
05 end of pier viewing area and water release
06 pedestrian water interaction area
07 stair system connection
08 south side viewing area
09 entrance from pike street
10 filtration pond #1
11 filtration pond #2
12 filtration pond #3
13 filtration pond #4
14 victor stienbrueck viewing area
15 ramp system down to waterfront
16 connection from pikes place market

Context:

Labeled are the areas I located on the master plan retrofited to 3D. This will give you a birdseye view of the site and where everything is located in relation to another.

context


08south side viewing area
09entrance from pike street
06pedestrian water interaction area
05end of pier viewing area and water release
03hilltop viewing area
04low flow water cleansing
13filtration pond #4
12filtration pond #3
Context:
Labeled are the areas I locat
the master plan retrofited to
will give you a birdseye view
site and where everything is
in relation to another.
context map

context map

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01 pier viewing area
02 relaxation area
03 hilltop viewing area
04 low flow water cleansing
05 end of pier viewing area and water release
06 pedestrian water interaction area
07 stair system connection
08 south side viewing area
09 entrance from pike street
10 filtration pond #1
11 filtration pond #2
12 filtration pond #3
13 filtration pond #4
14 victor stienbrueck viewing area
15 ramp system down to waterfront
16 connection from pikes place market

Context:

Labeled are the areas I located on the master plan retrofited to 3D. This will give you a birdseye view of the site and where everything is located in relation to another.

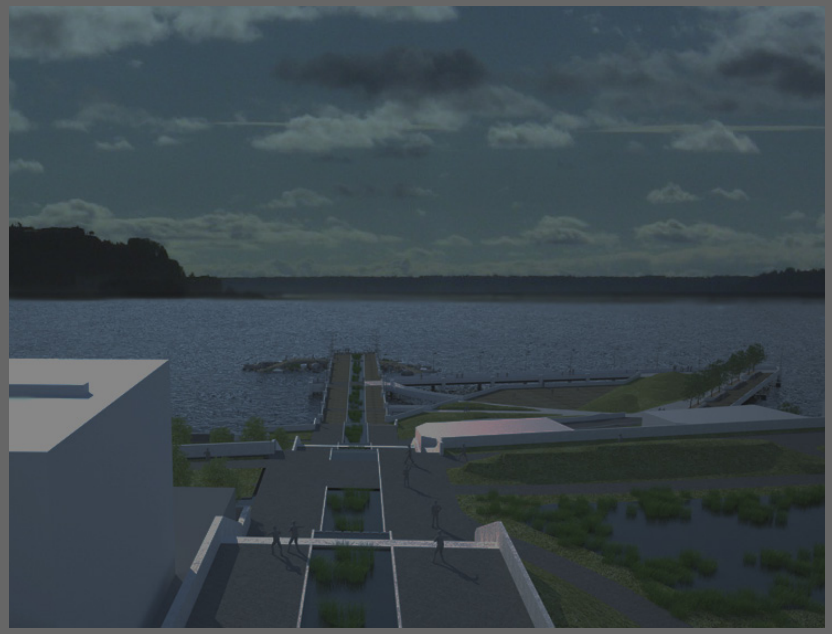
context

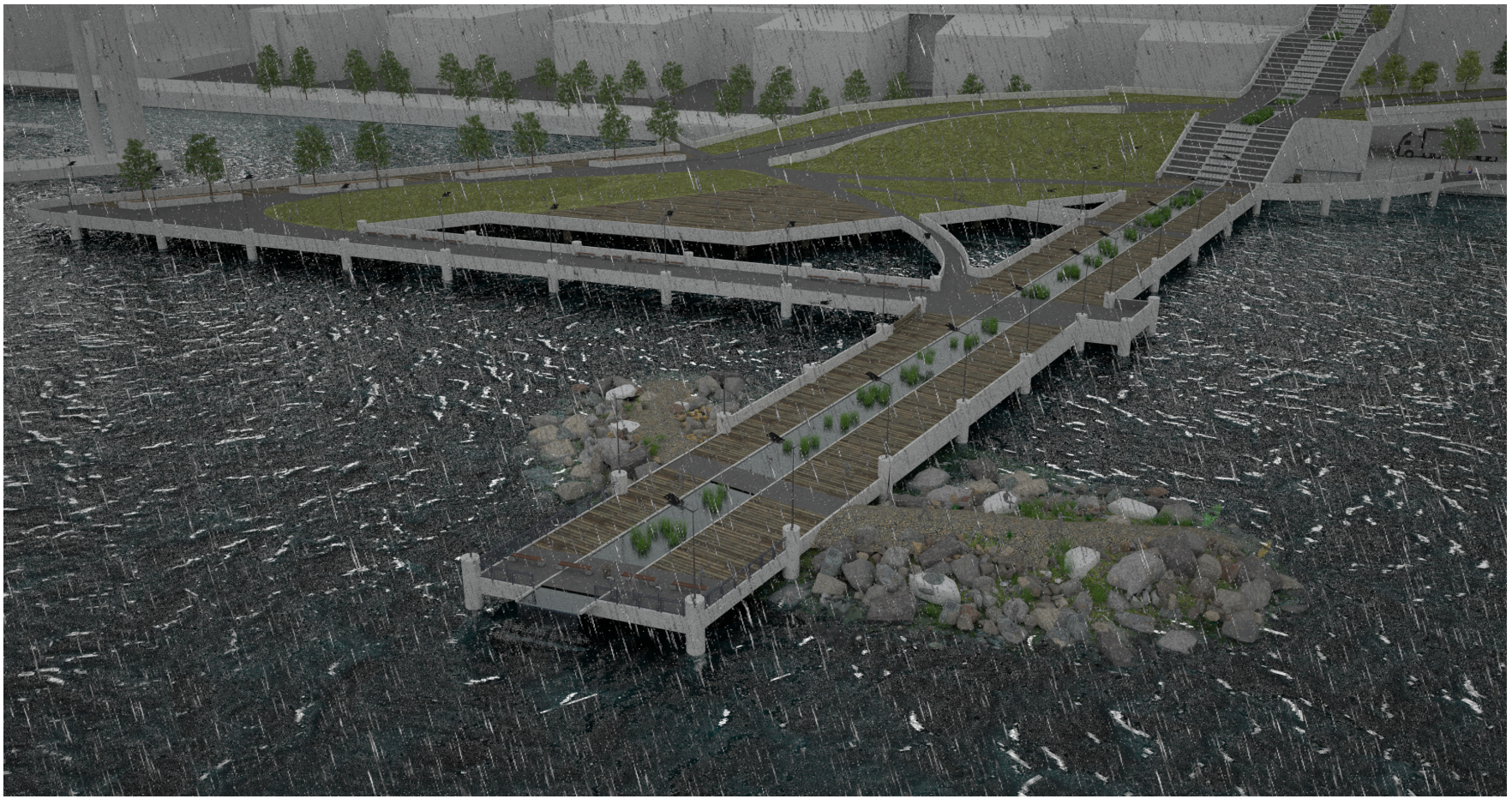
rain storm:

This perspective shows what the pier would look like in the event of a storm.

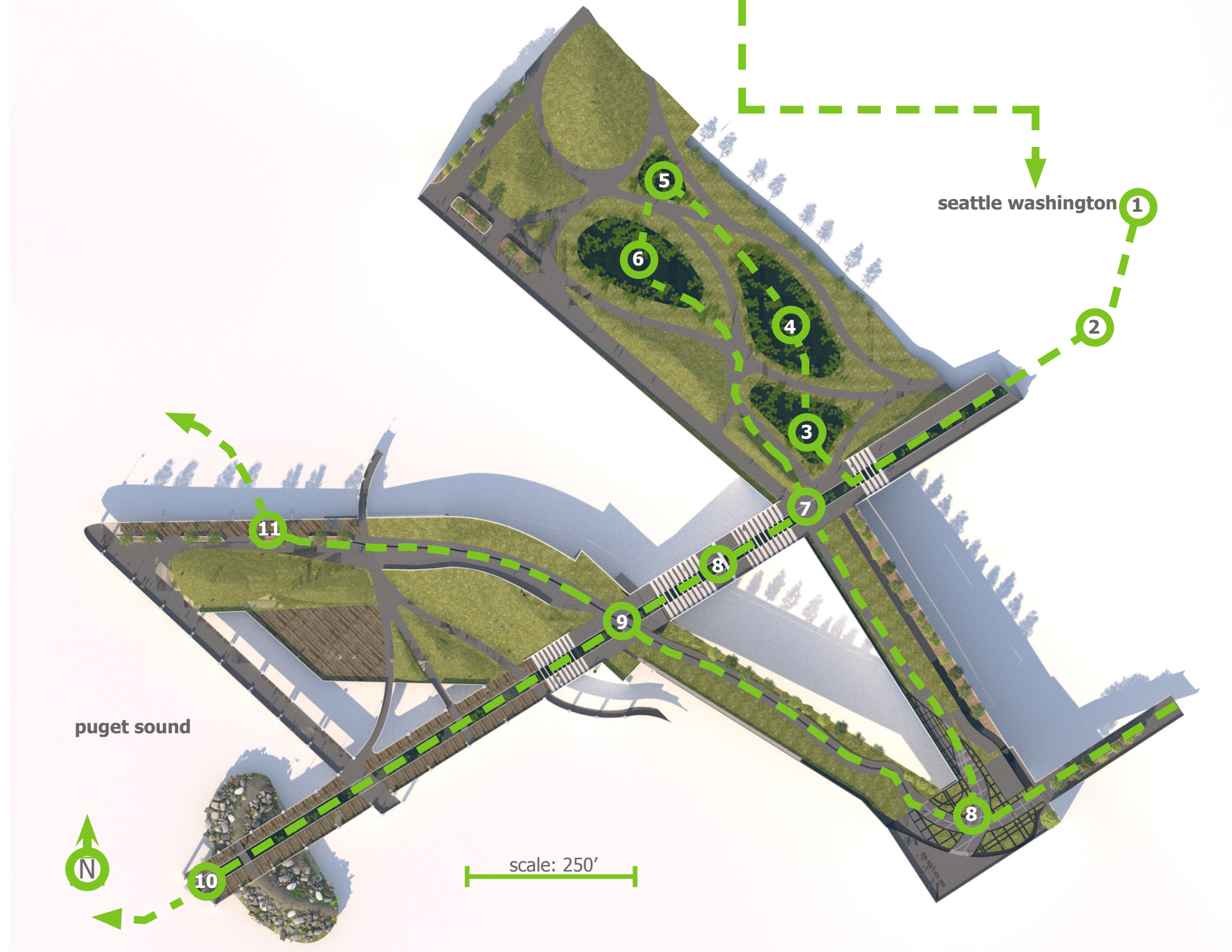
filtration system:

filtration system are comprised of several sustainable water retention techniques. Bioswales and urban planters intercept \ stormwater runoff, and allow it to be filtered before returning back into the water cycle.





stormwater


seattle washington
1
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puget sound
N
scale: 250’

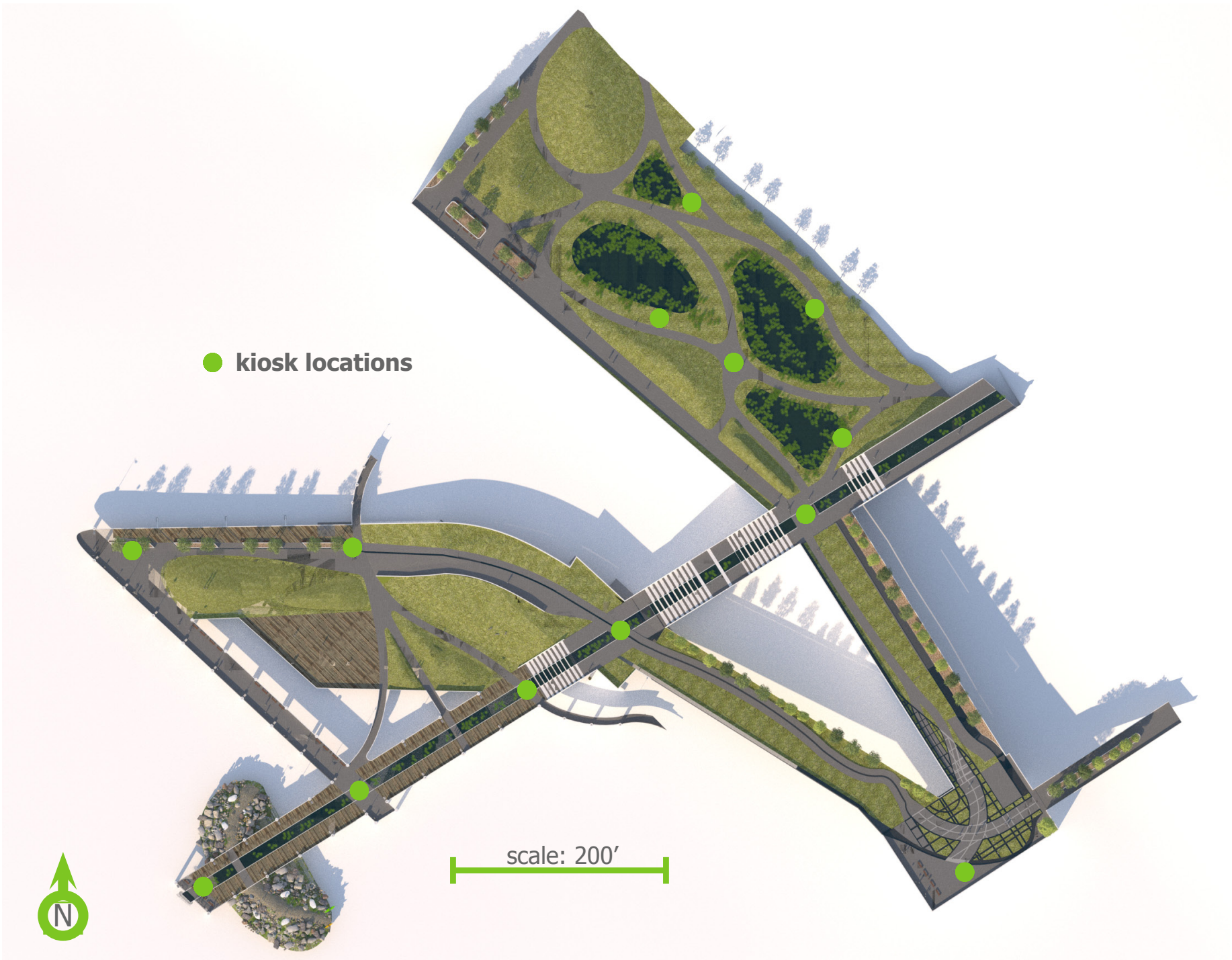
stormwater

01 seattle Washington
02 pikes place market stormwater collection
03 filtration pond #1
04 filtration pond #2
05 filtration pond #3
06 filtration pond #4
07 diversion hub and overflow diversion
08 low flow water cleansing and pedestrian water interaction area
09 stair system connection
10 end of pier viewing area and water release
11 end of pier relaxation area and water release

stormwater management:

The stormwater management areas are located throughout the site. They will utilize stormwater retention by slowing down the flow of runoff, in a low flow system, filtering the water through plants, while producing value with vegetation within the site. In addition, there will be kiosks throughout this design that will educate individuals by incorporating an element of interaction.

stormwater


kiosk locations
scale: 200’
N

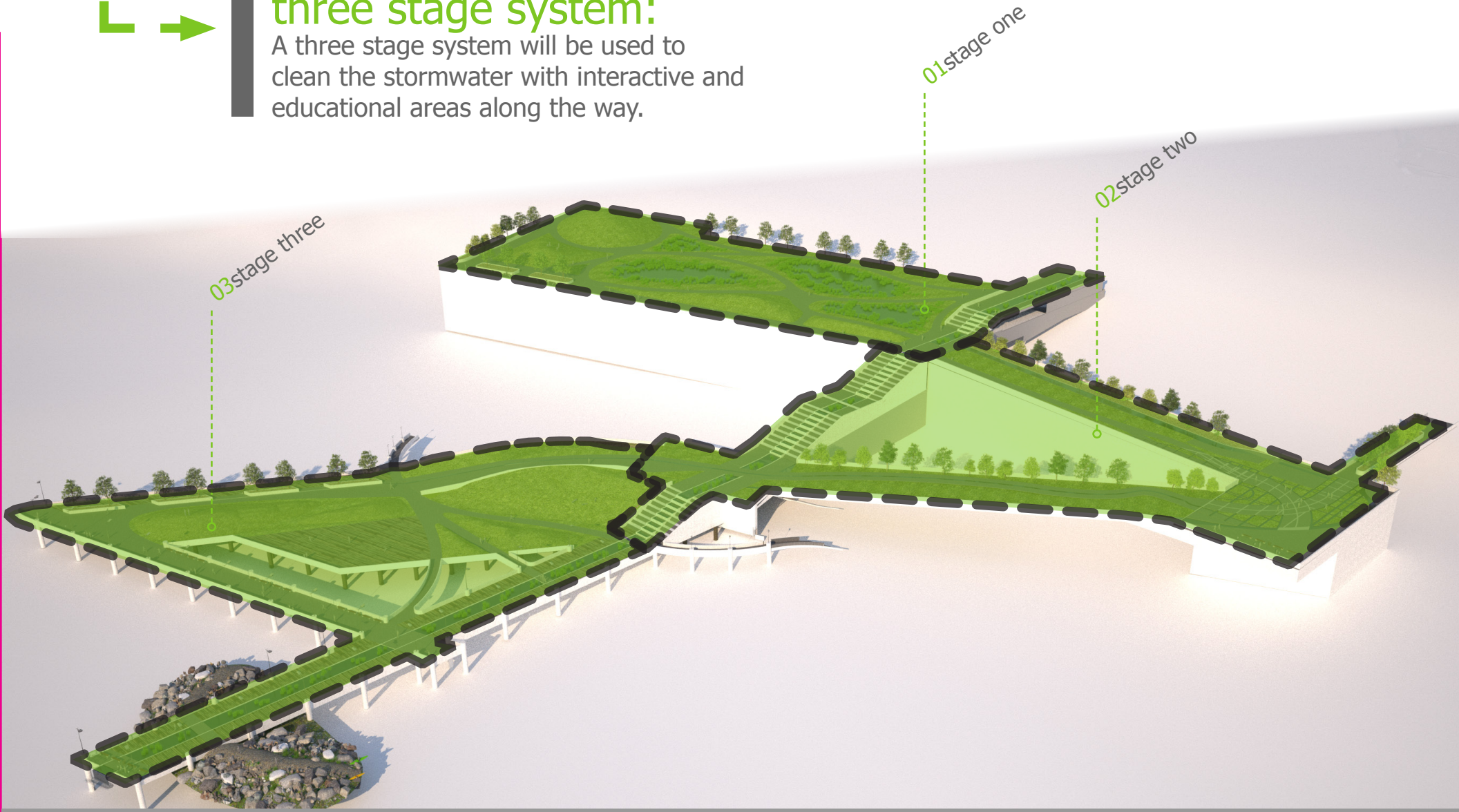
kiosk:

This perspectives shows what the educational stormwater management kiosk placed around the park would look like. These kiosks would describe the three stages and the effects of cleaning the water.

kiosk

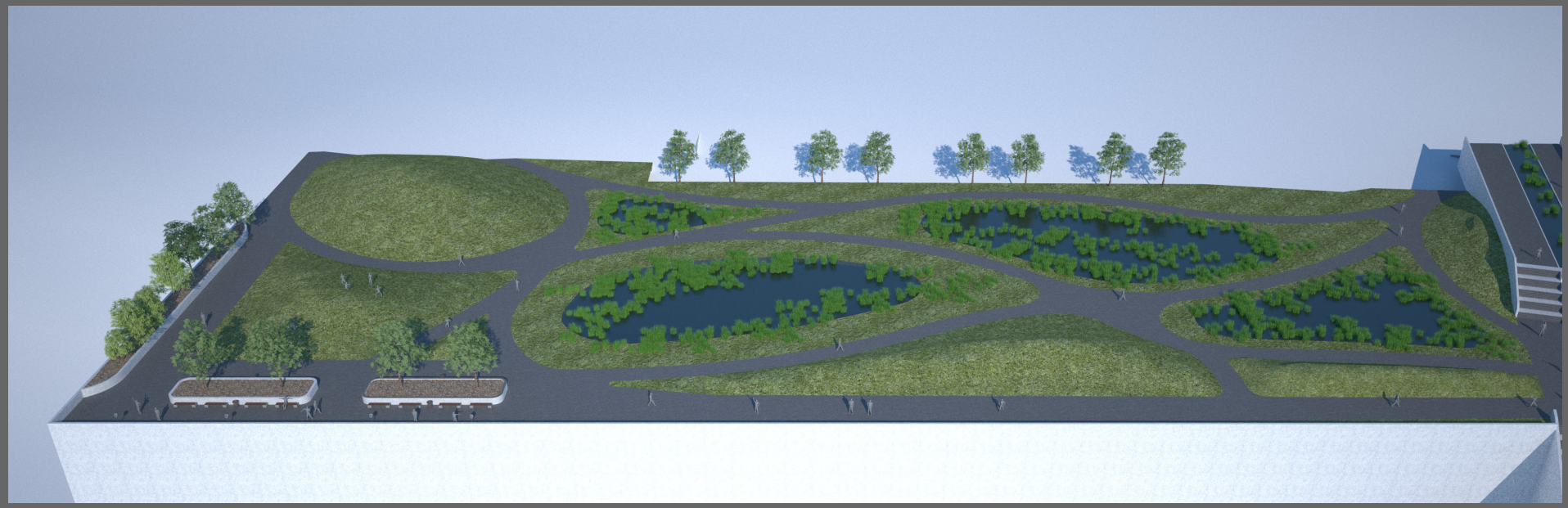
three stage system:

A three stage system will be used to clean the stormwater with interactive and educational areas along the way.



stage one:

This will be where the water will induce most of its cleaning through a four stage wetland.



bioswale collection:

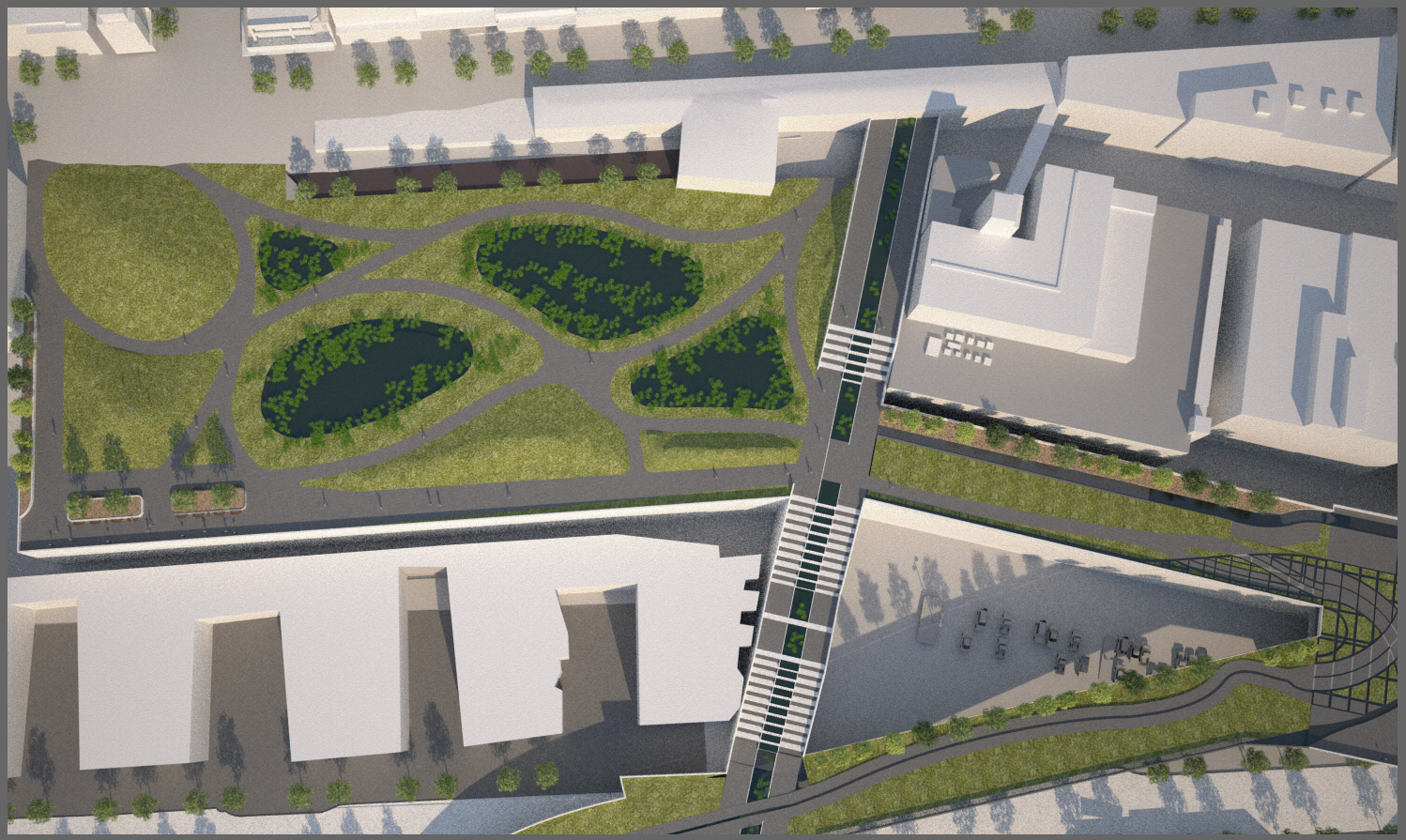
Bioswales will be within the boulevards to collect the stormwater and divert it to the park for proper filtration. Here will be four ponds that will slow the water down and clean it step by step.

greenways | green infrastructure:

The greenways are linear vegetation buffers that connect my site to the rest of the community. The greenways treat stormwater while providing an enjoyable, living, green space serving as an aesthetically pleasing walkway for individuals.

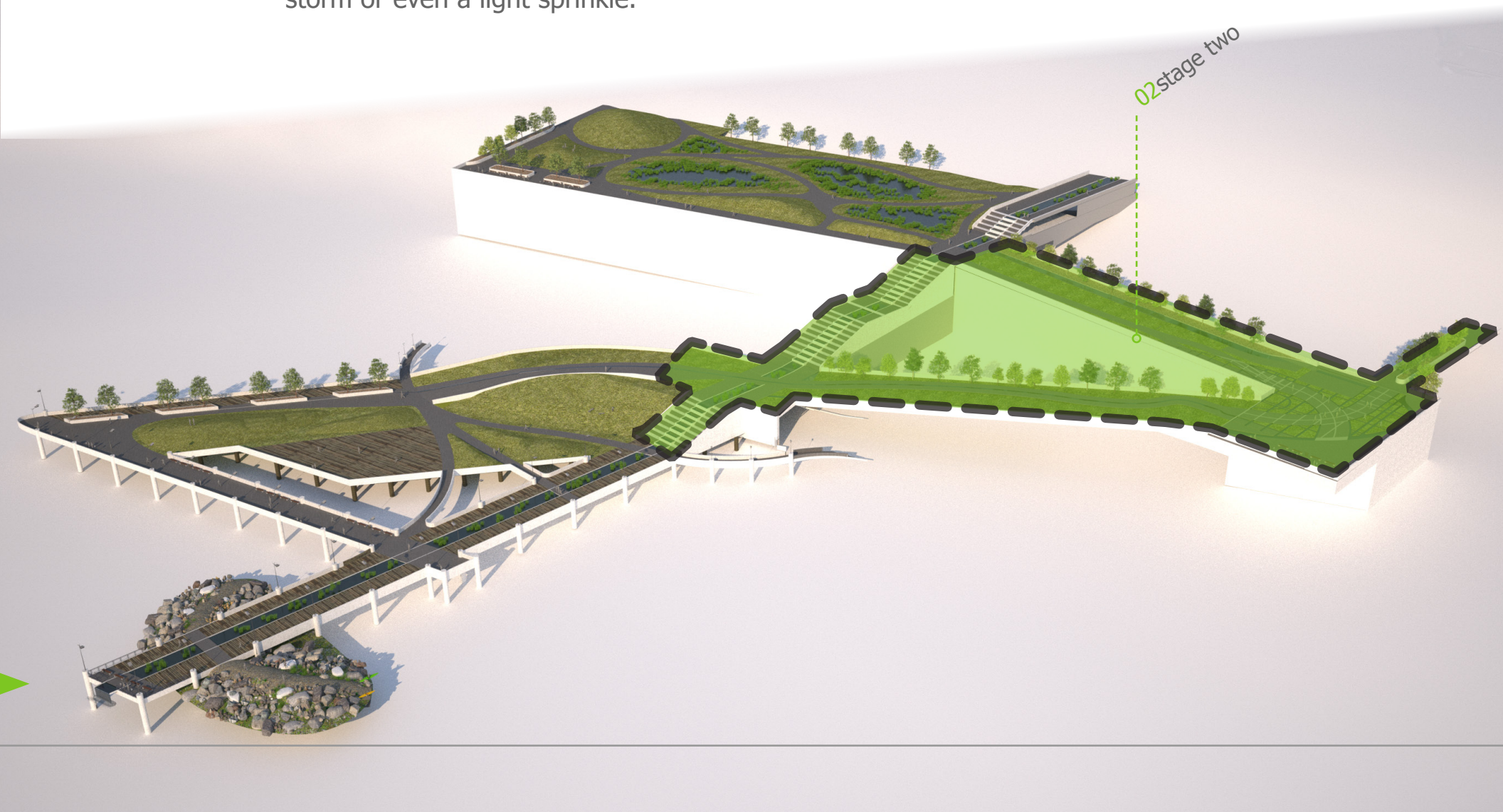
victor stienbrueck park:

The old Victor Steinbrueck Park is transformed into a viewing area highlighting nature and the filtration ponds. While acting as a water cleansing system, the filtration ponds also create a space for individuals in the community to gather and learn.



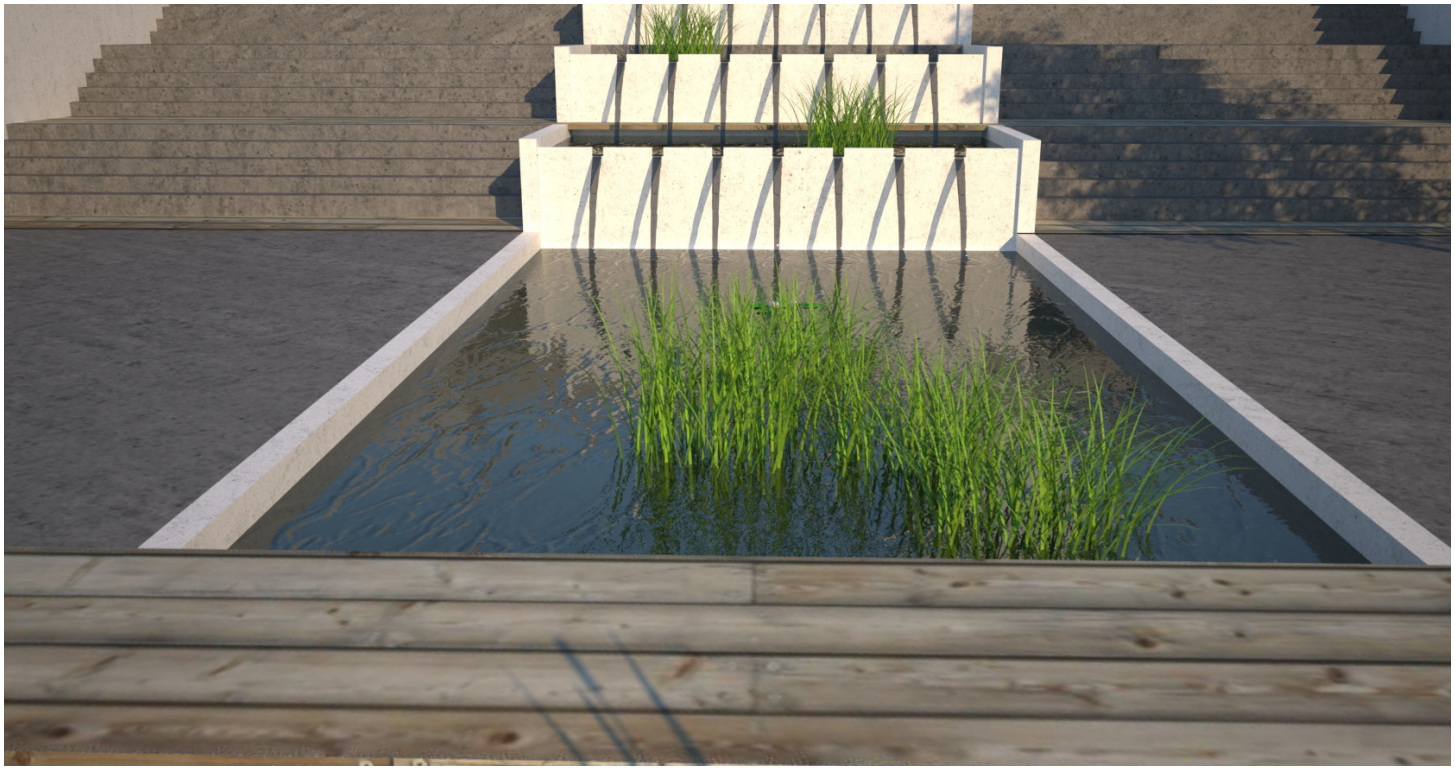
stage two:

This stage will be where the water will be filtered through a low flow terrace system that doesn't release water until new water is brought in such as a rain storm or even a light sprinkle.



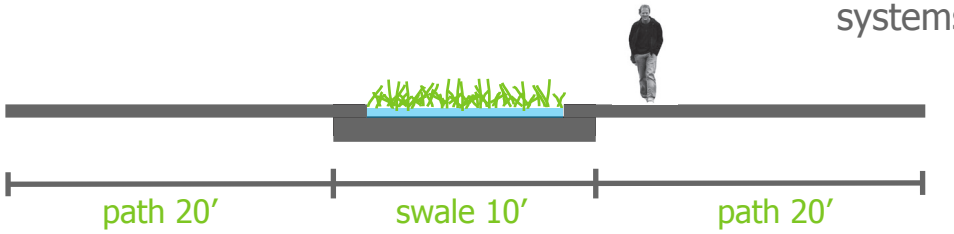
meandering ramp:

This birds-eye-view shows how the various path systems run throughout the space. The stairway provides access to the pier for those who are eager to be at the water's edge. On the other hand, the walking path serves as an outlet for individuals to meander and enjoy their surroundings on their way to the water. Additionally, this view shows the Southside viewing area, which directly connects the pier to Pike Street.



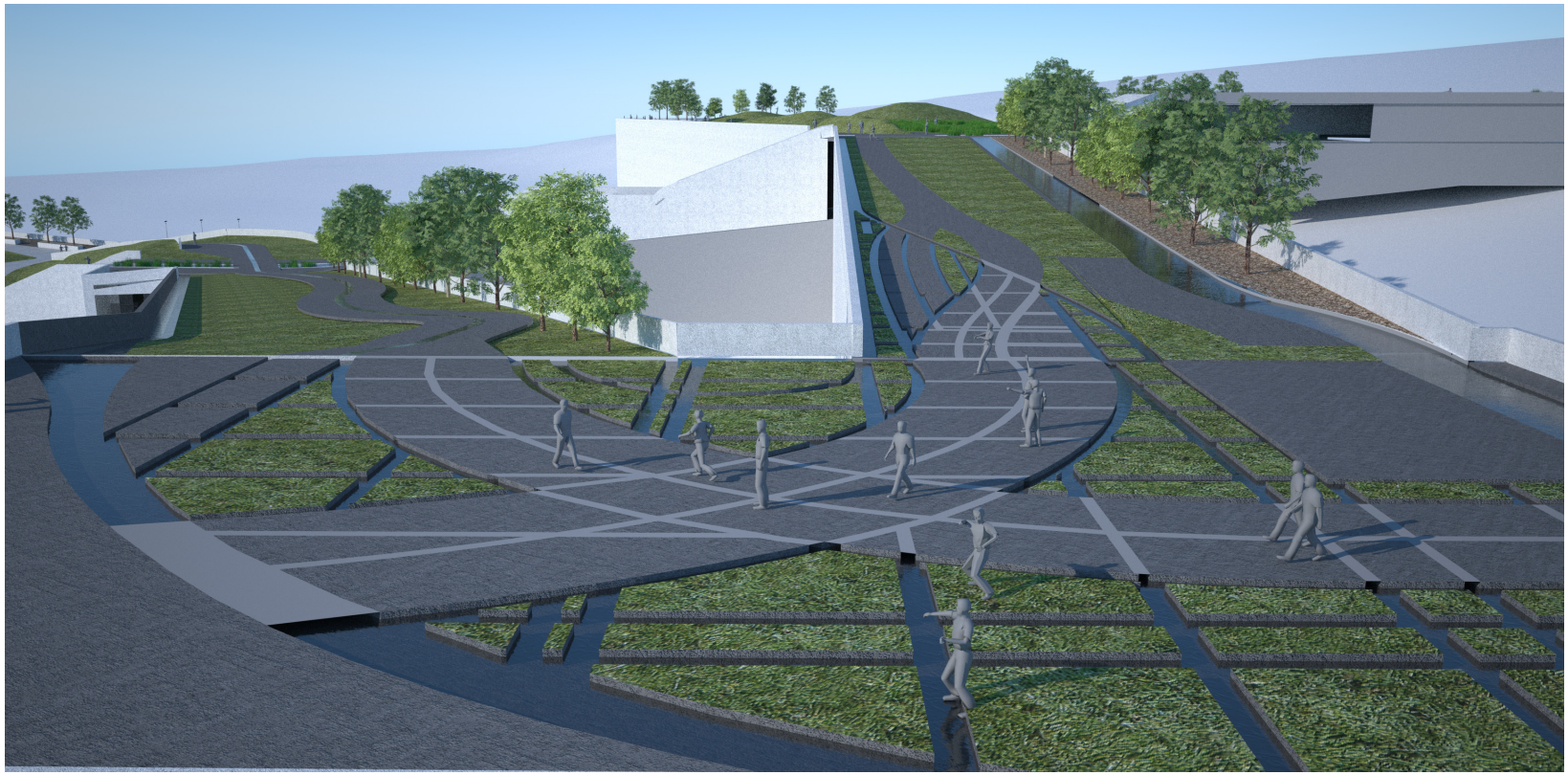
filtration terrace system:

Pikes Place Market is the starting point for the stairway that transports users to the waterfront of Puget Sound. These low-flow reservoirs serve as elements of interest and as purification systems for the water being released back into the sound.



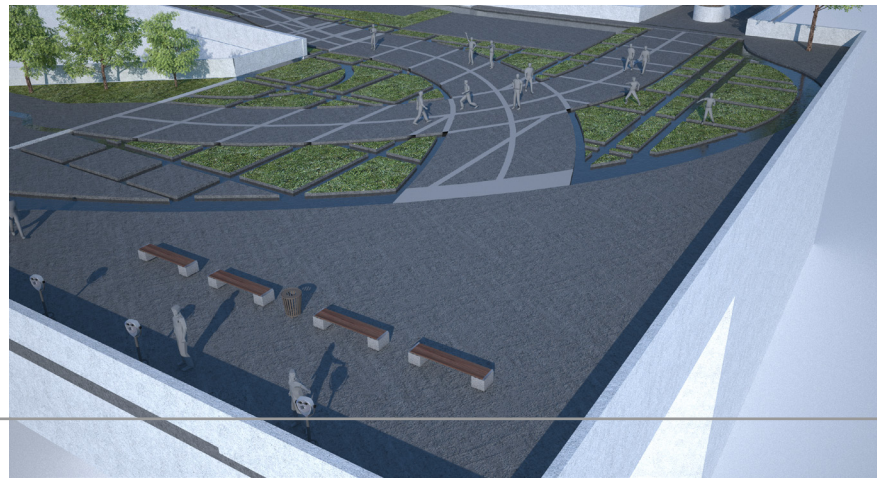
southside viewing area:

This view shows the Southside viewing area plan, which directly connects the pier to Pike Street. This area will be a delightful area to enjoy views of puget sound and of the skyline.



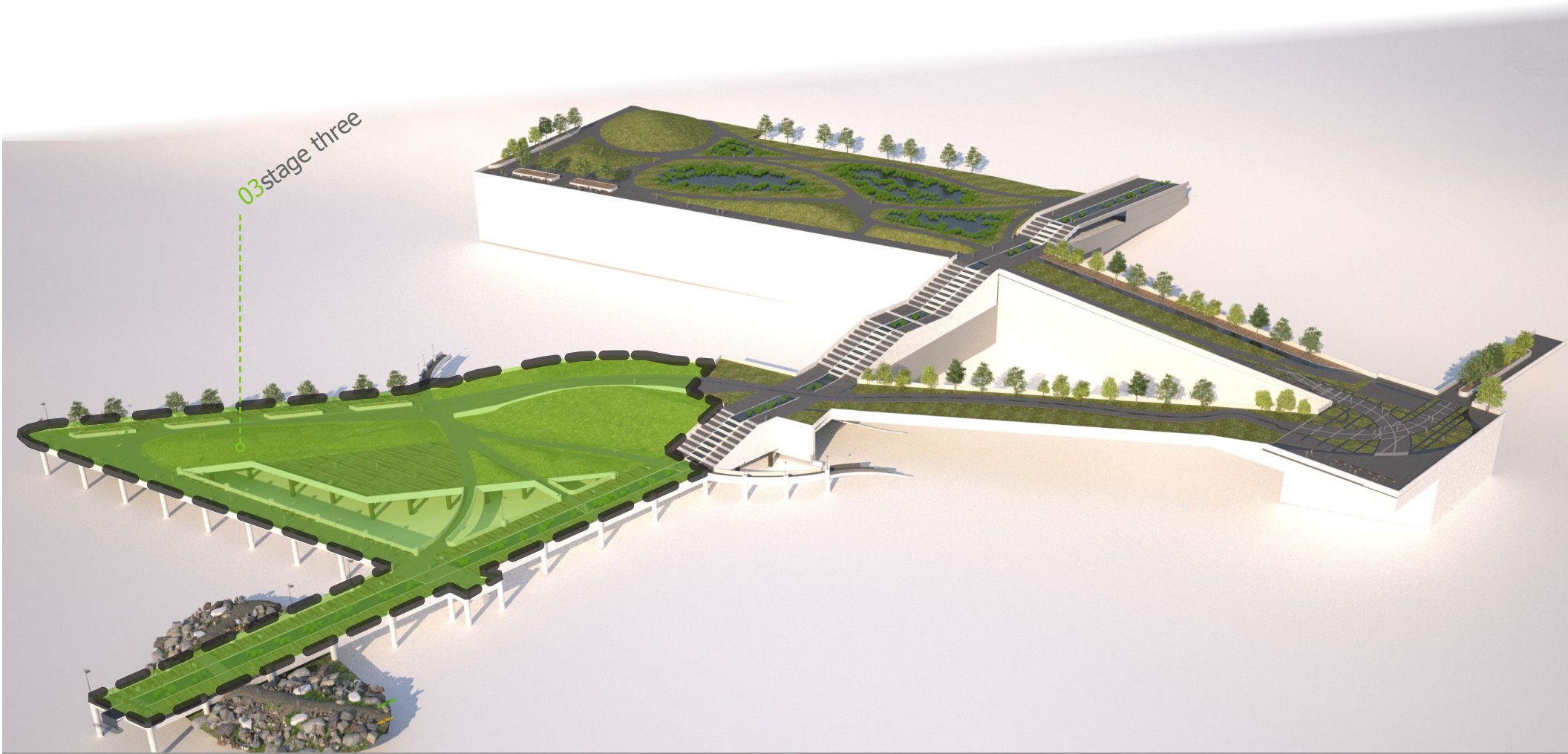
southside viewing area:

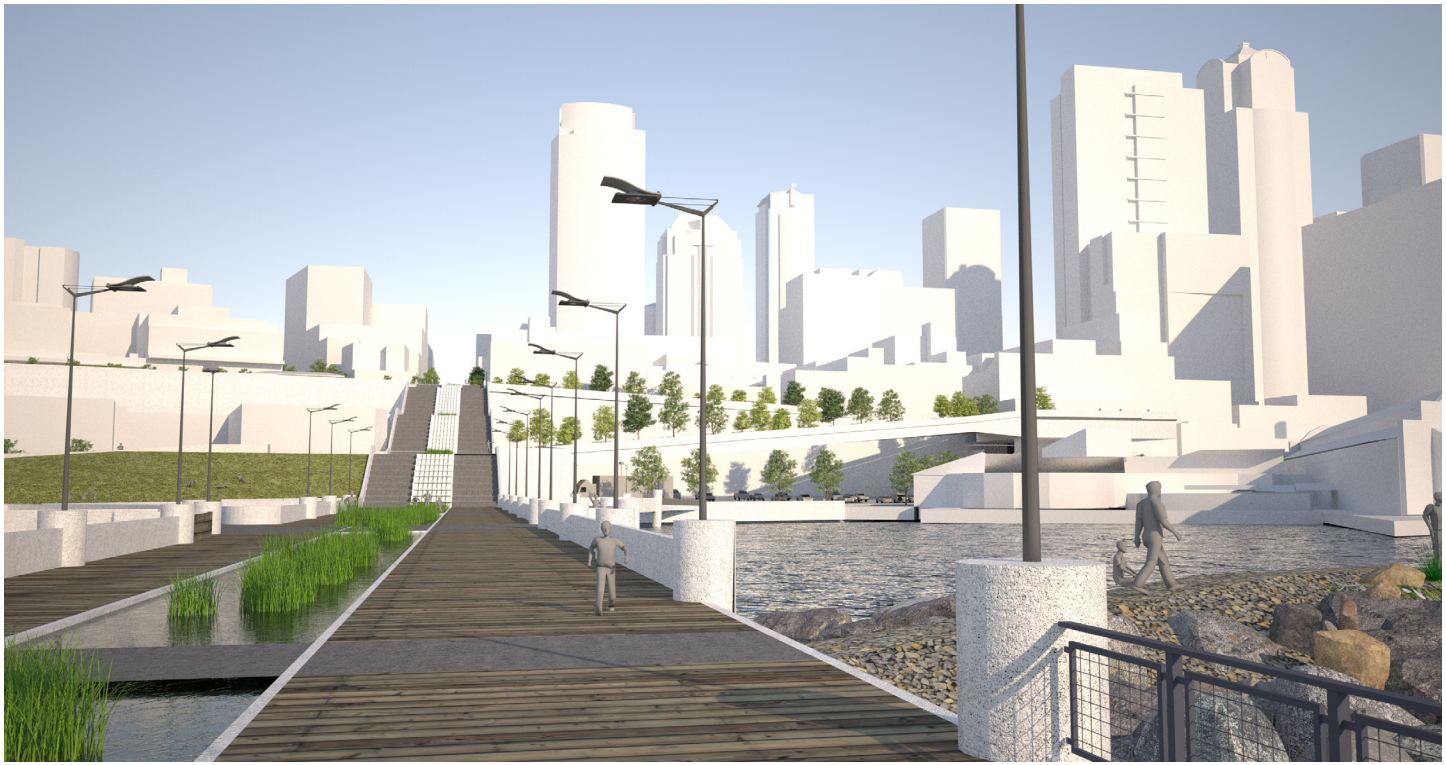
This view shows the Southside viewing area, which allows pedestrians to interact with the stormwater while the learn about it. This area will be a delightful area to enjoy views and hop over the water.



stage three:

This stage will be the final releasing of the filtered water.





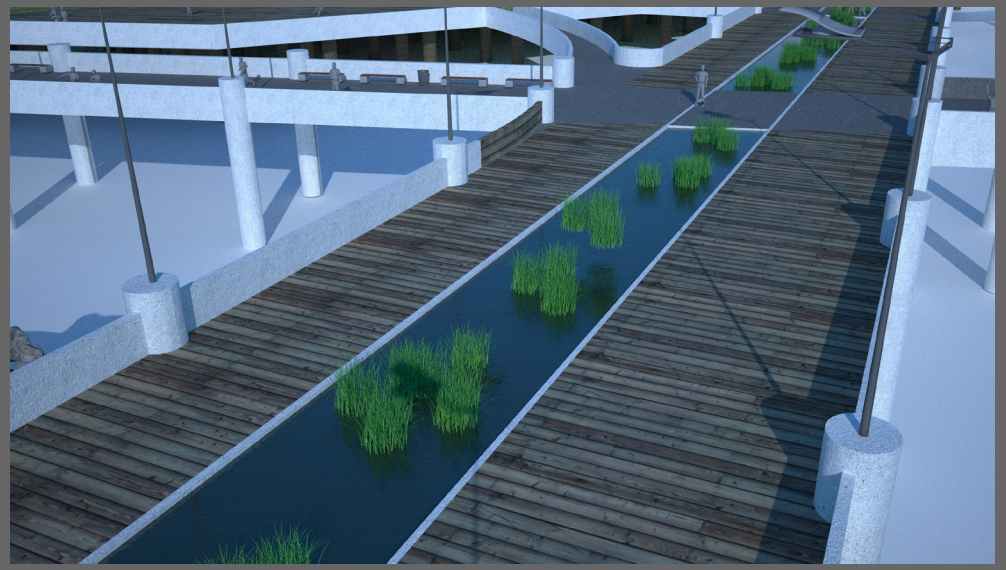
end of pier:

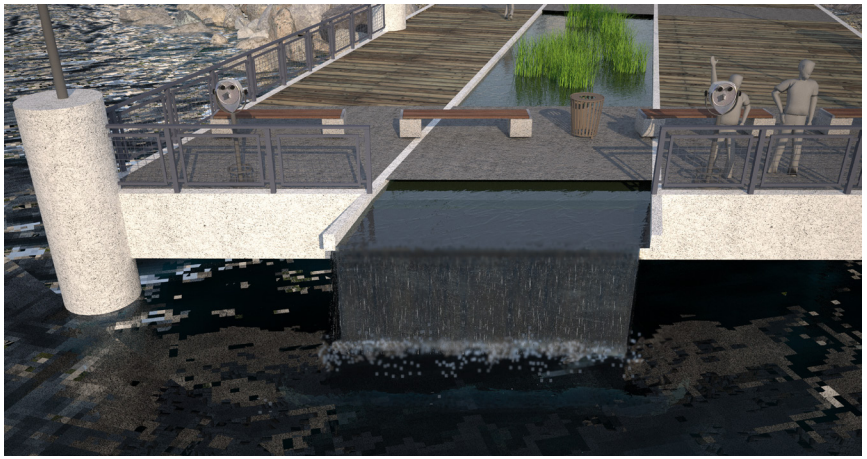
This perspective shows how users of the space would experience the end of the pier. Looking towards the city, individuals are able to see how this integrated nature fits into the city environment.

photo by: Zerek Kroll

water interaction:

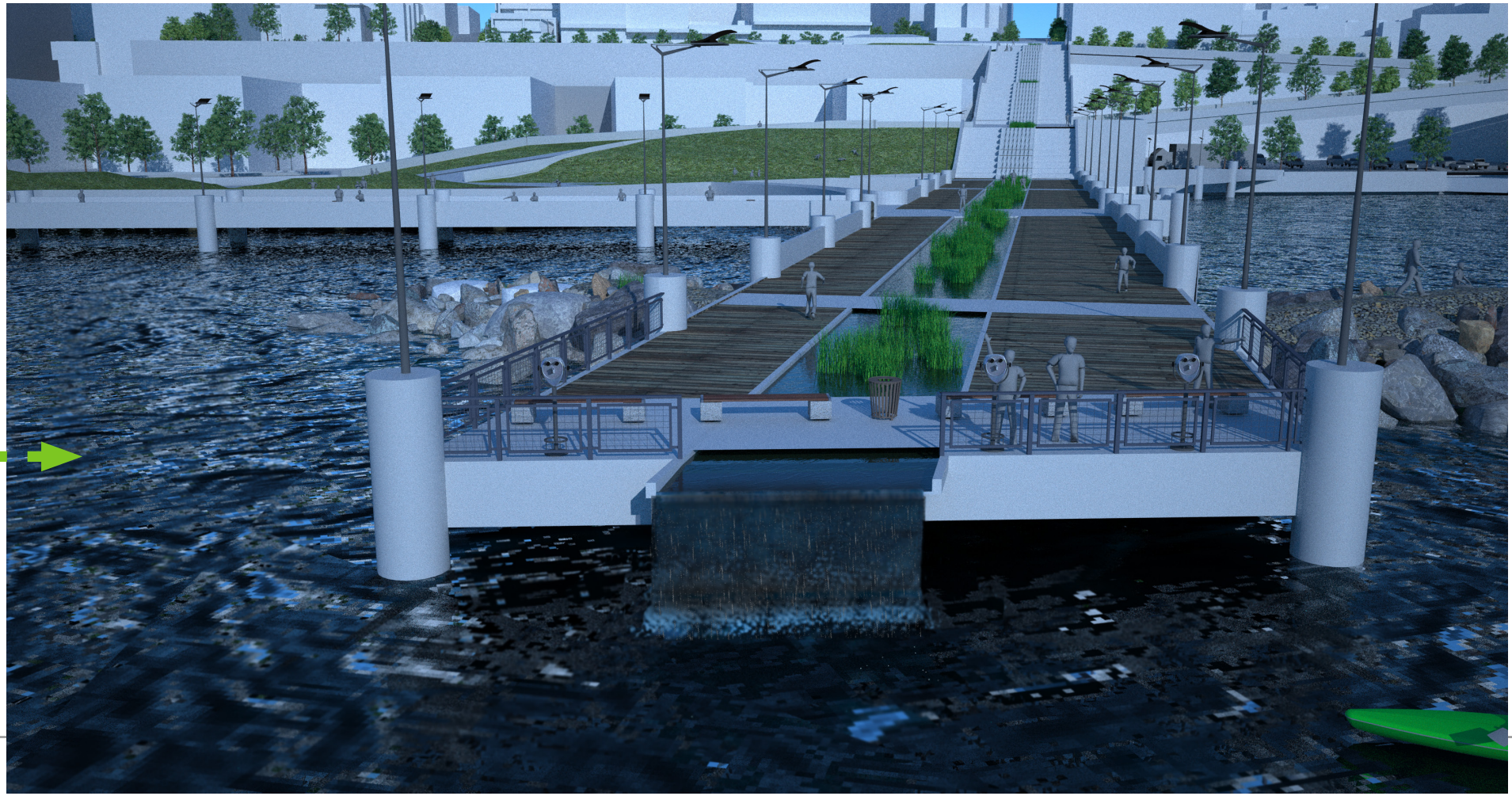
The end of the pier serves as an access point where individuals can interact with Puget Sound. This would be a great spot to put your kayak or canoe into the water and enjoy a day discovering puget sound or just able to touch the water. It also includes a stormwater filtration release waterfall that is fed by a long shallow yet narrow pool.

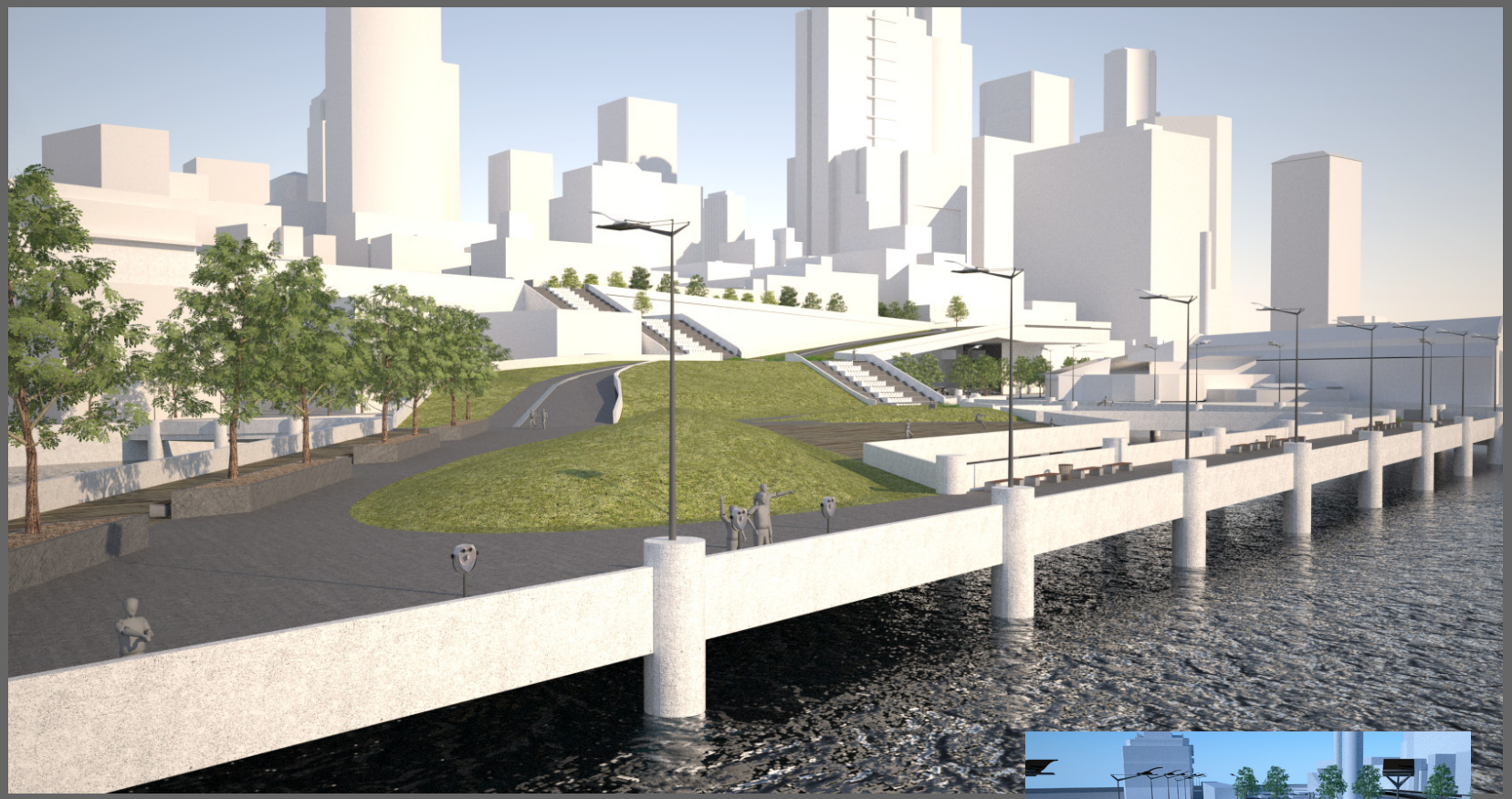


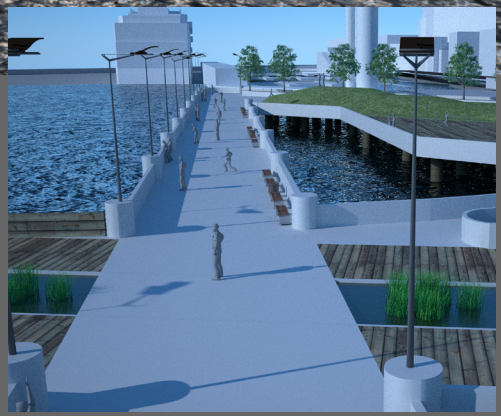


relaxation area:

This area of the pier displays fountain-like tubes that allow water to filtration from the reservoirs back into Puget Sound. The sound of running water paired with natural materials and fresh air create a tranquil area for relaxation and reflection.





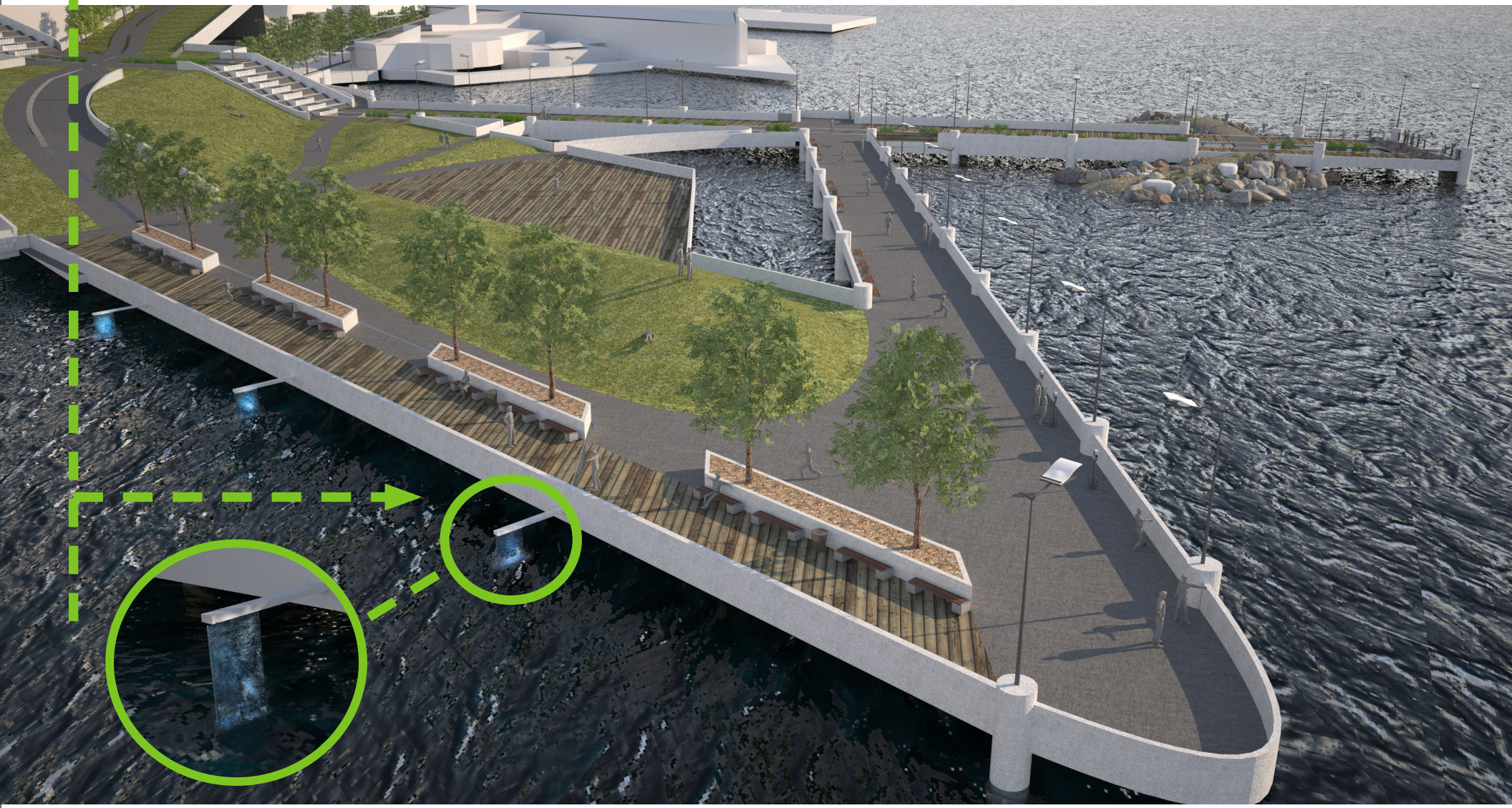


viewing area:

This part of the design solution allows users to experience the connection between Puget Sound and the city of Seattle, WA. Standing on this part of the pier allows individuals to look out onto the water, and turn around and see skyscrapers behind them. This space allows people to actually see how this built green environment fits into their neighborhood.

relaxation area:

This area of the pier displays fountain-like tubes that allow water to filtration from the reservoirs back into Puget Sound. The sound of running water paired with natural materials and fresh air create a tranquil area for relaxation and reflection.



120

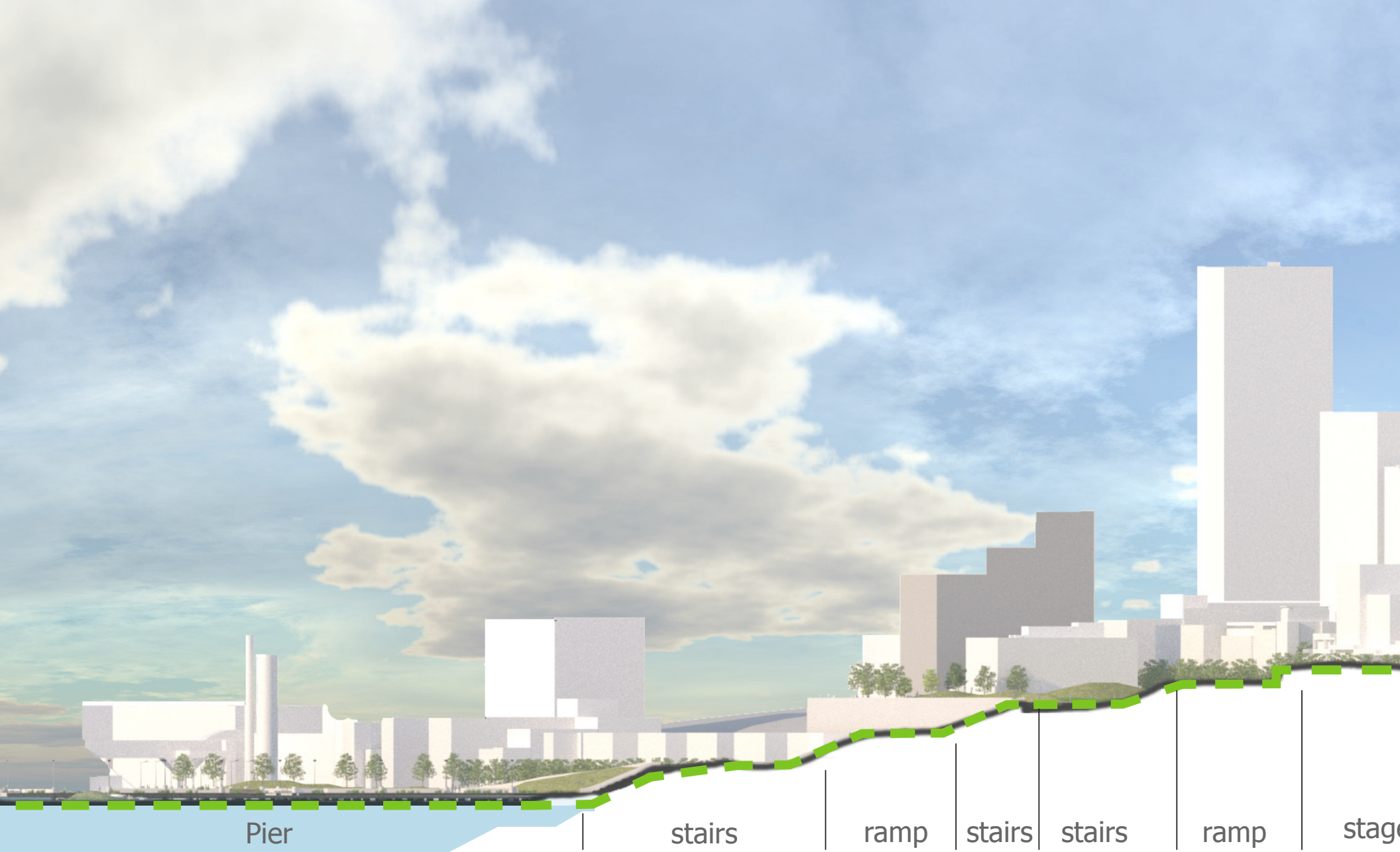
DESIGN

PERSPECTIVE

before:

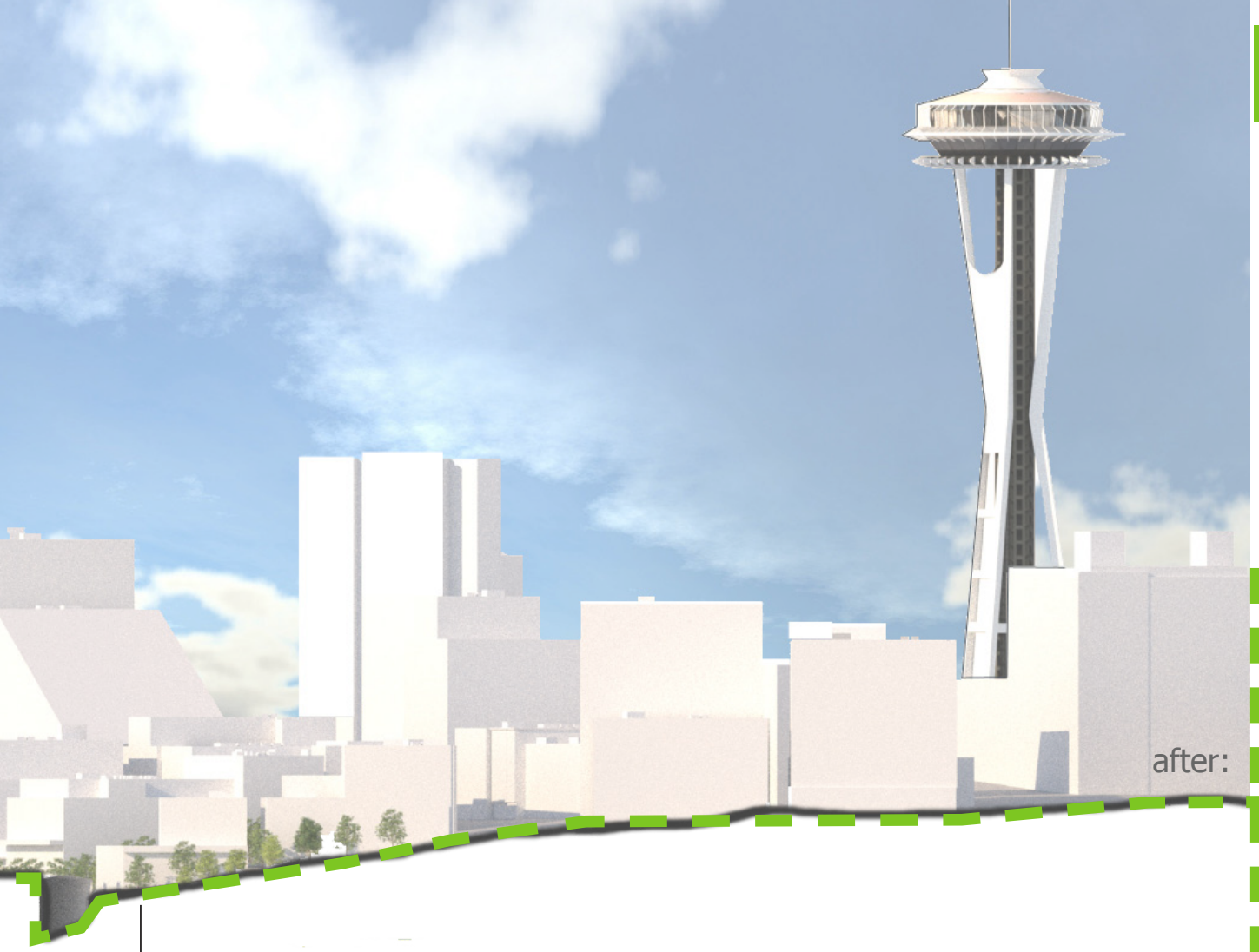
photo by: Zerek Kroll

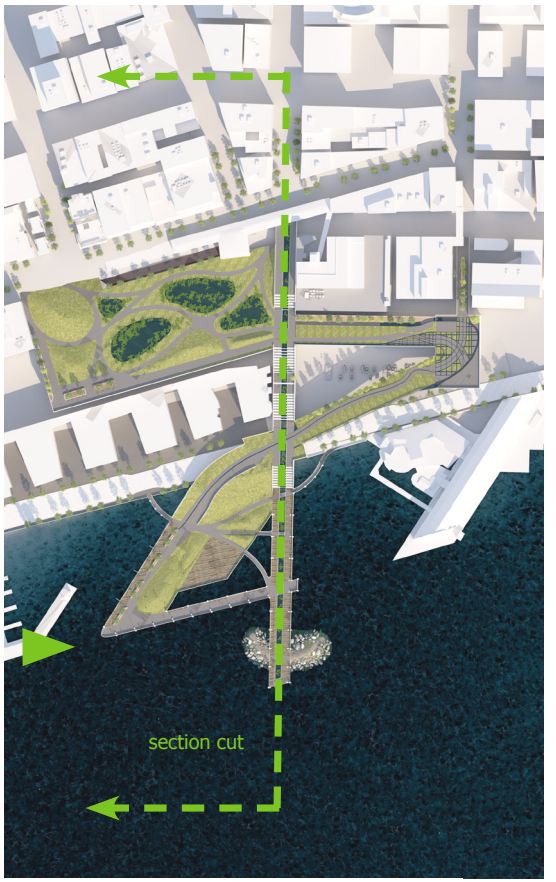
after:



section:

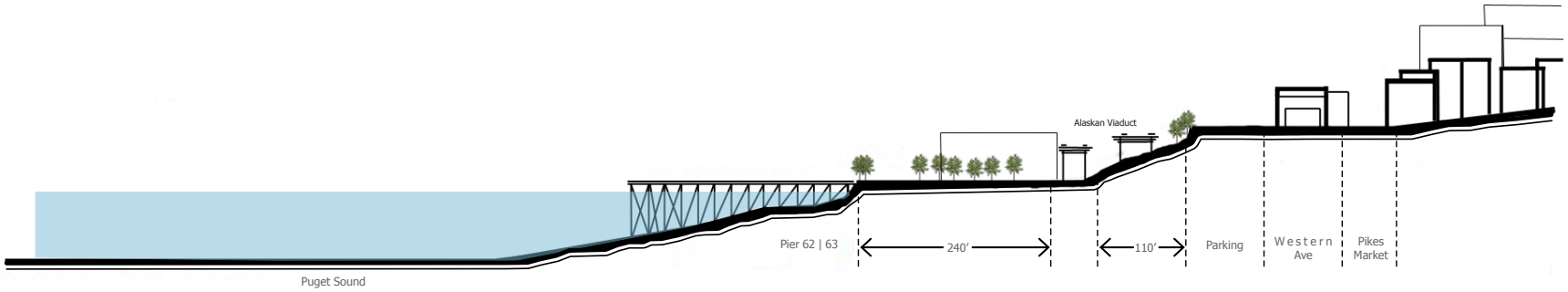
This section shows what the drast topography that is present on site changed to what it could be. You can also start to see the context and size of everything.

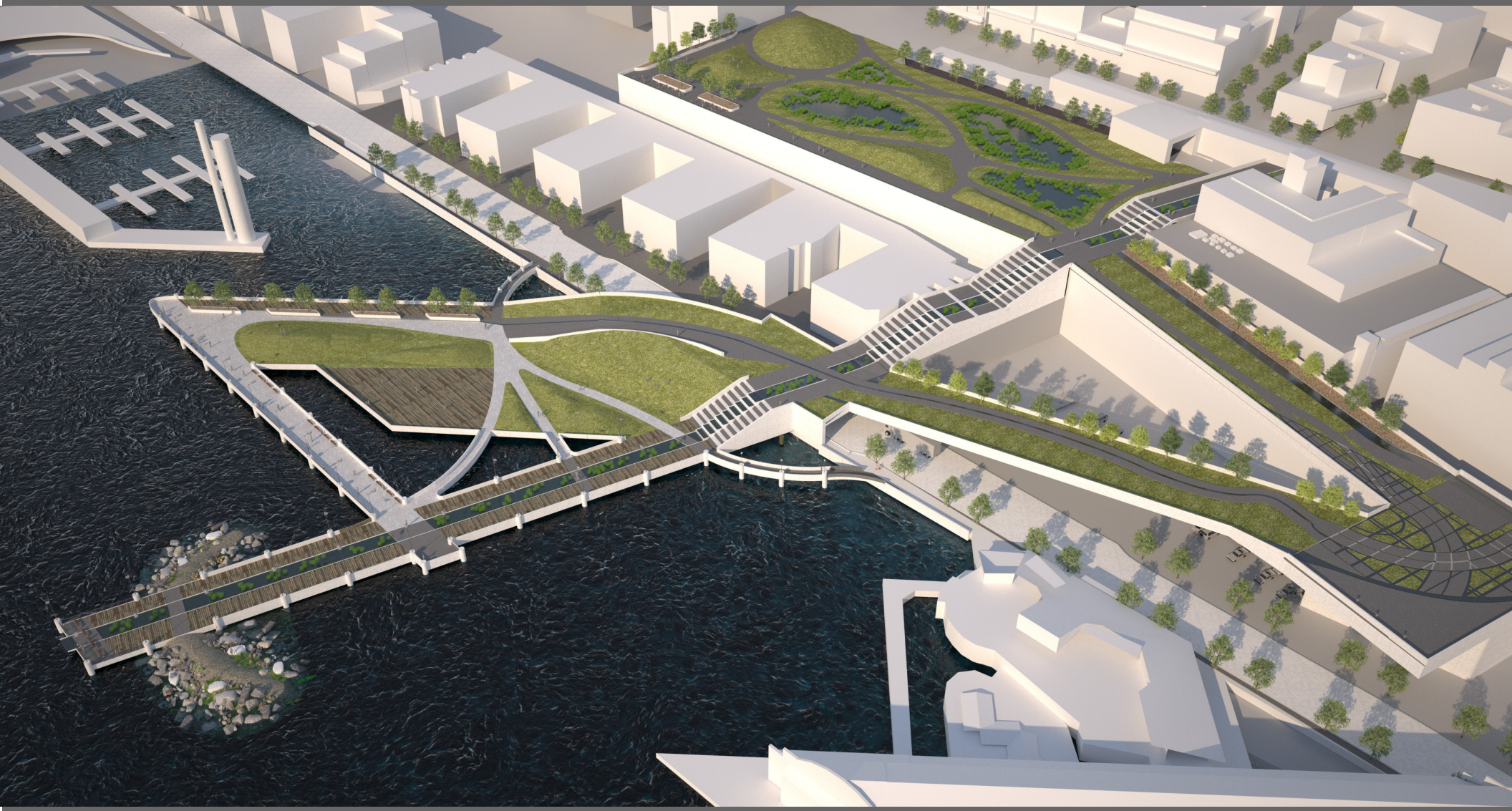

after:


section cut

before:

e 1


Alaskan Viaduct
Pier 62 | 63
240'
110'
Parking
Western Ave
Pikes Market
Puget Sound



statement of intent: *"How can sustainable stormwater management practices be incorporated into an urban environment while also creating public awareness and involvement?"*

statement

Webpages references

King, J. (2011, October 18). The Re-Representation of Urbanism. Retrieved from http://landscapeandurbanism.blogspot.com/2011/10/unlocking-lu-2-re-representation-of.html

City of Seattle. Seattle City Government, Department of Planning & Development. (2012). Seattle population & demographics. (N/A). Retrieved from City of Seattle website: http://www.seattle.gov/dpd/Research/Population_Demographics/Overview/default.asp

Whitman, J. (2011). Seattle temperatures by month. Retrieved from http://seattletravel.com/weather.html

Stormwater Management Program. Seattle Public Utilities(2001). Retrieved from http://www.seattle.gov/util/About_SPU/Drainage_&_Sewer_ System/Plans/StormwaterManagementProgram/

EPA. Environmental Protection Agency , Office of Wastewater Management. (2011). Stormwater Program. Retrieved from N/A website: http://cfpub.epa.gov/npdes/home.cfm?program_id=6

UNEP. (N/A). Statistics: Graphs and maps. Retrieved from http://www.unwater.org/statistics_res.html

United States Geological Survey , Department of the Interior. (2008). Natural processes of ground-water and surface-water interaction: The hydrologic cycle and interactions of ground water and surface water. Retrieved from Publishing Service Center website: http://pubs.usgs.gov/circ/circ1139/htdocs/natural_processes_of_ground.htm

Why. (2012). Retrieved from http://www.stormwaterpa.org/why-overview.html

Visitacion, B., Booth, D., & Steineman, A. (2009). Costs and benefits of storm-water management: Case study of the puget sound region. American Society of Civil Engineers, 135(4), doi: http://dx.doi.org/10.1061/(ASCE)0733-9488(2009)135:4(150) (9 pages)

Ecosystem services. Stormwater PA. (N/A). (2012). Retrieved from http://www.stormwaterpa.org/to-improve-water-quality.html

For the economy. Stormwater PA. (N/A). (2012). Retrieved from http://www.stormwaterpa.org/for-the-economy.html

*In the order they occur.

Webpages

Ecosystem services. Stormwater PA. (N/A). (2012). Retrieved from http://www.stormwaterpa.org/to-improve-water-quality.html

For the economy. Stormwater PA. (N/A). (2012). Retrieved from http://www.stormwaterpa.org/for-the-economy.html

To improve water quaility. Stormwater PA. (N/A). (2012). Retrieved from http://www.stormwaterpa.org/to-improve-water-quality.html

Churchill, E. J. (2010). Assessing stormwater management in king county, washington: an evaluation of pollution mitigation strategies. Low impact development 2010: redefining water in the city. Proceedings of the 2010 International Low Impact Development Conference, San Francisco, California, USA, 11-14 April, 2010., Reston: American Society of Civil Engineers (ASCE), 2010, 1101-1110 Retrieved from http://web.ebscohost.com.proxy.library.ndsu.edu/ehost/detail?sid=2a85e98f-508d-42bf-8202-3d7615910540@sessionmgr104&vid=1&hid=105&bdata=JnNpdGU9ZWhvc3QtbGl2ZSZzY29wZT1zaXRl

Sw 12th avenue green street . (n.d.). Portland Bureau of Environmental Services. City of Portand, OR. Retrieved from http://www.portlandonline.com/bes/index.cfm?c=45386&a=123776

Swales on yale. (2011). Seattle Public Utilities. Retrieved from http://www.seattle.gov/util/About_SPU/Drainage_&_Sewer_System/Projects/SwaleOnYale/ProjectDetails/index.htm

Sw 12th avenue green street project. (2006). Retrieved from http://asla.org/awards/2006/06winners/341.html

Tanner springs park. (2003). Retrieved from http://www.portlandonline.com/parks/finder/index.cfm?PropertyID=1273&action=ViewPark

Seattle Public Utilities, (2011). City of Seattle 2011 storm water management program. Retrieved from website: http://seattle.gov/util/Services/Drainage_&_Sewer/Keep_Water_Safe_&_Clean/RestoreOurWaters/index.htm

Engineering News-Record, & Architecture Record, (2009). Landscape Architects = Green. Posted by Jason King. http://landscapeandurbanism.blogspot.com/2009/08/landscape-architects-green.html

Monthly temperatures and rainfall in seattle. (1993). Retrieved from http://www.see-seattle.com/weather.htm

Seattle Public Utilities, (2011). City of Seattle 2011 comprehensive plan. Retrieved from website: http://www.seattle.gov/dpd/Planning/Seattle_s_Comprehensive_Plan/Overview/

Natrural drainage systems. (2011). Retrieved from website: http://www.seattle.gov/util/About_SPU/Drainage_&_Sewer_System/GreenStormwaterInfrastructure/NaturalDrainageProjects/index.htm

*In the order they occur.

REFERENCE LIST

Images

Schubach , E. (Artist). (2011). Washington state blank outline map. [Print Graphic]. Retrieved from http://www.theus50.com/images/state-outline-maps/washington-outline.gif

Setiawan, R. (Photographer). (2007). Space needle and downtown seattle in the evening. [Web Photo]. Retrieved from http://www.rudyphotography.com/wp-content/uploads/2007/10/space_needle_at_night.jpg

(2011). Blank outline maps of the united states — schools at look4. (2011). [Web Drawing]. Retrieved from http://schools.look4.net.nz/geography/ country_information/outline_maps/us

"Seattle." 47°36'22.36" N and 122°19'55.46" W. Google Earth. August 19, 2011. January 18, 2012.

"Pier 62/63." 47°36'33.02" N and 122°20'38.13" W. Google Earth. August 19, 2011. January 18, 2012.

"Seattle,WA" 47°60'35.61" N and 122°32'94.37" W. 3D Bing Maps. 2011. January 19, 2012. http://www.bing.com/maps/defaultaspx?v=2&cp=44.023938~-99.71&style=h&lvl=4&tilt=-89.875918865193&dr=0&alt=7689462.6842358#JnE9LnNlYXR0bGUlN2Vzc3QuMCU3ZXBnLjEmYmI9NjMuMDk0NDU0MTY4MDkwNyU3ZS00OC41MTM3MTA5Mzc1JTdlMTYuMDg3Mzk2MTA4NTQ0MiU3ZS0xNTAuOTA2Mjg5MDYyNQ==

Swales on yale. (2011). Seattle Public Utilities. Retrieved from http://www.seattle.gov/util/About_SPU/Drainage_&_Sewer_System/Projects/SwaleOnYale/ProjectDetails/index.htm

Perry, K. (Photographer). (2005). Looking north on sw 12th avenue. strong pedestrian circulation is maintained even with the addition of stormwater . [Web Photo]. Retrieved from http://asla.org/awards/2006/06winners/images/largescale/341-05.jpg

Perry, K. (Photographer). (2005). Project site plan showing the landscape stormwater planters at SW 12th Avenue. Stormwater runoff flows in and out of four consecutive stormwater planters located in the street's pedestrian zone. [Web Photo]. Retrieved from http://asla.org/awards/2006/06winners/images/largescale/341-02.jpg

Perry, K. (Photographer). (2005). Street runoff enters a stormwater planter during an intense autumn storm [Web Photo]. Retrieved from http://asla.org/awards/2006/06winners/images/largescale/341-07.jpg

Miller , J. (Photographer). (2010). Tanner springs park. [Web Photo]. Retrieved from http://www.flickr.com/photos/jonsview/4711566827/

(n.d.). North park square. [Web Photo]. Retrieved from http://www.dreiseitl.net//cms-gfx/27_Northpark_Square/020_TSP_bild1gr.jpg

(n.d.). Tanner springs park. [Web Photo]. Retrieved from http://archlandscapes.com/wp-content/uploads/2009/11/Tanner-Springs-Park-Landscape-Atelier-Dreiseitl-2005-USA-Oregon-Portland09.jpg

*In the order they occur.

Books

Axel, L. (2008). Designing with water. (p. 28). Boston, MA: Birkhauser.

(2007). Rain gardens. (p. 9). Portland, Or: Timber Press

(2001). Waterscapes: Planning, building, and designing with water. (p. 40, 125). Basel: Birkhauser.

France, R. L. (2003). Wetland design: Principles and practices for landscape architects and land-use planners. (1 ed., p. 80). New York City, NY: W.W. Norton & Company, Inc.

*In the order they occur.

references

Zerek R. Kroll

"I've always enjoyed Landscape Architecture and the work I've accomplished throughout the years, if designing is what I choose for a profession I feel like I wouldn't have to work a day in my life."

-Zerek Kroll

1012 10th Ave SE
East Grand Forks, MN, 56721
(218)-791-2262
http://zerekkroll.com/
Zerek.Kroll@my.ndsu.edu

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PERSONAL IDENTIFICATION

ZEREK KROLL

photo by: Zerek Kroll