Waterfront Connections: A Dynamic Learning Environment for Downtown Seattle

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A Dynamic Learning Environment for Downtown Seattle

Introduction

"Architecture and education intersect when it comes time to plan, design, build, and use new learning environments . . . where architecture is not a vacuous space but a learning tool."[42]

Schools are being re-imagined as dynamic experiences where the larger built environment in which they are located are just as influential on what is learned as are the lessons. They are no longer passive spaces where children are confined to rows of desks within cramped classrooms only to absorb what their teacher tells them. Students are active learners who have a natural inquisitiveness, and they learn in various ways that require different types of spaces and experiences. Both collaborative learning through a community among the students and teachers and contextual learning opportunities within the larger built and natural environments can contribute to an expanded view of education. When these internal and external relationships are valued and recognized as significant contributors to the educational experience, they guide the pedagogy, program, curriculum, and ultimately the design principles of the school (Figure 1).

This thesis proposes a K-12 option school, which explores the potential learning opportunities that exist in the Aquarium Plaza proposed by James Corner Field Operations on Alaskan Way and Pier 62/63 on Seattle's waterfront. The connections and relationships to, from, and within this place impact how students learn and how teachers teach, as well as influence the activities and courses that are offered, and the design of the spaces that support them. These factors enhance the interactions and relationships of the students with the physical location of the school, with the immediate community, with other students and faculty, and with the school building itself. This school also gives back to the greater context by recognizing the rich social and natural resources at this site and by providing facilities for community events and activities. Additionally, the opportunity to directly connect to the water provides a home base for an ecological-based facility as well as a dock for a mobile learning environment that explores the waters of Puget Sound and beyond.

[42] Taylor, Anne. Linking Architecture and Education: Sustainable Design for Learning Environments. Albuquerque, NM: University of New Mexico Press. 2009: 3.

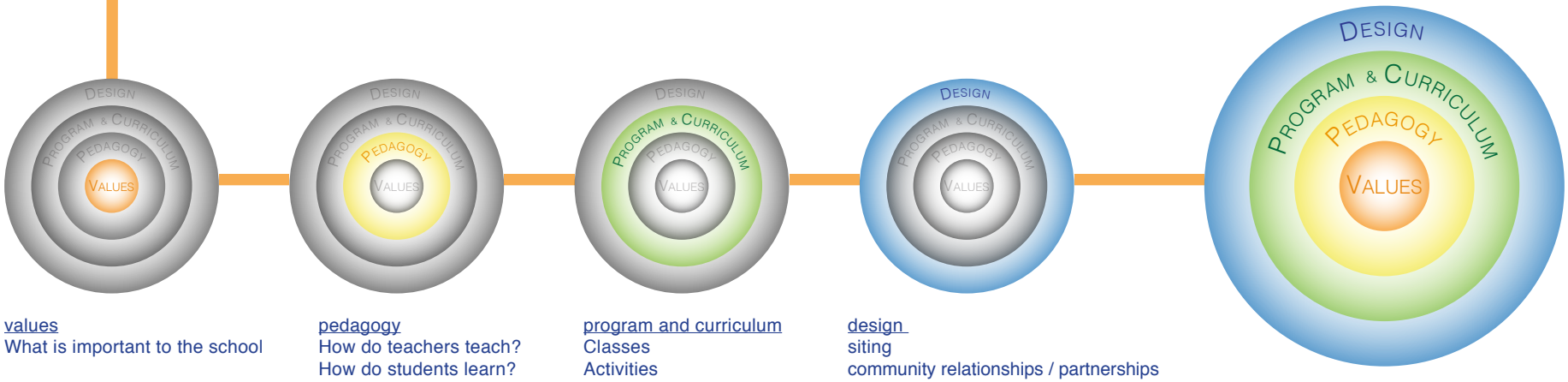
Students from Le Cordon Bleu College of Culinary Arts, Seattle, WA

University Child Development School, Seattle, WA

EXTERNAL RELATIONSHIPS
Community Partnerships
Environmental Connections

INTERNAL RELATIONSHIPS
Collaborative Learning
Social Interactions

DYNAMIC LEARNING ENVIRONMENT



values
What is important to the school

pedagogy
How do teachers teach?
How do students learn?

program and curriculum
Classes
Activities
Events
Spaces

design
siting
community relationships / partnerships
school community
building
environment

"learning has no boundaries"

Figure 1: Thereoretical Framework - Contributors to a Dynamic Learning Environment

Chapter I:

Educational Philosophies and School Design in America

School design in the United States has evolved in response to changing attitudes toward education. The prevailing values of the time dictated the educational pedagogy and curriculum, which in turn influenced the type and size of spaces needed to accommodate the courses that were offered. The location of the schools was usually determined by the proximity to the students' homes.

The first public schools in the United States were established in the late 18th and 19th centuries, around the time of the Industrial Revolution. These schools focused on fulfilling the minimum competency and literacy level needed to live and work in a rapidly industrializing, democratic society. They offered a limited six-year curriculum that focused on basic skills like reading, writing, and arithmetic. The iconic one-room schoolhouse was the archetype for this time (Figure 2). It was a modestly size building that accommodated 50-100 students and one teacher, and it was usually found in a rural or small-town setting. Because these schools were within walking distance of the students' homes, many were spread throughout the countryside.

In the mid-19th century, the American educator, Horace Mann, introduced the present school structure of 8 years of grammar school followed by 4 years of high school. Mann believed that school programs needed to be broadened to emphasize "the development of the body and character, as well as the mind"[43]. These subjects included basic science, languages, music, art, and physical education. To accommodate

Figure 2: Mt. Zion One-room School House

[43] R. Thomas Hille, AIA. Modern Schools: A Century of Design for Education (New Jersey: John Wiley & Sons, Inc., 2011), 13.

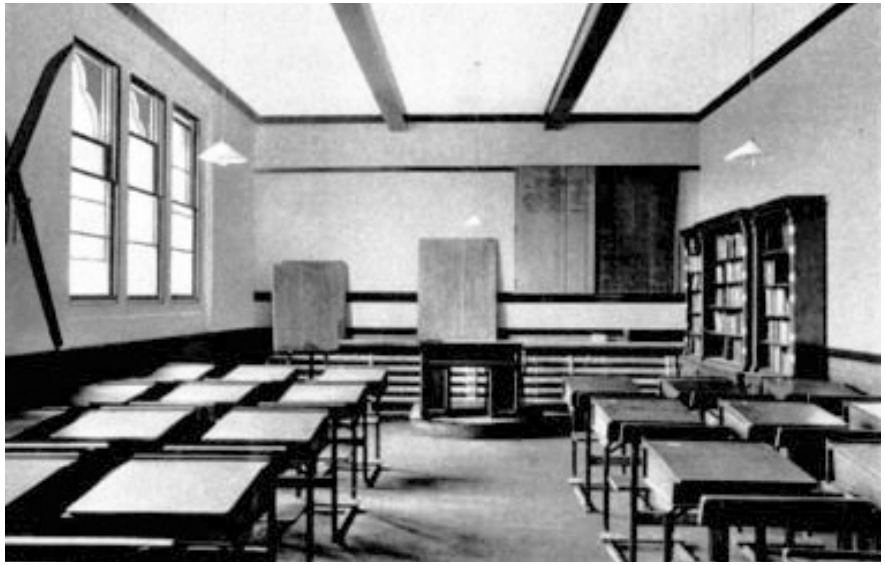


Figure 3: A Late 19th-century School Classroom

the expanded curriculum, larger schools were designed and diversified. Playgrounds, gymnasiums, and other related amenities were developed to correspond to a more physically active student population. There was also an emphasis on the comfort and health of the occupants, which resulted in improved mechanical, heating, and ventilation systems. In order to serve more students, a growing number of schools were located in urban areas.

The first large urban schools were introduced in the second half of the 19th century as a response to the rapidly-growing immigrant population. The goal of the schools at this time were to sustain basic educational courses and instill in students "the values of conformity, punctuality, proper manners and behaviour, and a strong work ethic"[44]. It became the prevalent pedagogy of this time to assume "that teachers were there to teach by imparting knowledge, and students were there to learn by passively receiving it"[45]. The class size was large, typically 50-60 students, and increased student populations, that sometimes numbered in the thousands, "carried the anonymity of the big city street into the hallways of the school"[46]. The archetype for these urban schools was a utilitarian, one or two-storey single block building comprised of homogenous classrooms organized symmetrically around a central hallway. The exterior walls of the school were usually of brick, and the floors and the interior walls were of wood. The school furniture were standardized individual desks bolted in rows to the floor. The only source of light that entered the classrooms were from tall narrow windows on two, sometimes three, sides of the room (Figure 3).

By the early 20th century, the program of the schools became more complex and diversified to include administrative offices; common multi-use

[44] Hille, 13.
[45] Hille, 13.
[46] Hille, 13.

facilities used by the school and the greater community, such as lecture halls, libraries, auditoriums, gymnasiums, and cafeterias; and specialized classrooms to accommodate kindergarten rooms, science laboratories, art studios, and music rooms. Other new elements included outdoor classrooms and classrooms with operable exterior walls that contributed to the improved health and hygiene of the students; nonstructural partition walls that allowed for flexible configurations of the rooms; and extensive development of the surrounding site into fields for organized athletics. At this time, there were also concerns for the physical health, well-being, and safety of the students crowded into these large urban schools and therefore, improvements were made to lighting, ventilation, and fire safety.

The utilitarian nature of these buildings was reinforced with the need to "turn out" as many students as possible and therefore, school design became highly regulated and standardized, resulting in "rational, systematic, and highly efficient planning at the lowest possible cost"[47]. To be structurally and materially economical, the classrooms were organized in multiple blocks in wings around double-loaded corridors that allowed students to circulate efficiently as well as mechanical systems to be distributed evenly. Because fire safety was a significant concern, brick and concrete were used in the construction of the building. The design standards specified high ceilings (12 to 15 feet) to accommodate tall windows, which in many cases provided the only source of light. The typical classroom was 32 feet by 28 feet and still featured fixed rows of standardized seating with the teacher's desk in front by the blackboard. Because of the standardization of these schools, they were inflexible with respect to the building's ability to adapt over time to changes in the educational program (Figure 4).

Figure 4: Typical 'Utilitarian' School

[47] Hille, 14.

Educational Reforms – Children are Active Learners

In the late 19th and early 20th centuries, the progressive educational reform movement was pioneered by educators like Francis W. Parker, John Dewey, and William Kirkpatrick, who saw limitations in the teachings and curriculum of the school system and the facilities that were designed to support them. These leaders believed that the traditional teaching methods did not acknowledge the individual needs of the student – that there was an emphasis on "conformity and convention over self-discovery and self-motivation, and made students passive rather than active participants in the learning process"[48]. Many currently accepted practices and philosophies toward education were established at this time that recognized students to be "seekers of knowledge, rather than passive receivers of information"[49]:

- A child-centered education acknowledges that each person is unique and learns differently through different styles and at different paces, and the educational program has to be responsive, flexible, and adaptive to effectively accommodate special learning needs.
- A self-directed education or self-instruction recognizes the natural curiosity of children and views them as active independent thinkers and initiators who will learn most effectively on their own if given the opportunity. This approach promotes independent and small-group activities and exploration that encourage unique interests.
- Activity-based learning or learning by doing engages students by demonstrating the usefulness of what is learned through practical, real-world applications. Through project-based group and team activities, students become more receptive and motivated to learn as well as encourage students to socialize and work cooperatively with others.
- Integrated or interdisciplinary learning identifies the interrelationships among different subjects and disciplines. As a team, teachers from different yet complementary backgrounds co-instruct the students.
- Educating the whole child encourages the intellectual, physical, social, and cultural development of a child by expanding the basic curriculum to include subjects like sciences, languages, art, music, and physical education that help to develop socialization skills.
- Lifelong learning extends the educational opportunities beyond compulsory learning to include adult education, continuing education, vocational education, and work-based learning. These programs take advantage of existing school facilities by using classrooms, shops, studios, meeting rooms, assembly and lecture halls, auditorium, theaters, and cafeterias during off-use hours, like after school and on weekends.

[48] Hille, 15.
[49] IDEO, "Investigative Learning Curriculum Reimagining Teaching And Learning For 21st-Century Students" (www.ideo.com, 2008).

To accommodate these new approaches to education and learning, new and different kinds of learning spaces were designed to be flexible, responsive, and adaptive. These spaces supported an expanded definition of learning that promoted "socialization, self-awareness, community interaction, and public health and welfare . . . - an acknowledgement that the educational process is by necessity more integral to everyday modern life and more reflective of its values"[50]. The architecture of the modern school reflected these new patterns of learning. The building became more open and interconnected both inside and out. A connection to the outdoors became common practice for health and hygiene, access to natural light, fresh air, exercise, and as a place for learning. Other prevalent educational pedagogies that arose in the 20th century and that are still present and influential today, actively customized the school environment to reflect their values and guiding principles.

Maria Montessori, Italy, 1907 - First Montessori classroom

The Montessori method stresses the importance of free will in the learning process and that children must have the freedom to express themselves by exploring and developing on their own. Maria Montessori believed that a child is "formed by the environment"[51], and Montessori schools have well-ordered classrooms that are child-scaled. They are open, decentralized, and individualized to allow children to develop on their own through spontaneous, active participation. Building

Figure 5: Delft Montessori School, Herman Hertzberger, Delft, Netherlands (1966-1981). The library is located within the open space of the hall to encourage interactive use. The reading table and book display provide opportunities for spontaneous activities.

[50] Hille, 16.
[51] Hille, 343.

materials are often left exposed and unfinished to stimulate learning and encourage interactivity, and the classroom is diversified with specific zones designated for different learning activities that can accommodate simultaneous independent learning (Figure 5). The child is the "center of the activity, free to move about at will, and the teacher, by contrast, has no desk, no authority, and no directive to 'teach'"[52].

Figure 6: Addition to the Rudolf Steiner School, Schmidt Hammer Lassen Architects, Aarhus, Denmark (2009). A series of angled roofs result in every room having a different shape and character that creates engaging, colorful areas for students to explore as well as provides views of the schoolyard and the forest and sea beyond.

Rudolf Steiner, Germany, 1919 - First Waldorf school

Another influential educational philosophy that is still significant today is the Waldorf method, which was developed in the early 20th century by the Austrian philopher Rudolf Steiner. This practice integrates artistic, academic, and practical elements of education in order to "transform education into an art that educates the whole child—the heart and the hands, as well as the head . . . generating an inner enthusiasm for learning within every child"[53]. Dynamic, pictorial, creative, hands-on, physical activities and tasks and low-tech instructional methods are emphasized, such as pen and paper rather than computers, where "engagement is about human contact, the contact with the teacher, the contact with their peers"[54]. This methodology allows for individual variations in the pace of learning, based upon the expectation that a child will grasp a concept or achieve a skill when he or she is ready. Classrooms are large,open-spaces constructed with exposed, natural materials and adorned with evidence of student work (Figure 6).

[52] Hille, 343.
[53] "Why Waldorf Works", *Association of Waldorf Schools in North America* website (http://www.whywaldorfworks.org/02_W_Education/index.asp).
[54] Richtel, Matt. "A Silicon Valley School That Doesn't Compute". The New York Times. 22 October 2011.

Reggio Emilia, Italy, 1945

A more recent educational approach is the Reggio Emilia philosophy developed after World War II by Loris Malaguzzi in Italy who was inspired to build schools for "a new generation of highly creative, rather than destructive, people"[55]. The school is carefully planned and child-scaled to encourage free choice and creativity, as well as allow the teachers to collaborate and co-learm with the child by facilitating the child's learning through activities and lessons based on the child's interests, actively questioning the child to further understanding, and engaging in the activities alongside the child (Figure 7). The surrounding environment is considered the "third teacher", and each classroom is integrated with the rest of the school, and the school with the surrounding community. It is believed that children can best create meaning and make sense of their world through environments which support "complex, varied, sustained, and changing relationships between people, the world of experience, ideas and the many ways of expressing ideas"[56].

These schools are welcoming, livable, and complex at the same time, and spaces are integrated and connected allowing for free and unobstructed movement (Figure 8). There is high visibility and permeability among different areas and with the outdoors, and spaces are flexible and at times deployable to allow children to act on and modify their environment. There are also collective gathering 'piazza' spaces that emphasize collaboration and shared values, and atelier workshops and studios that support constructiveness and hands-on creativity.

Figure 7: University Child Development School (UCDS), Don Carlson, Seattle, WA (2003)
UCDS was designed following the Reggio Emilia principles. Teachers are regarded as educational researchers who continue to understand and inspire children through active engagement.

[55] Taylor, 76.
[56] Cadwell, Louise Boyd. Bringing Reggio Emilia Home: An Innovative Approach To Early Childhood Education. NY: Teachers College Press. 1997: 93.

Figure 8: University Child Development School, Don Carlson, Seattle, WA (2003)
The shared computing facility with adjoining library links a large wet lab gathering space to the classrooms beyond.

Crow Island School

Perkins, Wheeler, and Will & Eero Saarinen - Winnetka, IL (1940)

The Crow Island School was the first modern elementary school of its kind and is considered an " . . . expression of progressive education, . . . [an] inspiration to a new generation of school designers"[57]. It represented a revolutionary and influential change in thought for it was a building specifically designed for its occupants. According to Larry Perkins, who watched and plotted the children's actions in order to create the design (Figure 9), "It was the rejection of the rigid, conventional classroom"[58]. "Like all good buildings, it grew from the inside out. The needs of the children determined the individual classroom shape and this, in turn, determined the basic design of the building. No better self-contained classrooms are to be found"[59]. Each L-shaped, one-room module has an abundance of natural light from large low windows, and there is a private access to an outdoor courtyard that the class plants and maintains (Figure 10).

The school was designed to fit the child, and everything is scaled to their needs, from the height of door handles and blackboards, to the size of benches under the windows (Figure 11). Additionally, each classroom contains a workroom and a private lavatory. The classrooms are grouped in separate wings according to age level and are connected by a core of common use rooms, such as the auditorium, library, gym, activities room, and administration (Figure 12). "Everything at Crow Island affords young people a more intimate, homelike atmosphere while, at the same time, they experience an expansive sense of freedom. . . . In every way possible--through lighting and ventilation as well as texture and color, the architects provided for the welfare of the children who spend their hours of work and play in these rooms"[60]. According to Carleton Washburne, the Superintendent of Winnetka Public Schools in 1941, "The most important feature of the Crow Island School is that it is the architectural expression of an educational philosophy, which in Winnetka is essentially the philosophy of progressive education……it recognizes the child's need for physical health, emotional and social adjustment, self-expression and the development of special aptitudes, and the mastery of the useful parts of reading, writing, arithmetic, history, geography and science"[61].

[57] Taylor, 169.
[58] "Crow Island School" video, YouTube.com [http://www.youtube.com/watch?v=CfDM483zfyo].
[59] "History". *The Winnetka Public Schools District* website [http://www.winnetka36.org/CrowIsland/history].

[60] Shepherd, Roger. Structures of Our Time: 31 Buildings that Changed Modern Life. New York: McGraw-Hill (an Architectural Record Book). 2002. [http://rogershepherd.com/WIW/solution5/crow2.html].
[61] "Crow Island School" video, YouTube.com [http://www.youtube.com/watch?v=CfDM483zfyo].

Figure 9: Crow Island School - Larry Perkins noting children's activities

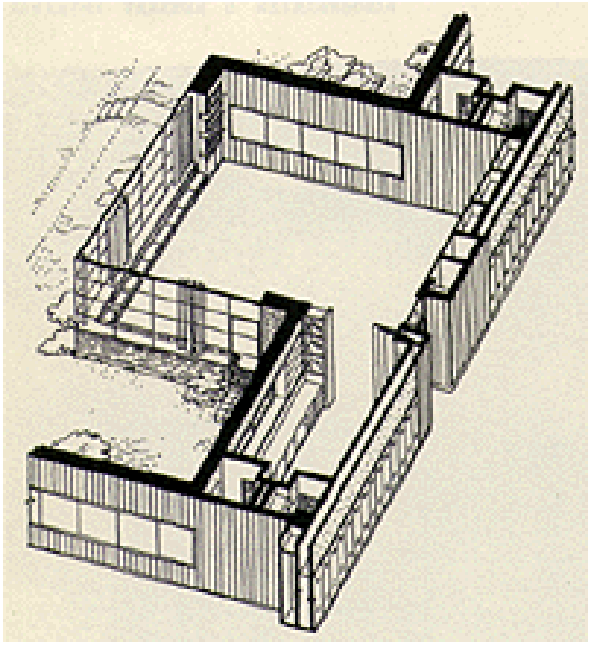


Figure 10: L-shaped classroom and adjacent courtyard of the Crow Island School

Figure 11: Crow Island School - The classroom is child-scaled.

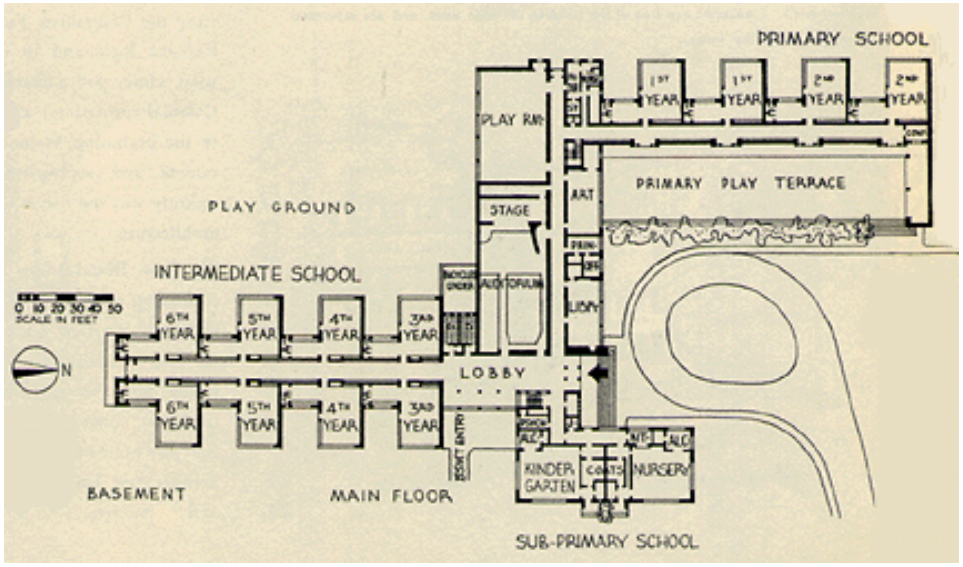


Figure 12: Plan of the Crow Island School depicting age-designated wings

Great Schools by Design

American Architectural Foundation (2009)

The relationship between the methods that promote children to learn and the facilities designed to effectively support them continue to be explored and expanded. In 2009, the American Architectural Foundation, along with the New York City Department of Education, conducted the Great Schools by Design initiative that began with a design charrette for the School of One Pilot program. The School of One program focuses on a curriculum that is customized to meet the needs of individual students through personalized learning experiences. According to Susan Wolff, Ed.D., an educational facilities planner from Oregon, "the goal is to create the freedom to be the best you can be. If we give them the space and freedom, they're going to come up with ideas and thoughts we don't have"[62].

The design aim of the program was to create a facility that retained these personalized methods while accommodating hundreds: "The School of One would create connections for all students: to their peers, to their teachers, to the environment, and to the future. . . . A sense of personal choice would reflect the philosophy of the school"[63]. The charrette resulted in designs that included a welcoming entryway, or "Porch", that connected to a large, central learning space equipped with monitors that displayed the students' daily schedules and learning sub-spaces. This central space functioned like a "coffee place . . . infused with technology and music and filled with flexible, comfortable furniture where students would create their own community"[64](Figure 13). This flexible environment enabled students to make connections with friends and teachers, allowed large and small groups to be educated, as well as provided spaces for collaboration among staff and students (Figure 14). Anchoring off the main central space were additional learning spaces that had flexible configurations or one of seven options of fixed configurations for personalized instruction (Figure 15). These various spaces enabled students to learn through different instructional modes, such as large and small group instruction, peer tutoring, individual tutoring, asynchronous instruction (self-paced software, online games), synchronous instruction (virtual tutors), and independent learning.

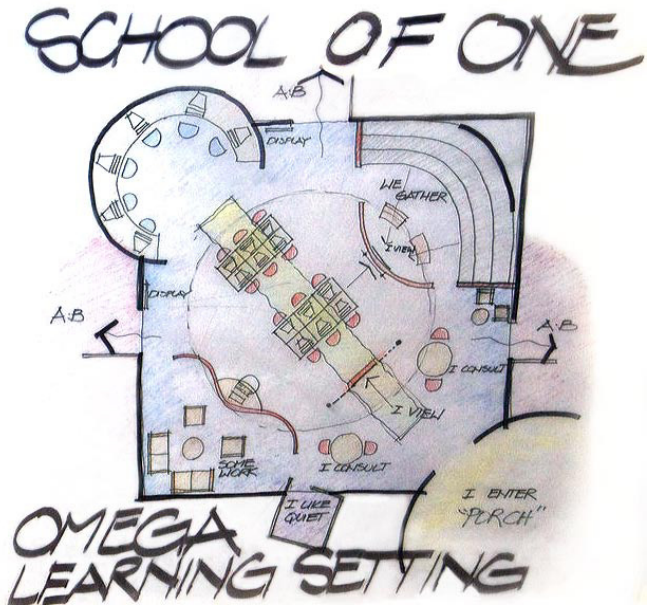


Figure 13: School of One Pilot Design - Plan showing the library organized around a central learning space and with smaller group learning spaces spread throughout

[62] Linda Hales, School of One Design Charrette Report (American Architectural Foundation, 2009), 6.
[63] Hales, 8.
[64] Hales, 7.

Figure 14: 3D Rendering of the School of One Pilot Design

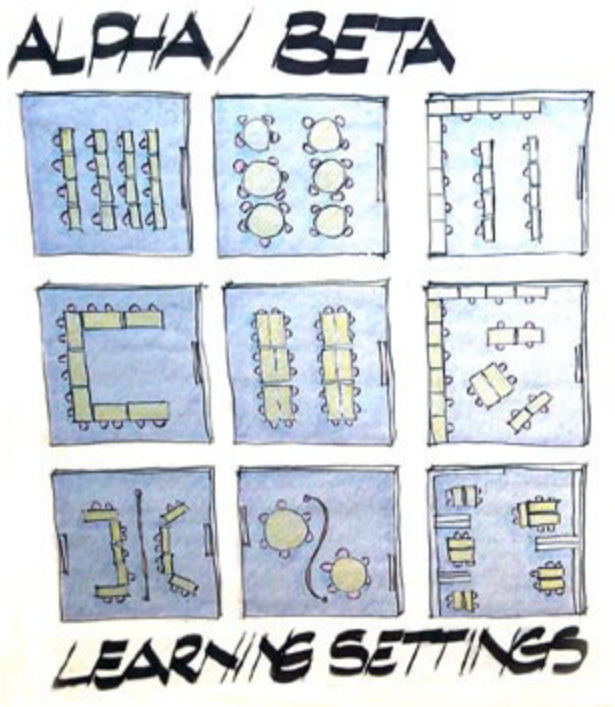


Figure 15: School of One Pilot Design - Proposed Configurations of Classrooms

The Building as a Teaching Tool

Another current design trend is the potential of having the actual school building function as a teaching tool for the students. The students can immediately learn from their surroundings and how their school is built by exposing the structural, material, and mechanical systems and assemblies (Figure 15). From on-site weather stations, sundials, and rainwater harvesting techniques to walls and floors made from limestone that feature fossilized animal remains to interactive dashboards that report on the energy performance of the building, learning opportunities are "woven into the structure of a school, making it an active space rather than a passive space housing a disarray of "things"[65] (Figure 17). The entire school environment, from the grounds to the walls to mechanical systems, serve as dynamically active and significant contributors to what the students learn.

The architecture of the school is no longer seen as utilitarian or static, but rather transcending the traditional notions of art, aesthetics, form, and function. There is a dynamic interaction between the person and the form. The design of the school has the ability to create, shape, and affect how a student experiences a space: "Architecture addresses us directly through the unconscious spatial and multi-sensory language of the body, through an embodied system of codes bound to our most archaic memories. Our world view, view of life, hierarchy of values and yearning for beauty turn into structures, spaces and relations, as well as into an alternation of public and private, monumental and intimate, light and

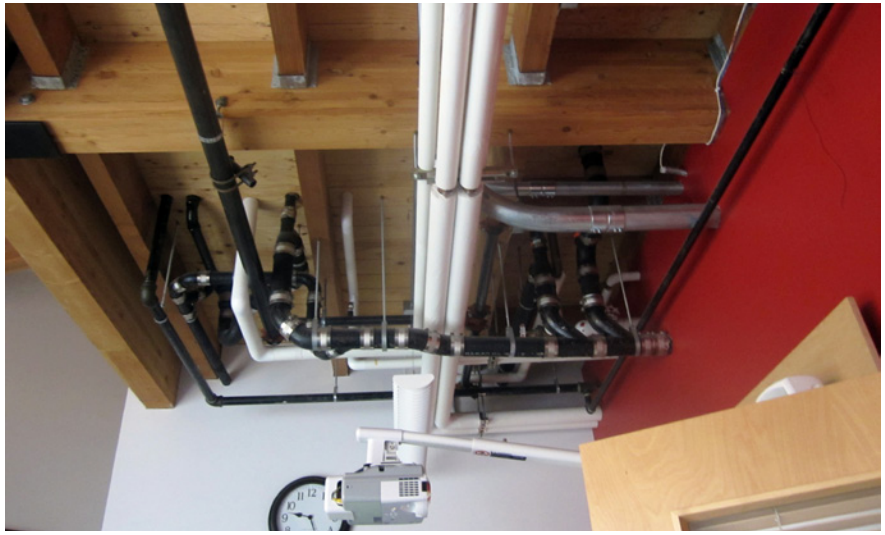


Figure 16: The exposed structural, mechanical, and plumbing systems of UCDS are incorporated into the lessons learned at the school.

Figure 17: The photovoltaic panels and the living machine are used as interactive learning tools at IslandWood on Bainbridge Island.

[65] Keep, Gary. "Buildings That Teach". The Educational Facility Planner. 37(2). 2002.

shadow"[66]. By orchestrating volume, skin, sound, and light, the sensory texture that is created affects what a person experiences while in a building, what they feel when approaching it, and what lingers when they leave. A building space can take the person out of the normal everyday routine and transpose them into another reality.

By emphasizing the values of phenomenological architects such as Juhani Pallasmaa, Steven Holl, and Peter Zumthor, in a formative environment, such as a school, the environment will be holistically enhanced and the lessons that are taught will be dynamically enriched: "The duty of education is to cultivate and support the human abilities of imagination and empathy . . . Education in creativity has to begin with a questioning of the absoluteness of the world and with the expansion of the boundaries of self. . . . the education of the sense and the imagination is necessary for a full and dignified life"[67].

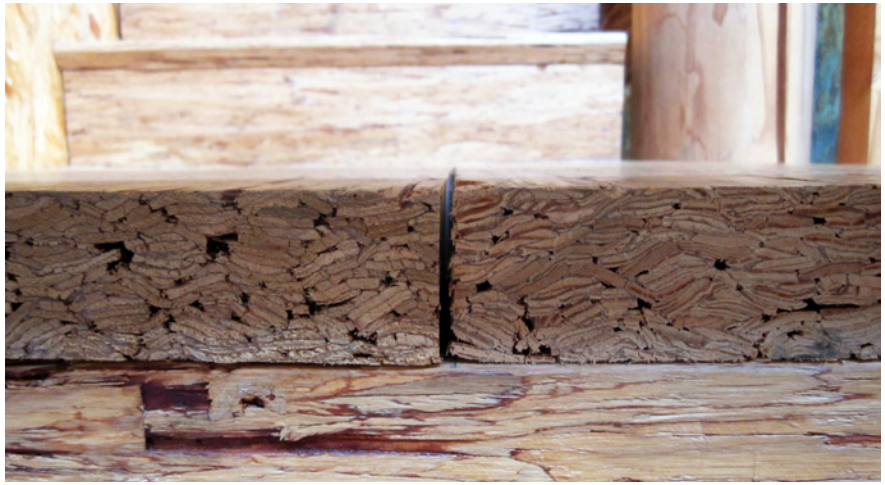


Figure 18: The raw edges of the recycled, FSC-wood stair treads at IslandWood are left exposed, eliminating the need for finish materials.

[66] Juhani Pallasmaa, Sensuous Minimalism (Beijing, China Architecture and Building Press, 2002), p. 7.
[67] Juhani Pallasmaa, "Lived Space: Embodied Experience and Sensory Thought", p. 188.

The phenomenological aspects of the built environment help in the learning process by stimulating the senses, and they can also be used as teaching tools. For example, attention can be brought to the materiality of surfaces, whether the material has a unique history, such as a wall embedded with fossils, or brings attention to a larger issue, such as FSC-wood (Figure 18). In "A Way of Looking At Things", Peter Zumthor elegantly describes his use of materials: "The sense that I try to instill into materials is beyond all rules of composition, and their tangibility, smell, and acoustic qualities are merely elements of the language that we are obliged to use. Sense emerges when I succeed in bringing out the specific meanings of certain materials in my buildings, meanings that can only be perceived in just this way in this one building"[68].

In addition to the built environment, the experience of the students can also be amplified through their interactions with other peers, with their instructors, and with the larger community of society. This strategy emphasizes a holistic approach to learning for concepts are taught as parts of an integrated whole rather than fragmented and disparate elements. The students can appreciate their role as stewards of their world being in a school that implements responsible design strategies, such as appropriate building orientation, natural ventilation, water catchment, and passive solar control. These design aspects not only respond conscientiously to the environment and optimize building performance, they also strengthen the occupants' connection to their context. The challenge with such design strategies is how to make the information accessible, easy to understand, and engaging to the students.

[68] Peter Zumthor, "A Way of Looking At Things", Thinking Architecture (Berlin: Birkhauser, 1996), p. 10.

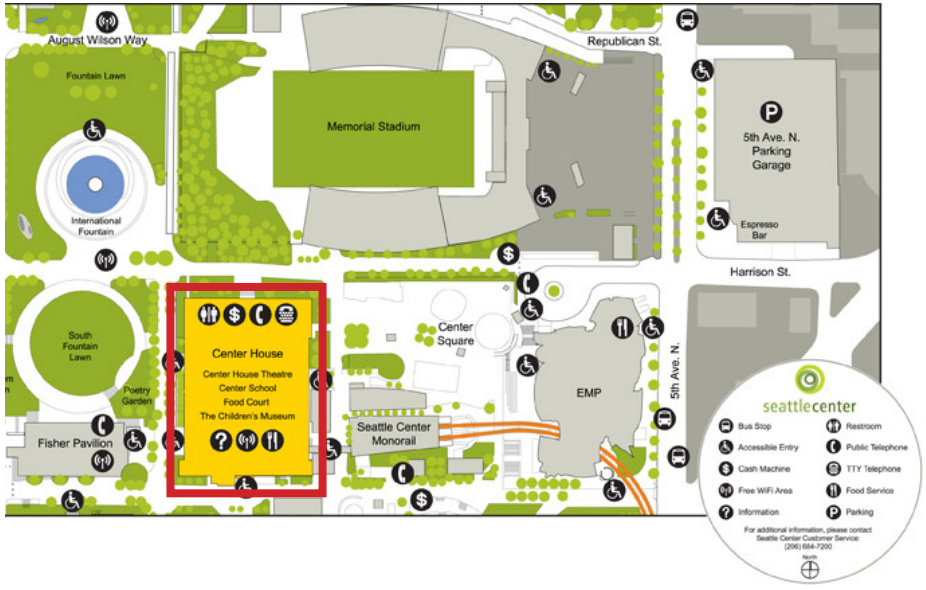
Historically, schools were located in urban areas to accommodate the students who lived there. However, as space within urban areas become more confined and more families move to suburban areas, more public schools are located within residential neighborhoods that are close to students' homes and that have a larger site area that can accommodate a diversified curriculum. In most school districts in the U.S., the school a student attends is determined by where he or she lives. Attendance boundaries are drawn to include the projected number of students who live in an area, and the children that are expected to attend a school there. In the 1970s, the 'magnet' or 'options' school became a popular way to diversify the student population by attracting all students equally, regardless of race or socioeconomic status, by virtue of each school's special curriculum or particular program. This resulted in voluntary integration where "school leaders saw these schools as a proactive, positive way to embrace diversity, bring students from different neighborhoods together, and use the carrot of quality education in an integrated setting as a way to market the schools and advance integration"[69].

An advantage to an urban school is the proximity to non-traditional educational opportunities that are presented in a diversified community. From museums to city libraries to real-world work/internship possibilities, students can benefit from the dynamics of a vibrant place. Most often, formal learning opportunities are restricted to what is offered within a school. By locating a school in an urban area, the school environment is deinstitutionalized, and learning can be extended beyond the classroom walls by establishing a greater connectivity to the surroundings, creating partnerships with local organizations and artists, conducting classes at off-site facilities, accessing preserved habitats and ecosystems, using professional venues for drama classes, and involving the students in the city. For example, the Center School is a public high school located in the Seattle Center that extends learning beyond the classroom walls by using professional venues for drama classes, creating partnerships with local artists, and involving the students in the city (Figure 19). The school itself can also become an important shared resource with the community by opening access to the school to support related learning opportunities, such as public lectures in the auditorium, events in the assembly halls, and meetings in the classrooms.

In conclusion, the current ways of thinking in school design support and facilitate the individual student as an active social learner who is most effectively taught in a holistic, dynamic, and interactive environment. There is an emphasis on flexible spaces that encourage different learning modalities, from individual and small-group learning to collaborations among students to relationships with the greater community. There is also potential for the building itself to become a three-dimensional learning tool. The site of the school is also an important contributor to the learning environment by integrating the students' experiences within society and recognizing the physical, social, and cultural context of the school to create a meaningful place.

[69] Payzant, Tom. Urban School Leadership. San Francisco: John Wiley & Sons, Inc., 2011: p. 15.

The ***Center School*** (TCS or Center) is a small public high school with a focus on the arts and community engagement. The Center School is open to any student, grades 9-12, in Seattle. The 300 students come from all over the city (via a free Metro pass) to create a close-knit, diverse community. Located in the Center House at the heart of the Seattle Center, the school utilizes resources in the heart of Seattle's cultural, civic and arts communities. There is an effort to extend learning beyond the classroom walls by using professional venues for drama classes, creating partnerships with local artists, and involving the students in the city. A focus on social justice issues also provides opportunities for students to have an impact on the world outside the schoolhouse.



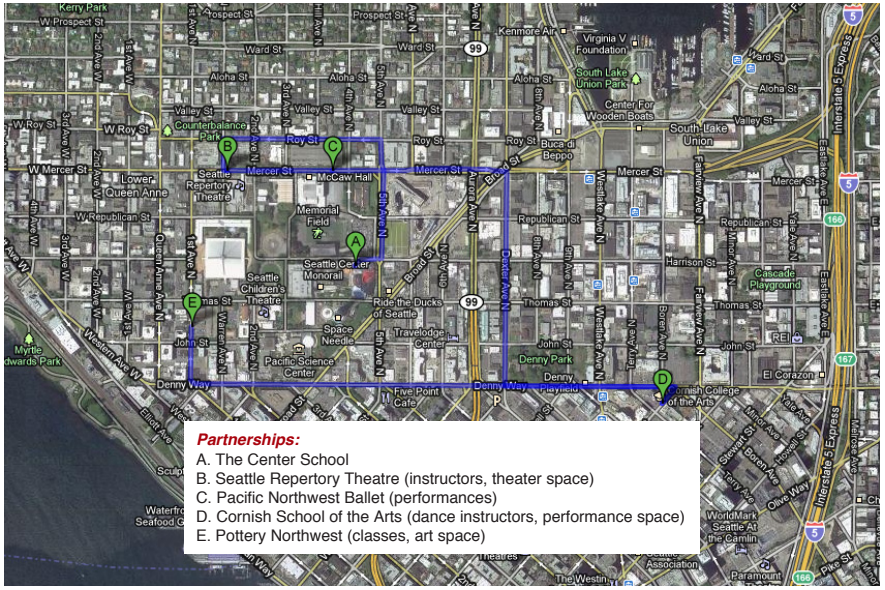


Figure 19: The Center School

Chapter II:

Case Studies - An Analysis of Local Schools and Facilities

The following case studies were chosen, because a strong set of values and educational goals influenced the program, curriculum, and ultimately the design of the facility. These examples emphasize expanding education beyond what is taught in the classroom through the internal relationships and community among the students and faculty (as in the cases of UCDS and Marysville Getchell) or through external connections with the broader context (as in the case of IslandWood). In each case, students are acknowledged and encouraged to be active thinkers who learn through dynamic engagement with their surrounding environment.

A Dynamic Learning Environment - University Child Development School

Location: 5062 9th Avenue NE, Seattle, WA 98105

Architect: Don Carlson, Carlson Architects

Description: The University Child Development School (UCDS) is a Pre-K to 5th grade school that closely follows the creative, atelier principles of Reggio Emilia. The school started as an experimental laboratory school in 1911 at the University of Washington where educational researchers taught the Pre-K- and Kindergarten-aged children of UW faculty and students.

Values: The mission of the school is to develop a child's intellect and character through a dynamic learning environment that emphasizes "the process of joyful discovery that is central to meaningful and responsible learning"[70] (Figure 20). The core values of UCDS are individualized instruction, inquiry, community, collaboration, responsibility, and diversity. The school continues

Figure 20: Detail of the entrance gate to UCDS where the dynamic approach to learning is reflected in the motifs.

to operate as an educational research facility that recognizes that each child learns differently, and there are different ways to approach a task. All children are naturally curious and have a desire to learn, and classrooms are regarded as laboratories where the child is the researcher and the teacher is the coach: "The child is working fundamentally to please him/herself rather than working to please the teacher . . . The job of the teacher is not to create a single perfect curriculum or a spectacular lesson, but rather to observe individual children carefully to create instructional strategies based on what a child needs"[71]. Children are encouraged to be reflective learners where they construct their own understanding of tasks by questioning, investigating, and testing theories. Teachers must be flexible, creative, and open to stretching and refining the lessons to ensure the children are not confined to a restricted course of learning. There is no set curriculum, no required textbooks, but

[70] "The UCDS Mission". University Child Development School website [http://ucds.org/explore/mission.html].

[71] "The UCDS Mission". University Child Development School website [http://ucds.org/explore/mission.html].

Figure 21: At UCDS, collaboration among the students and the teachers is encouraged to strengthen social bonds and to collectively solve problems.

Figure 22: Left - Child-height view of the cathedral across the street. Right - Child-scaled fixtures.

rather a continuum of skills to be achieved. A strong sense of community exists within the school among the students, teachers, parents, staff, board of trustees, and surrounding neighborhood. The teachers do not work in isolation, but rather as a team with each other. Collaboration is encouraged to create a democratic community where students engage and communicate with each other for collective problem solving and flexible thinking (Figure 21). Personal responsibility is valued as a way to enrich the community by sharing knowledge, demonstrating tolerance and empathy, and exhibiting moral development. Diversity is emphasized to reflect acceptance and appreciation of a broader community.

Design: According to Melissa Chittenden, the Assistant Head of School, "this is the kids' school" and "once they are here, this is their space". The school is scaled to child-height, from the classroom furniture and fixtures to the window sill height and specific views to the outside that can only be seen if one is less than 4 feet tall (Figure 22). The entrances to the school are designed to ensure that an adult monitors these access points so that the children are free to circulate and collaborate through the school unescorted (Figure 23). These details help to encourage personal responsibility and autonomy among the students who take ownership of their space. Most surfaces and pathways are curvilinear to introduce an organic flow through the space (Figure 24). In the design process, attention to sun angles, the use of color, and how the light reflects different hues at different times of the day resulted in the whimsical use of bright colors and shapes (Figure 25). Because spaces are defined by the activities that occur, multi-functionality and flexibility was emphasized in the design of the building and in the selection of the furniture. There are no corridors or hallways, but rather gathering places and hidden nooks lined with

Figure 23: The UCDS entry featuring a curved receptionist desk and wait area.

Figure 24: Curviliner, tackable surfaces showcase student work at UCDS.

Figure 25: UCDS - Whimsical use of colors and shapes ensure a playful and child-centered atmosphere.

tackable surfaces to showcase the students' work (Figure 24). Most furniture are mobile to allow for the configuration of spaces, and the vertical volumes are maximized with the creation of lofted play areas (Figure 27). Because the educational approach of UCDS is "learning by doing", each classroom is designed as an atelier workshop (Figure 28). There are no rows of desks, but instead zones to encourage different types of learning, from gatherings on the floor to activities seated at work tables. There are three classrooms per grade that are connected to each other and to a central common space. The interconnectivity also applies to the entire building where each floor is connected to another through lightwells or a central stairway. The structure and materiality of the building is exposed to show how the building is constructed and is also incorporated into lessons. The structural system is also used to configure spaces as partitions and classroom equipment are suspended from the exposed beams.

Figure 26: Although the shelves are child-scaled, the UCDS library features high ceilings to resemble a collegiate library and many nooks to encourage reading.

Figure 27: At UCDS, classroom space is maximized with lofted play areas.

Figure 28: UCDS classrooms are designed as atelier studios with different zones of learning. Each classroom is connected to an adjacent classroom with a uniquely shaped door.

A Place-based Education -

IslandWood

Location: Bainbridge Island, WA

Architect: Mithun Architects

Description: IslandWood, A School in the Woods (Figure 29), is a 70,000 sf outdoor learning center located on 255 acres on Bainbridge Island. It was created "with the idea that kids from inner-city areas don't often have the opportunity to leave the urban environment and spend time in the natural world"[72].

Values: IslandWood is designed for visitors to have "exceptional learning experiences and inspire life-long environmental and community stewardship"[73](Figure 30). The experiential approach to education at IslandWood is achieved through "hands-on" activities using the unique ecology and natural history of the Puget Sound, viewing the surrounding environment as an active classroom, combining science, technology and arts to enhance learning, and highlighting sustainable practices and design strategies. The programs that are offered emphasize personal exploration and an understanding of the natural world.

Design: To truly understand and appreciate the site, the architects at Mithun camped out in all types of weather to analyze and study what the site had to offer. According to Richard Franko, principal architect at Mithun, the intent of the project was to have "buildings AND landscape that teach." There are a variety of eco-systems on the site, such as a pond, a stream and wetlands, as well as shelters, walkways (Figure 31), bird blinds (Figure 32), and lookouts spread throughout the area. According to Bert Gregory,

[72] Debbi Brainerd, Founder and Chairperson of IslandWood, "IslandWood – Buildings that Teach" video, http://mithun.com/knowledge/article/islandwood_buildings_that_teach/

[73] IslandWood website, http://www.islandwood.org/

Figure 29: IslandWood - View of the dining hall and learning studios buildings and adjoining solar meadow

Figure 30: IslandWood - The Welcome Center

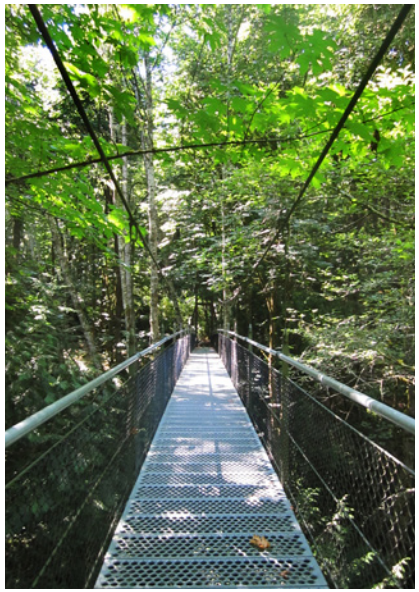


Figure 31: IslandWood - Suspension Bridge

Figure 32: IslandWood - Bird Blind

AIA, President of Mithun Architects, "the buildings [at IslandWood] did more than contain programs or hold people. . . . there are opportunities to teach about sustainability, about the natural world. . . . How do we create buildings in which 4th and 5th graders would have an impact in their life that they can carry home and tell others?"[74]. The buildings at IslandWood were intentionally designed to be a teaching tool that was integrated into the curriculum: "The buildings are a textbook, the buildings are things they can operate . . ."[75]. One of the guiding principles of the design was to make all environmental aspects of the buildings and the site visible (Figure 33). These interpretive elements reinforce the phenomenological faculties

[74] Bert Gregory, AIA, President of Mithun Architects, "Islandwood – Buildings that Teach" video, http://mithun.com/knowledge/article/islandwood_buildings_that_teach/

[75] David Goldberg, Mithun Architects, "Islandwood – Buildings that Teach" video, http://mithun.com/knowledge/article/islandwood_buildings_that_teach/

Figure 33: IslandWood - The solar lobby of the learning studios acts as a heat sink for the building.

of learning. As Alvar Aalto stated, ". . . a building has to be conceived from inside outwards, that is, the small units and details with which a person is engaged form a kind of a framework, a system of cells, which eventually turns into the entity of the building"[76]. According to Dick Baker, an IslandWood tour docent, ". . . everywhere you look, there is always a learning potential, down to the smallest detail . . . every detail tells a story . . .", from the recycled yogurt containers that make-up the countertops to the 92-foot, 120-year-old salvaged wood beam that is suspended in the welcome center (Figure 34). The raw finish of the building materials are left exposed and often, much of the source material is left intact, such as the bark from a tree. The fireplace in the dining hall is composed of different rocks that tell the geological history of the Pacific Northwest (Figure 35). Children cannot only see the differences, but they can also feel the textures of the stones. Each lodge also features a fireplace comprised of geological rock from a certain era that often have embedded fossils of animals that used to inhabit the site (Figure 36).

In addition to the sensory environment, there are on-site graduate students and facilitators who help the children learn and engage in the environment. ". . . Hands-on, minds on . . ." states Adam Talamantes, M.Ed, who completed the IslandWood program in June 2010. According to one young student, "They didn't show you, they let you do it". IslandWood also offers team courses that encourage collaboration among the participants. One teacher observed less bullying and more cooperation among her students after that had returned from an overnight stay at the facility.

IslandWood exemplifies the lessons that can be learned through the phenomenological experience of the place as well as the through the

[76] Alvar Aalto, 1956

Figure 34: IslandWood - The 92-foot, 120-year-old salvaged wood beam that was found abandoned in a field is the main design element in the Welcome Center.

Figure 35: IslandWood - The fireplace in the dining hall.

Figure 36: IslandWood - Fossils embedded in the fireplace of one of the lodges.

Figure 37: IslandWood - The floating classroom.

interactions with others. Mithun Architects were successful in designing buildings that reflect the core values of IslandWood. The team lived and breathed the site, and they even illicited feedback from the students as to what features they would like seen. These participatory events resulted in a floating classroom (Figure 37) that could be operated by the students and a treehouse. The personal investment of the architects into the development of the site further reinforced the guiding principles of IslandWood, that " . . . intimate contact with the natural world, especially during childhood, is essential in forming meaningful bonds with, and promoting positive values towards, the natural environment"[77].

[77] Hinds, Joe and Paul Sparks. "Engaging with the Natural Environment: The Role of Affective Connection and Identity". Journal of Environmental Psychology. Vol. 28 (2008): p. 109..

Where Guiding Principles become Design Principles -

Marysville Getchell High School

Location: Marysville

Architect: DLR Group

Description: Marysville Getchell High School is comprised of four autonomous learning communities: Academy of Construction and Engineering, Bio-Med Academy, School for the Entrepreneur, and International School of Communications. While the same core curricula is taught in each small learning community (SLC), the students choose the school based on the electives and opportunities that are offered (Figure 38).

Figure 38: Marysville Getchell High School is comprised of four identical buildings that house autonomous learning communities.

Values: The idea of this school arose from a tumultuous period in the Marysville school district. For many years, the district suffered from one of the longest teacher strikes in history as well as a low (<55%) graduation rate. Students were getting lost in large anonymous high schools, and there were low expectations for academic success from the staff, the community, and the students. The school buildings suffered from inflexible designs that made it difficult to accommodate changing educational needs. It was evident that there had to be a "change by necessity"[78]. The district set a goal to reach every student and to understand the unique ways of learning. They recognized that learning is dynamic, and students learn in various ways, from individually to small groups, from large teams to involving the entire school. A new vision was developed for student learning that included the tenets of rigor (every student is ready for college entry and success through high levels of literacy and math), relevance (every student develops interest toward a meaningful career), responsibility (every student is prepared for responsible citizenship), and relationships (every student is known, guided, and supported for academic success)[79]. After touring and analyzing SLCs from around the country and observing the personalization, autonomy, and attention each student receives in these types of schools, members of the Marysville school district drafted five guiding principles for the restructuring of the high school system: relationships at the center, focused learning, identity, accountability, and community.

[78] Craig Mason, architect, DLR Group

[79] Bingham, John and Gail Miller. "Instruction and Construction: The Reciprocal Nature of Teaching and Learning and Facilities Design". Presentation at the BCES Conference. Marysville School District, WA. 27 June 2008.

Figure 39: There are no corridors at Marysville Getchell High School, but rather spaces that foster collaboration and community among the students.

Figure 40: A high amount of transparency emphasizes a connection to the outdoors.

Design: The guiding principles of the school district not only influenced the operation and curriculum of the school, but they also directed the design principles. According to Craig Mason of the DLR Group, "the building was there to support the transformation". The program of the school reflected essential learning spaces: core learning, information resources, specialized learning, applied learning, project learning, science, social commons, and teaming. According to Shawn Stevenson, the Principal of the Academy of Construction and Engineering, " . . . the kids are able to make choices as to what fits for them".

Working with the district and facilities managers, the architects at DLR group translated the five core values into design strategies. 'Relationships at the center' meant spaces where the students and staff are visible to each other, such as through open spaces and the liberal use of transparency. Relationships also meant spaces for collaboration among the students and teachers (e.g., project space, professional development space, distributed learning resources space), and spaces that promote social and academic relationships, such as learning commons and social commons. There are no corridors, no "cells and bells"[80] (Figure 39). Relationships also translated to a connection with the surrounding landscape. The high school is nestled within a woodland, and the school buildings are organized around a central cluster of trees. There is a high use of transparency to the outdoors, where specific views to the surroundings are framed (Figure 40).

[80] Craig Mason

‘Focused learning’ ensured that core instructional areas were equipped with adequate technology, storage, student tables instead of desks, and shelving for classroom libraries and other learning materials. The learning commons were designed to provide space and resources for research and interactive/interdisciplinary project work as well as a distributed library resources concept (Figure 41).

‘Identity’ was reflected in the personalization of each building. To save costs, the design and footprint of each school building were identical, however the learning spaces were specialized according to the unique identity of each school. For example, the applied learning space (Figure 42) is a student store in the School for the Entrepreneur whereas it is a physical therapy clinic in the Bio-Med Academy.

Figure 41: The library is distributed throughout the school, as seen here in this common learning space.

Figure 42: The applied learning space of the Academy of Construction and Engineering is a shop.

‘Accountability’ was achieved through the high visibility of the staff and students, which supported higher levels of teaching and learning. Because of the large amount of transparency within the building, students and staff became more self-aware and responsible for themselves as well as each other (Figure 43).

And ‘community’ was expressed in the design of easily accessed spaces for community use, and also through partnerships with community agencies. A ‘living room’ is defined within the entrance of each school building, where visitors can meet with students and staff without having to enter further into the school (Figure 44).

Figure 43: A high level of transparency within the school and open common spaces ensure the students and the staff are accountable for themselves and each other.

Figure 44: The ‘Living Room’ where students and staff can meet with visitors or use as a gathering space.

Chapter III:

Site Selection and Analysis

A school for K-12 does not currently exist in downtown Seattle, yet there are more than a dozen daycares and preschools, and numerous options for adult education, spread throughout the five neighborhoods that comprise the area (Belltown, Denny Triangle, Pioneer Square, the International District, and the Commercial Core) (Figure 45). Also, according to the 2010 census reports, very few families with children live in this area, which may be due to limited housing space and lack of neighborhood schools. A K-12 option school in this location will help transition youth from daycares and preschools and provide opportunities for older students to learn in an urban setting.

Figure 45: Lack of K-12 schools in the downtown core.

Downtown is also a well-connected site with numerous opportunities to commute by non-auto modes (bus, ferry, walk, bike) and established pedestrian and bike routes, thus minimizing the need for on-site parking (Figure 46). Additionally, these established pedestrian and bicycle routes help children develop a positive and holistic view of their community as well as richer connections to and an appreciation for their surroundings[83]. By expanding the learning environment beyond the boundaries of the school, students will gain perspective on the larger world in which they live, both socially and contextually.

[83] Bruce S. Appleyard, "Livable Streets for Schoolchildren: How Safe Routes to School programs can improve street and community livability for children" (National Center for Biking and Walking (NCBW) Forum, 2005).

Figure 46: Accessibility and multi-modal transporation in Downtown

Site Selection

The site chosen for this thesis project is Pier 62/63 at Alaskan Way and Pine Street (Figure 47) and parking lot across the street from the pier, which is the location of the Aquarium Plaza proposed by James Corner Field Operations (Figure 48). Vehicular traffic at this location is also projected to be minimized as this area is to be integrated into an expanded public space that prioritizes pedestrians and keeps them away from the new Alaskan Way when the Viaduct is demolished and the new waterfront is constructed in 2016. This site is also close to the Belltown neighborhood and across the street from the waterfront condominium units. Because this site is heavily trafficked by pedestrians throughout the year, it is well maintained and has a 'safe and secure' feeling associated with it. The site is also easily accessed using public transportation and a pedestrian and bike path that parallels Alaskan Way. Because of its location at the heart of the waterfront, this site is within walking distance of numerous potential adjunct educational facilities, such as the Seattle Aquarium located on the pier directly South of Pier 62/63, the Bell Harbor Marina just North of the site, and Pike Place Market to the East. A strong public presence already exists along the waterfront, and this location offers the opportunity for public engagement of both locals and tourists as they visit the publicly-accessed piers that include Waterfront Park and the Aquarium. The pier and the plaza are also highly visible from the tourist-heavy Pike Place Market and Victor

Figure 47: Pier 62/63, Seattle waterfront

Figure 48: [Proposed] Aquarium Plaza, Alaskan Way

Figure 49: Site Context

Pier 62/63

Pier 62/63 (Figure 51) is approximately 56,000 sf and was first built in 1901 (Pier 62) and 1905 (pier 65). Past uses include a canning and distribution fishery, and then as a stage for the 'Summer Nights at the Pier' concert series. However, the concerts were cancelled due to the deteriorating condition of the piers which no longer handle the weight of a stage and a crowd. Since 2006, the city has been considering the removal or replacement of these piers. Currently, the piers serve as publicly accessed open space. Pier 62/63 was primarily chosen because of its location over the water. Seattle is strongly characterized by its unique location at a juncture between the water and the city. Puget Sound is integral to the identity of Seattle, and by building on a pier at the waterfront, this connection will not only be emphasized, but it will also be strengthened. The pier is close to proposed aquatic habitat restorations along the waterfront, and has unobstructed views of Elliot Bay and the Cascade mountains. Numerous opportunities exist for students to learn from these natural resources as well as to become intimately involved in their upkeep. Pier 62/63 was also chosen because of the opportunity to use an existing structure (the pier).

Across the street - Waterfront Condos

South of the site - Seattle Aquarium

North of the site - Bell Harbor Marina

Pedestrian path

Figure 50: Pier 62/63 Site Context

Across the street - Seattle Aquarium

Looking South from the site

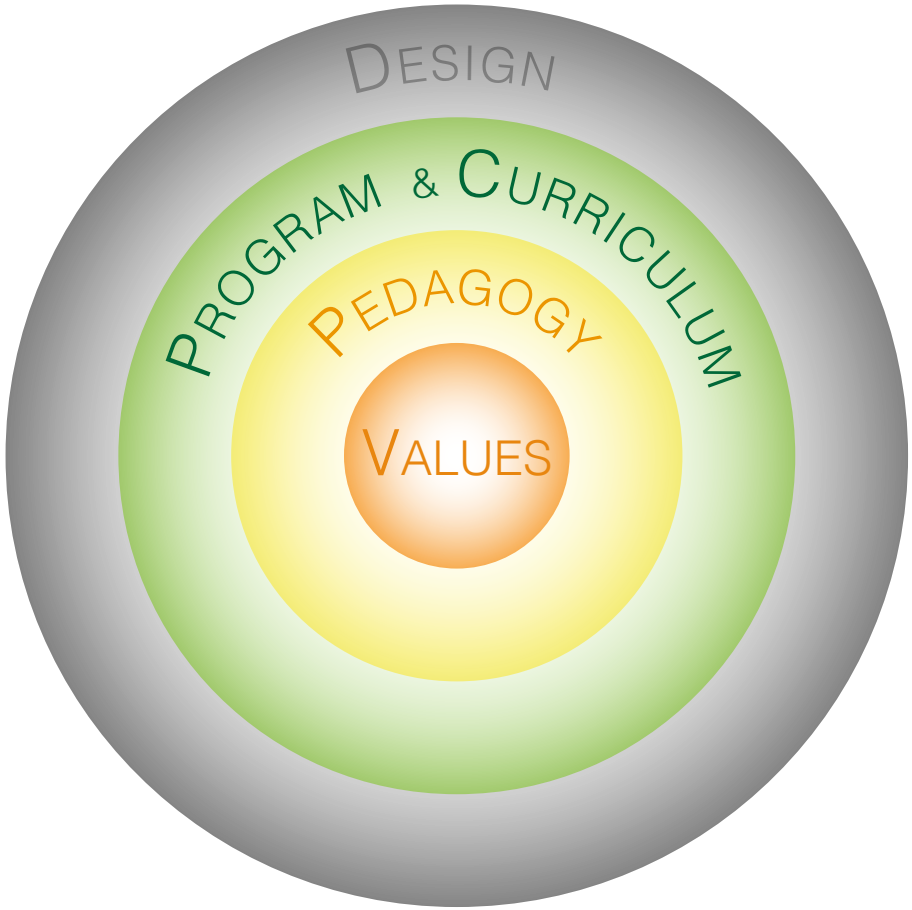
East of the site - Pike Street Hill Climb

Pedestrian path

Figure 51: Aquarium Plaza Site Context

Aquarium Plaza

The proposed location for the Aquarium Plaza (Figure 51) is currently a parking lot that is approximately 60,000 sf and is dominated by the Viaduct. It abuts the Waterfront Condominiums, and there is presently a small office building located there. It is heavily used by visitors and patrons of the Waterfront. This site was primarily chosen because of its proximity to the pier and Seattle Aquarium and to strengthen the connection to downtown. This connection provides opportunities for students to access adjunct learning facilities located in this urban setting. There is also the opportunity to build into the proposed terrace scheme that borders this site, which links Victor Steinbreuck Park and the Waterfront. This site is also located at the base of the Pike Street Hill Climb, which connects Pike Place Market and the Waterfront, and there is the possibility to integrate the public into the proposed design.


DESIGN
PROGRAM & CURRICULUM
PEDAGOGY
VALUES

Chapter IV:

Values, Pedagogy, Program and Curriculum

Following the proposed theoretical framework, what is important to this thesis project is a connection with a greater context - that is, with each other, with the community, and with a place: “When we try to pick out anything by itself, we find it hitched to everything else in the Universe”[81]. Learning has no boundaries, whether it occurs internally among students, or externally beyond the classroom walls. Strong relationships within a school (staff-to-staff, staff-to-students, student-to-student, parent and community to school) promote and support collaborative learning. Students feel supported and recognized; there is more accessibility to teachers and assistance, as well as each other. Outside of the school, partnerships with the surrounding community provide opportunities to expand what is taught and to apply lessons in a real world setting. Resources exist that support academic learning experiences, such as adjunct facilities for alternative educational venues. By being part of a greater network, the school is integrated within the community, where the members are responsible for developing, nurturing, and maintaining a great school, and the school gives back to the community by providing facilities for events and activities. By regarding the surrounding natural and built environments as a “third teacher”, there are opportunities for a place-based education where everyone is accountable for maintaining the place/environment: “In the end, we will conserve only what we love. We will love only what we understand. We will understand only what we are taught”[82].

Figure 52: Students from Le Cordon Bleu College of Culinary Arts, Seattle, WA

[81] John Muir, My First Summer in the Sierra. Boston: Houghton Mifflin. 1911.

[82] Baba Dioun, Senegalese environmentalist and poet, from a speech made in New Delhi, India to the general assembly of the International Union for Conservation of Nature, 1968

Figure 53: University Child Development School, Seattle, WA

Pedagogy - Students are Active Learners

In line with valuing relationships and connections to a broader context, students are active learners whose innate inquisitiveness allow them to seek out knowledge and engage in their lessons. By acknowledging that each student is unique, and they learn in different ways, the design of the facility must be flexible to accommodate various learning styles as well as different types of interactions, from individual instruction to group dynamics. In turn, this flexibility provides for a dynamic learning environment that reinforces an expanded view of education.

Mission Statement

The Waterfront School is a public K-12 school that focuses on environmental and community engagement. The school is open to any student in Seattle. Located in the heart of the Seattle waterfront, the school utilizes resources in the city's aquatic, natural, cultural, civic and arts communities. There is an effort to extend learning beyond the classroom walls by establishing a greater connectivity to the surroundings, creating partnerships with local organizations and community members, conducting classes at off-site facilities, accessing preserved habitats and ecosystems, and involving the students in the city. A focus on social justice and environmental issues also provides opportunities for students to have an impact on the world outside the school. It is the goal of the school to instill values in youth that encourage them to be socially-minded leaders and conscientious stewards of the environment.

There are many courses, activities, and experiences that reflect the values of the school and that also benefit from the site location. Refer to Appendix I for the K-8 science curriculum offered at the Waterfront School.

Location as Classroom

As students progress through the grades, they venture further from the school (homebase) via different modes of transportation to expand their learning opportunities (Figure 54). Downtown can be seen as a juncture between the prevalent natural resources characteristic of Washington state and the metropolis of the city. The waterfront has been described as the "front porch" to Puget Sound, as it looks over Elliott Bay, the Sound, the Cascade mountains, and Mt. Rainier. There is an opportunity to design a dock on the pier for a mobile learning facility, such as the *Science Barge* by NY Sun Works[84], that takes advantage of the waterways to broaden the curriculum offered at the school (Figure 55).

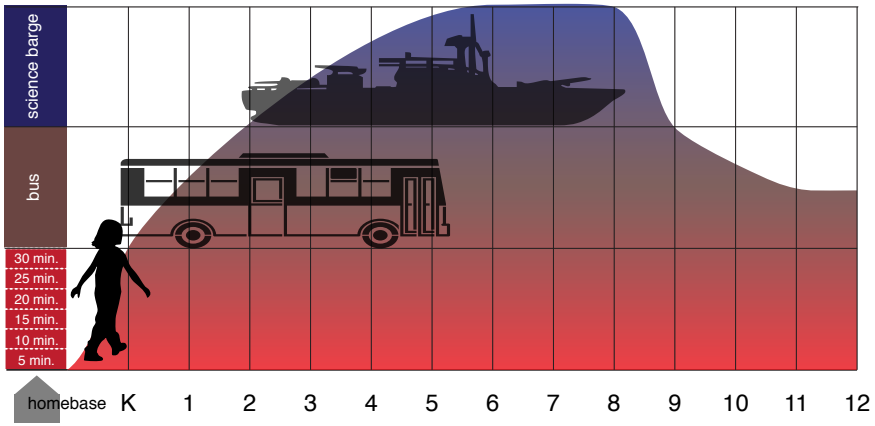


Figure 54: Proximity to homebase by grade vs. mode of transportation

[84] http://nysunworks.org/thesciencebarge

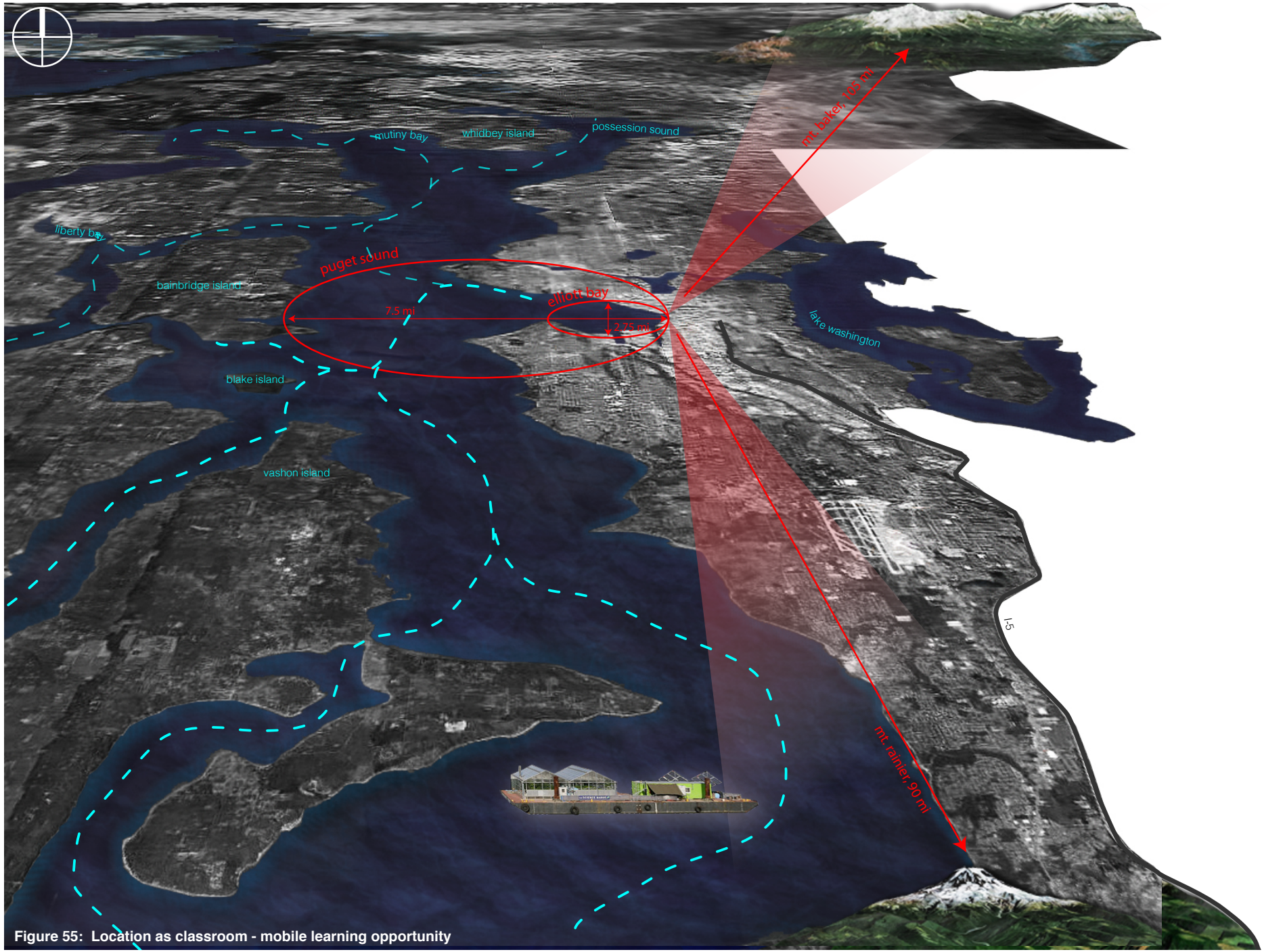


Figure 55: Location as classroom - mobile learning opportunity

Community as Classroom

The project site is in close proximity to the five downtown neighborhoods: Belltown, Denny Triangle, Pioneer Square, the International District, and the Commercial Core. Currently, the waterfront lacks the intimate feeling of a characteristic neighborhood of Seattle. There is a disconnection between the residences, the waterfront, and the city (Figure 56). Dead-end alleys and dark spaces do not offer personal safety or comfort (Figure 57). By introducing a school, a waterfront neighborhood is possible. With the Alaskan Viaduct to be torn down and the selection of James Corner Field Operations as lead designer for the new Seattle waterfront, an opportunity is presented to create a Seattle waterfront neighborhood that will serve as a destination for both tourists and locals. A school located here can be integrated as an important community asset as well as improve the living conditions of the surrounding areas (Figure 58).

Figure 56: Disconnect between the waterfront and the city

Figure 57: Dead-end alley and dark spaces along the waterfront

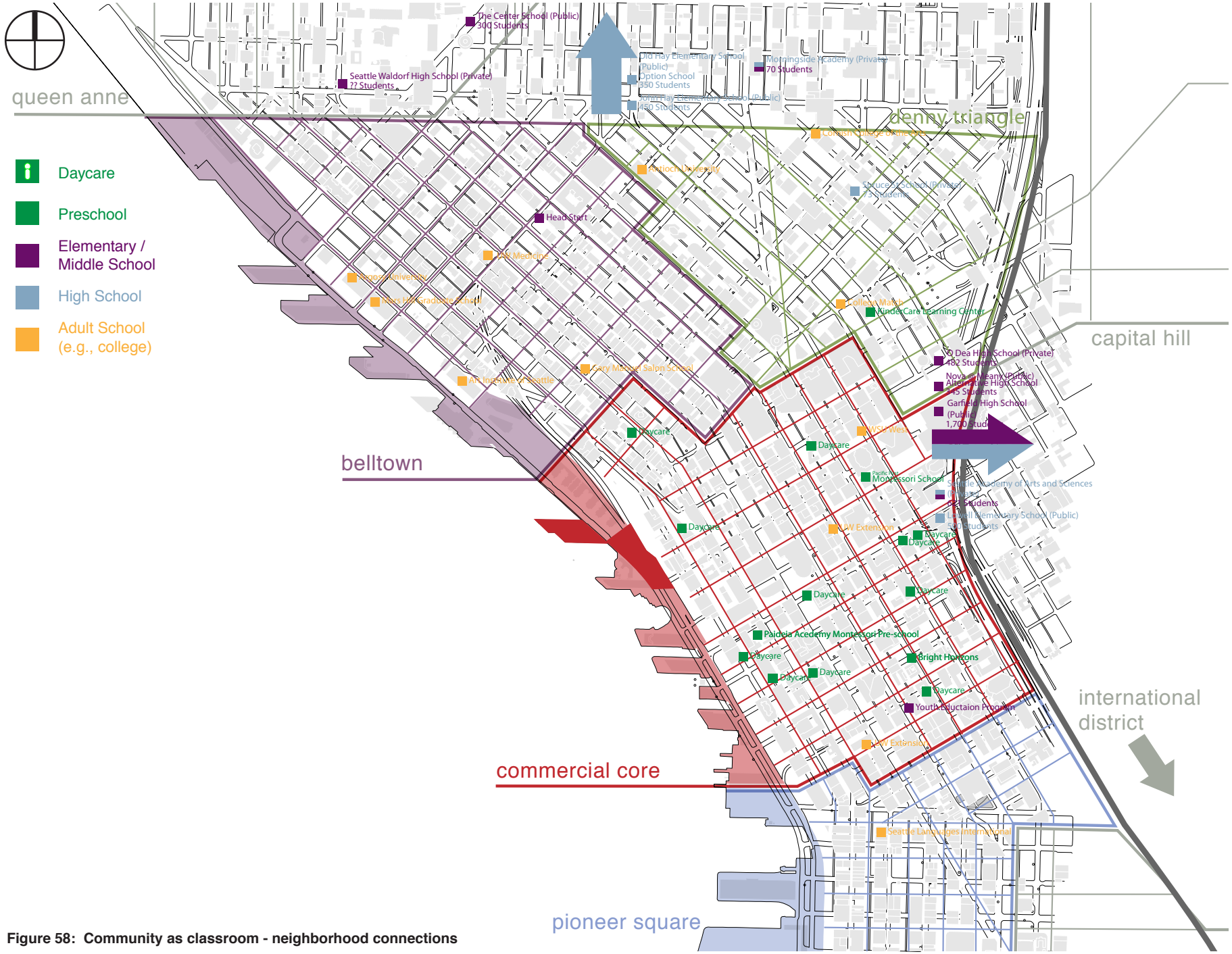


Figure 58: Community as classroom - neighborhood connections

City as Classroom

Locating a school downtown presents opportunities for non-traditional learning facilities, such as the Seattle Aquarium, the Art Institute, Benaroya Hall, the Seattle Central Public Library, and Pike Place Market, which can possibly supplement the education of the students. Partnerships in the fields of commerce, culture, and ecology can be established with community organizations (Figure 59, Figure 60, Figure 61). Many of these locations are within walking distance of the school. These facilities may serve as field trip sites, long-term research study areas, or even internships opportunities for the high school students. Other locations may also be accessed by public transportation if beyond the walking range (Figure 62).

Figure 59: Partnerships for commerce

Figure 60: Partnerships for culture

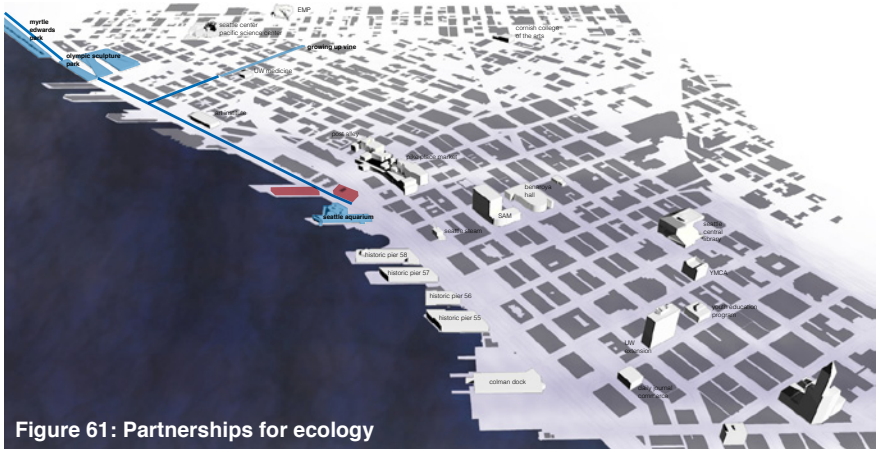


Figure 61: Partnerships for ecology

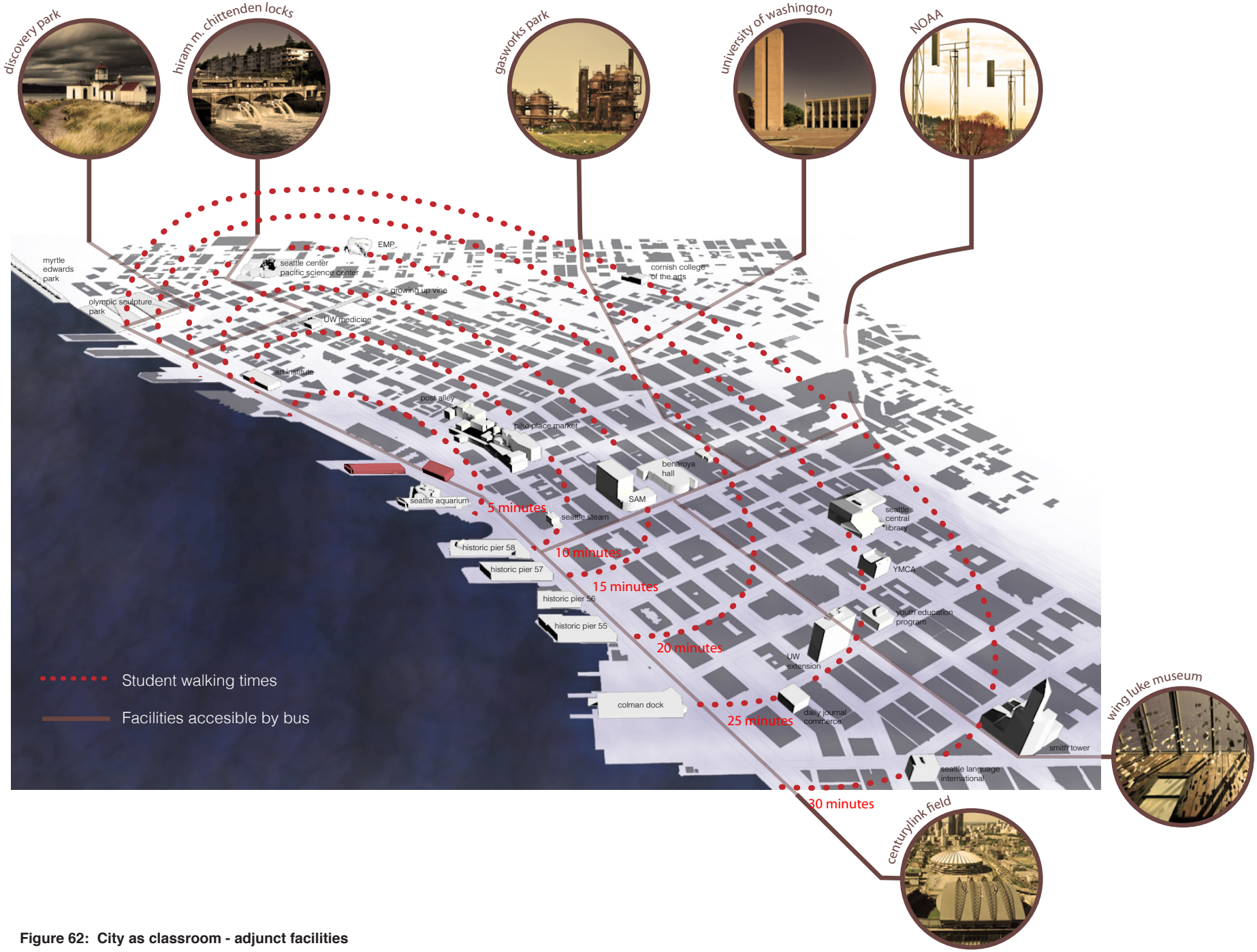


Figure 62: City as classroom - adjunct facilities

Pier as Classroom

Students can greatly benefit from this site by being situated in this seam between nature and urbanity, and have hands-on access to protected wildlife habitats and ecosystems as well as opportunities to "touch the water". Currently, the Department of Planning and Development have plans to restore shallow water habitats, create eco-infrastructure such as habitat benches, and reestablish a salmon migration route along the waterfront in conjunction with the rebuilding of the seawall. These plans provide opportunities to learn about local habitats and to directly observe the impact of the built environment on these sensitive systems.

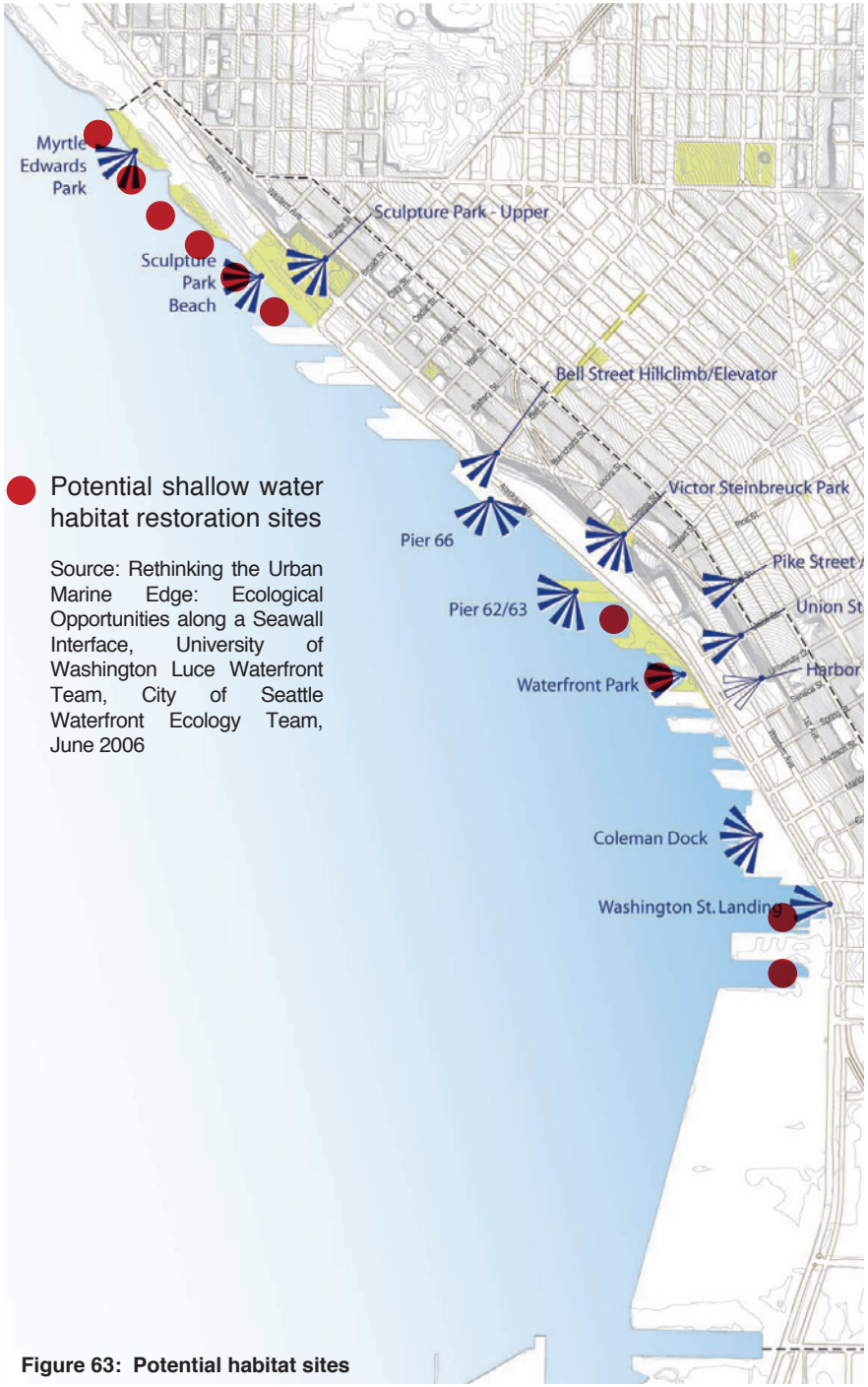


Figure 63: Potential habitat sites

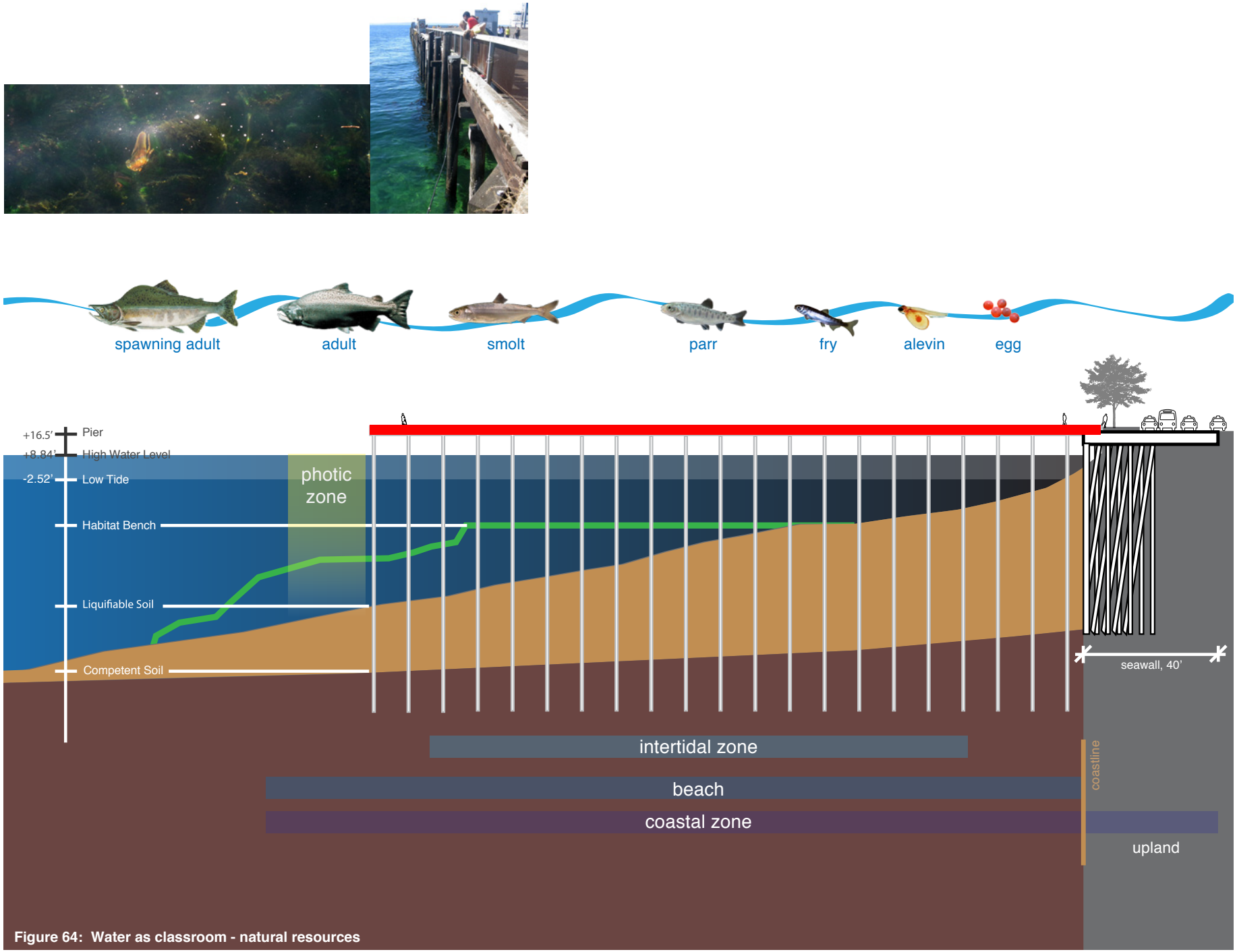


Figure 64: Water as classroom - natural resources

Three Users -

The Intersect of Pedagogy, Program, and Time

By acknowledging the strong public presence that already exists at the site as well as analyzing the potential to connect directly with the natural environment, three user groups were identified: school (students, faculty, staff), public (visitors, tourists, local community), and ecological center (researchers, scientists, staff).

Pedagogy

Types of Learning

School only

School, Public

School, Eco-center

School, Public, Eco-center

Child-centered education

Self-directed education

Activity-based learning

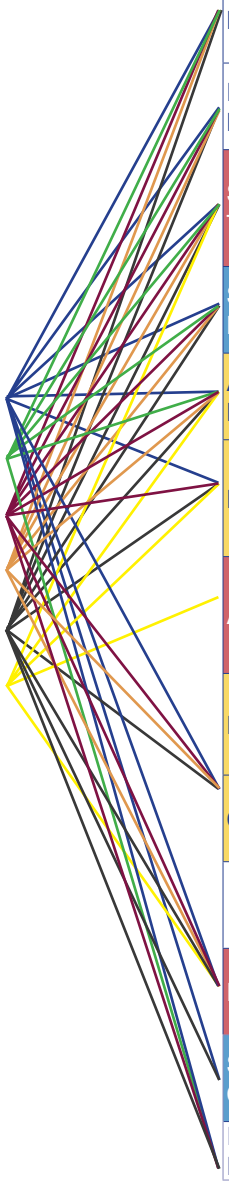
Integrated learning

Educating the whole child

Lifelong learning

Design parameters: A K-12 Option School with 390 students (30 per grade), 26 teachers (2 per grade), and 10 administrative and staff for a total of 426 occupants.

The programmatic spaces of the project were determined by understanding the different ways children learn and hypothesizing how these spaces were to be used by the three user groups. As seen in Figure 65, a matrix analyzes the schedule of the users and determines where the times of use overlapped.



Program	Description	SF	
Core Learning	instructional spaces / open-concept classrooms / small group learning	1000 sf [1-4] 1000 sf [K, 5-8] 1200 sf [HS] 2 per grade	
Project Learning	interdisciplinary, interactive projects - large group learning / outdoor spaces / breakout areas	1200 1 per 2 grades	
Science and Technology	labs / inquiry-based learning	1200 each	
Specialized Learning	curriculum-specific spaces	1500	
Applied Learning	"real world" application	1500	
Dining	dining area + kitchen	6000	
Auditorium	large assembly, stage	3000	
Entry	entrance, atrium	1500	
Gymnasium	locker rooms, gymnasium	8000	
	offices, meeting rooms, student services	1500	
Eco-center	ecological institute	3000	
Social Commons	informal gathering spaces		
Information Resources	resource / research / interaction		

Figure 65: Program Development Matrix

	Users	Uses	Days	Times
	School	core curricula	M-F , School year	7:00 - 5:00 [8:20-2:45 = school day]
	School	core curricula	M-F, School year	7:00 - 5:00 [8:20-2:45 = school day]
	School, Public, Eco-center	science labs, eco-center labs, wet science, technology centers	School: M-F, School year Public: Special events at eco-center Eco: (labs only) M-F, year round, weekends for special events	School: 7:00 - 5:00 Public: TBD Eco: 8:00 - 6:00, weekends TBD
	School, Eco-center	floating classroom, underwater classroom, art studio and gallery	School: M-F, School year Eco: (labs only) M-F, year round, weekends for special events	School: 7:00 - 5:00 Eco: 8:00 - 6:00, weekends TBD
	School, Public	student store/cafe, science demonstrations, community learning, after-school programs, clubs	School: M-F, School year, weekend special events Public: Special events at eco-center	School: 7:00 - 7:00, TBD Public: TBD
	School, Public	cafeteria, restaurant, culinary academy	School: (cafeteria, open space, culinary program) M-F, school year Public: (restaurant/culinary academy) weekends, holidays, school breaks	School: 7:00 - 5:00 Public: 10:00 - 10:00
	School, Public, Eco-center	theatre, presentations, assembly, lectures	School: M-F, School year, weekend special events Public: Special events Eco: Special events	School: 7:00 - 5:00, special events Public: TBD Eco: TBD
	School, Public	reception, “living room”, gathering space, social space, music hall	School: M-F, School year, weekend special events Public: Visiting, Special events	School: 7:00 - 5:00, TBD Public: TBD
	School, Public	exercise (“five for life”), health, community gatherings and events	School: M-F, School year, weekend special events Public: Special events	School: 7:00 - 7:00, TBD Public: TBD
	School	offices, teacher lounge and prep, workrooms, conference rooms, first aid, counseling, private rooms for consultants	M-F , School year	7:00 - 5:00 [8:20-2:45 = school day]
	School, Public, Eco-center	exhibit space, lab, offices, conference room, launch site	School: M-F, School year Public: (exhibit space only) 7 days, year round Eco: M-F, year round	School: 8:00 - 5:00 Public: 11:00 - 5:00 Eco: 8:00 - 6:00
	School, Public	dining, atrium, outdoor terraces, entry, views, “nooks”	School: M-F, school year Public: (outdoor terrace) weekends, holidays, school breaks	School: 7:00 - 5:00 Public: 10:00 - 10:00
	School	technology and library integrated throughout	M-F , School year	7:00 - 5:00 [8:20-2:45 = school day]

The annual usage of several programmatic spaces (school, dining, specialized learning, auditorium, and the eco-institute) were diagrammed to analyze how the use of these spaces may interrelate (Figure 66). A more detailed analysis of the users' schedules was needed in order to determine where the overlaps occurred, so the weekly usage of the seven major programmatic spaces were mapped (Figure 67). Spaces that had identical users and times were combined, such as the applied learning, atrium, and gymnasium spaces. The schedules were divided into two time frames: the school year (September - May) and school breaks (holidays, summer). The seven major program categories were: school - core learning, project learning, administration, social spaces; applied learning, gymnasium, and atrium; dining and adjacent outdoor terrace and gardens; science and technology; specialized learning; auditorium; and the eco-center. This diagram outlined how these spaces were to be used, by whom, and when the mixing of the different user groups may occur. These observations reinforced the dynamic nature of the programs as well as the previously identified values of relationships and connections to a greater context.

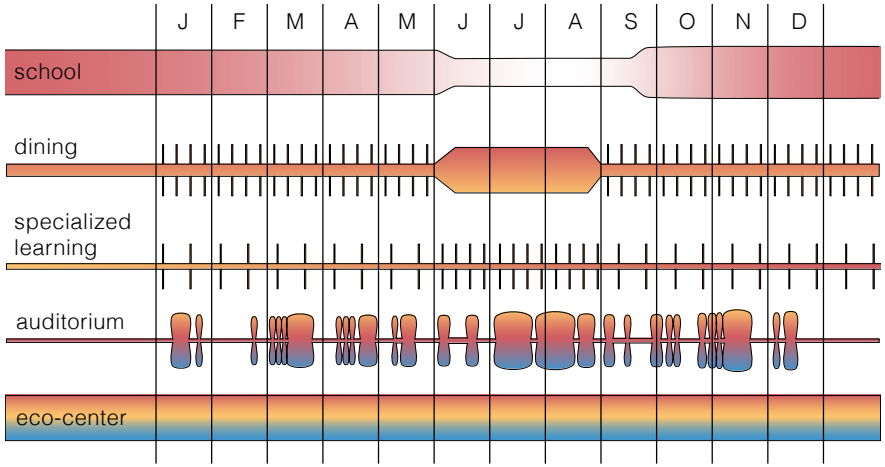
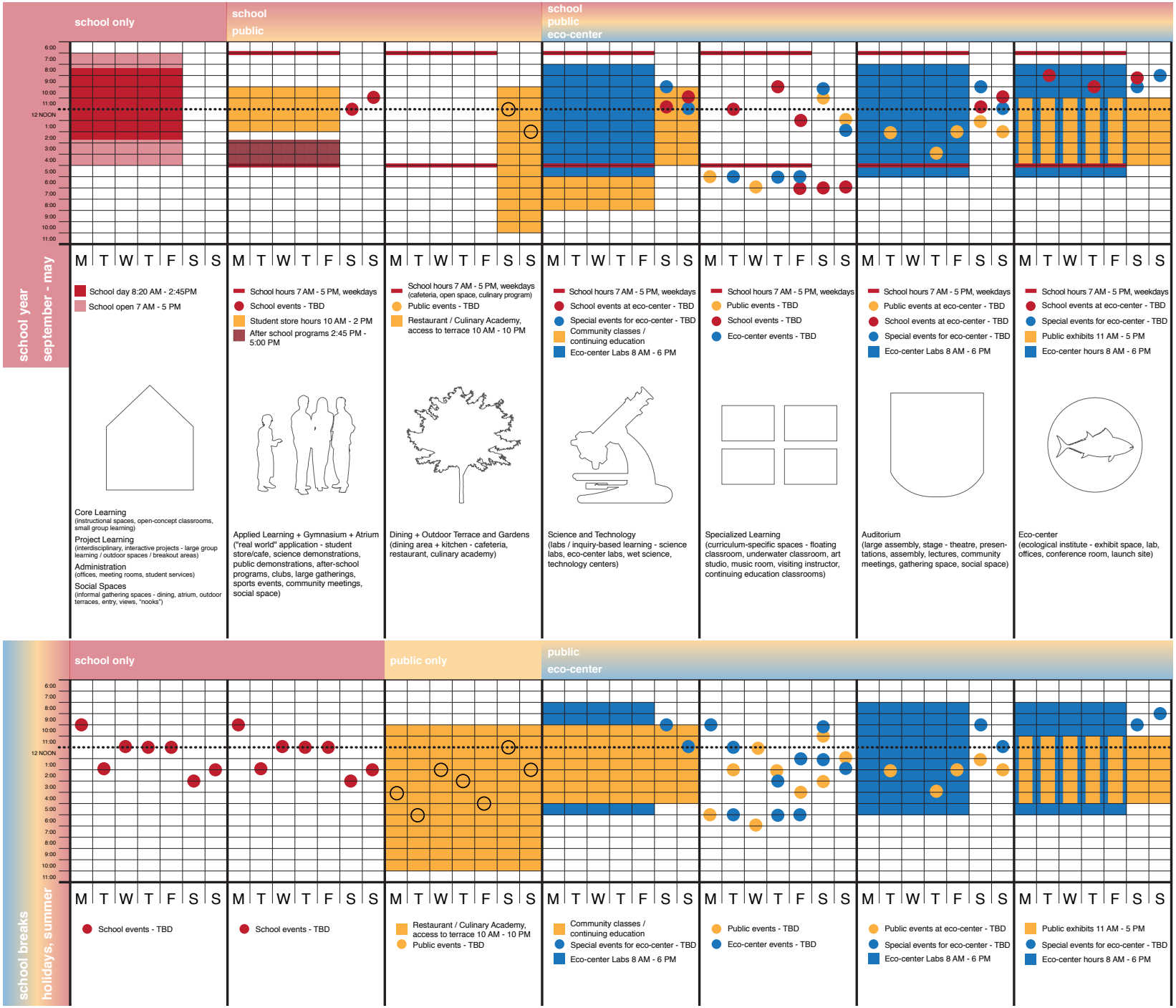


Figure 66: Annual Calendar of Programmatic Spaces

Figure 67: Weekly/daily Usage of Programmatic Spaces



Interactions with the Public Realm and Program Placement

To guide the placement of the programmatic spaces within the site, the terrace scheme that links Victor Steinbreuck Park and the waterfront and the Aquarium Plaza proposed by James Corner Field Operations, and the future Alaskan Way, was mapped (Figure 68). These design interventions expanded the public realm by connecting highly visited public areas (Pike Place Market, the waterfront, Seattle Aquarium, Victor Steinbreuck Park, Pier 62/63) and rerouting the future Alaskan Way away from the waterfront. From this mapping, three zones were identified: terrace, plaza, and pier. Using the information from the "Weekly/Daily Usage of Programmatic Spaces" diagram, the programmatic spaces and circulation were mapped onto a schematic section of the site by user group, and then combined to determine where mixing and overlapping would occur (Figure 69). Floor-to-ceiling measurements were cued from the Seattle Aquarium to maintain the public street front and building scale. Factors, such as views of the city and the water, and school spaces that were to be accessed by the public, like the cafeteria and gymnasium, directed the placement of the spaces. When views of the surroundings took priority, these spaces were placed on the second floor or located in areas where the view was unobstructed, like placement of the auditorium at the end of the pier. When public access took priority, these spaces were located adjacent to the public areas, like on the ground floor facing Aquarium Plaza or along the terrace path. Careful attention ensured that specific spaces, such as the atrium and the gymnasium, fronted a large public area to allow for the potential expansion of these spaces into the public realm that optimizes

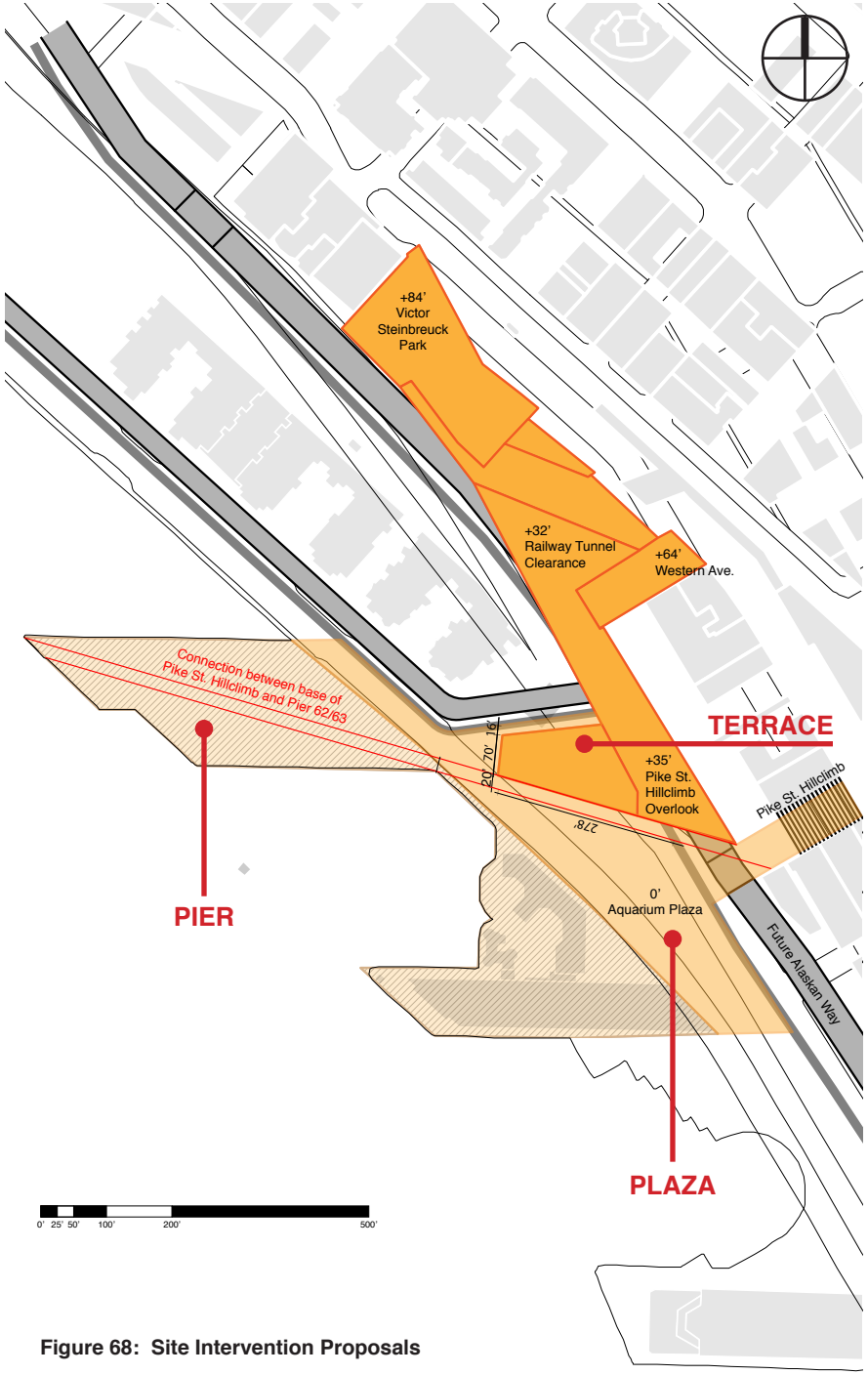


Figure 68: Site Intervention Proposals

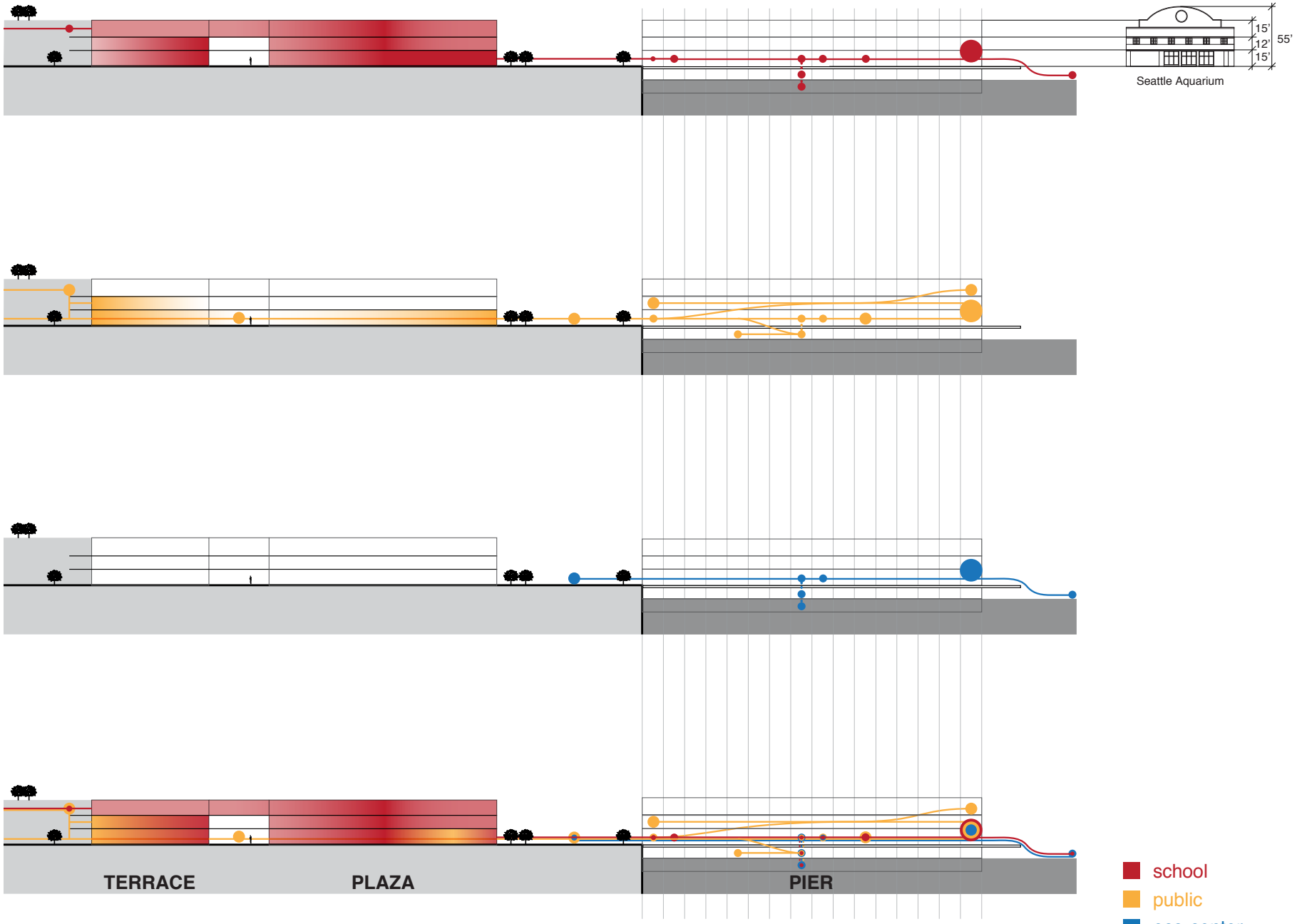


Figure 69: Schematic sections of the terrace, plaza, and pier zones showing possible program placement by user group

engagement with the public. Spaces used by the eco-center users were located on the pier with direct access to the water. Figure 70 is a diagram of the proposed design interventions overlayed by user group as determined by the sectional analysis of program placement. Figure 72 depicts the overall site intervention. Figure 72, Figure 73, and Figure 74 highlight the plans for each level of the three buildings on the site.

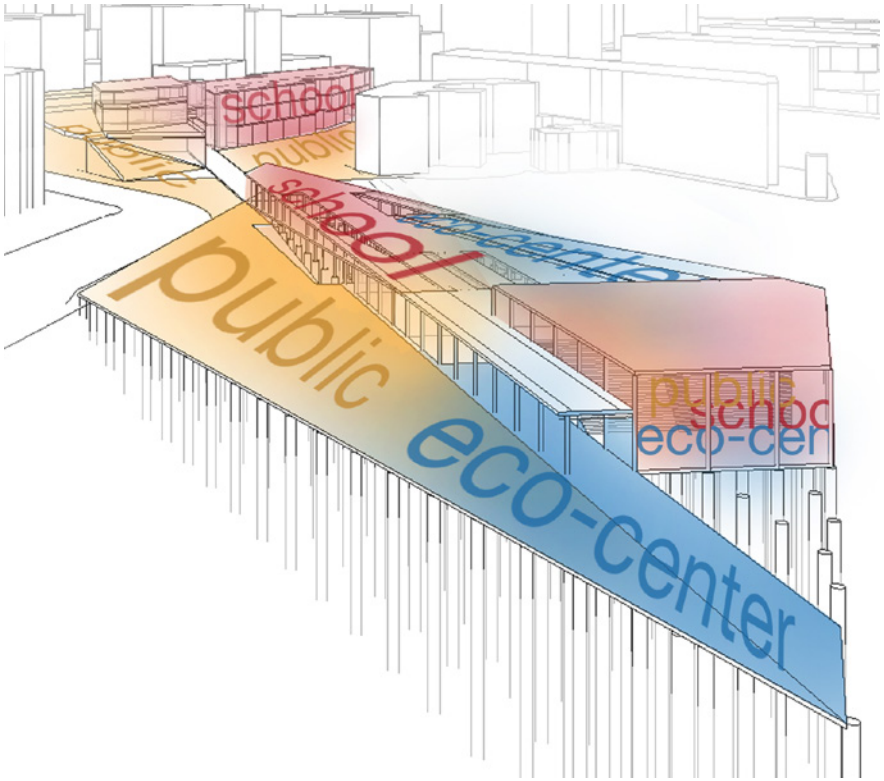


Figure 70: Proposed design interventions overlayed by user group

Figure 71: Site Intervention

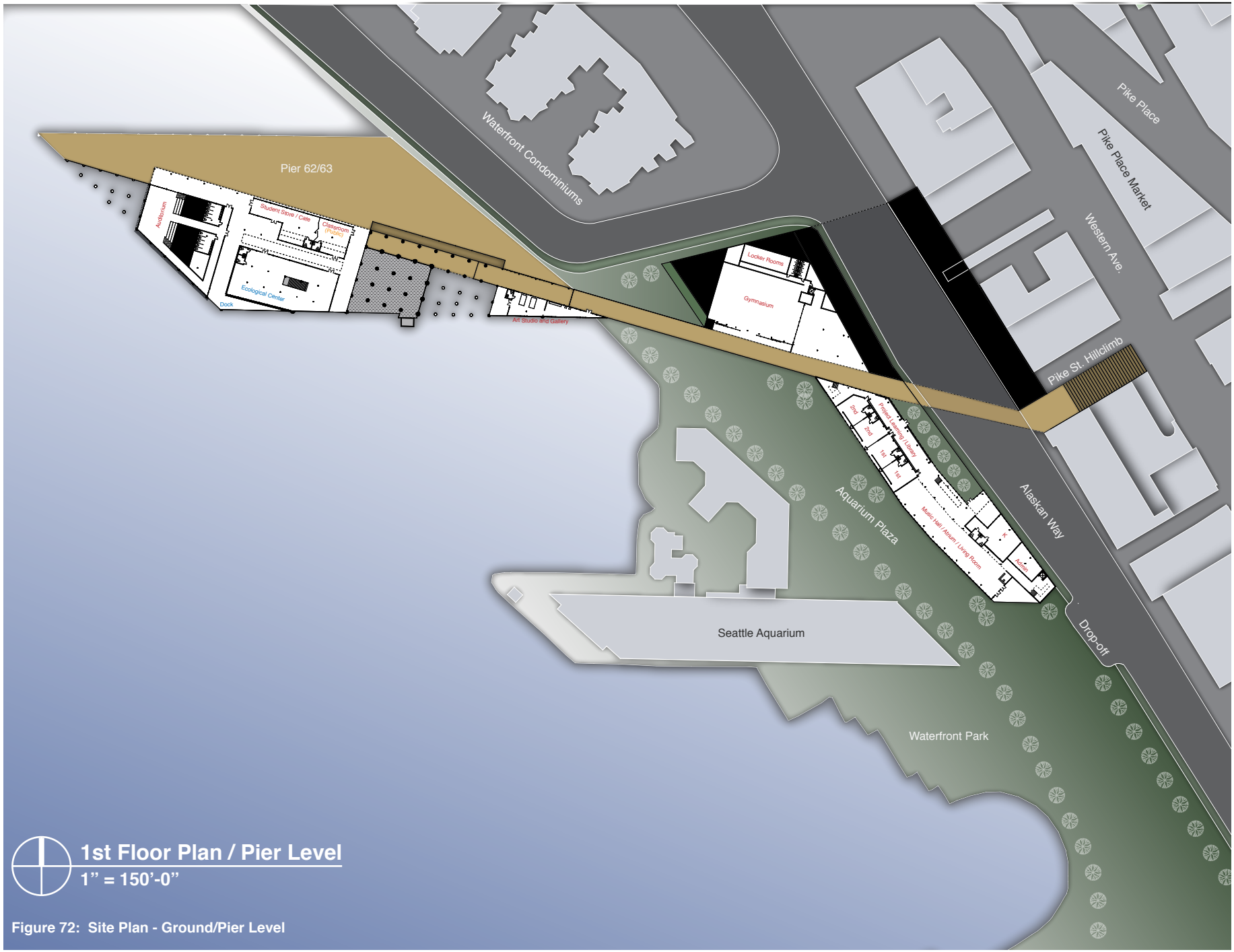
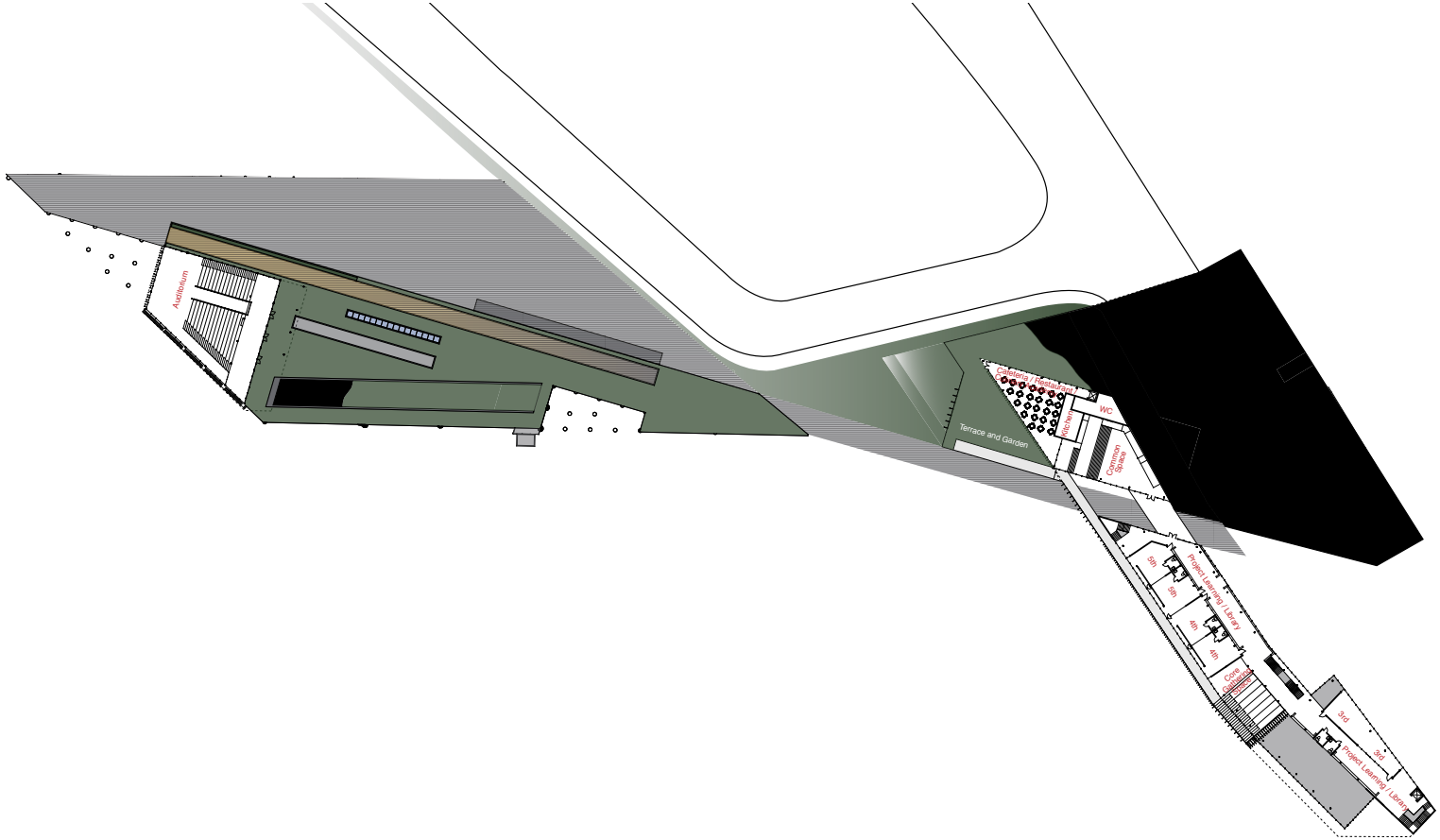


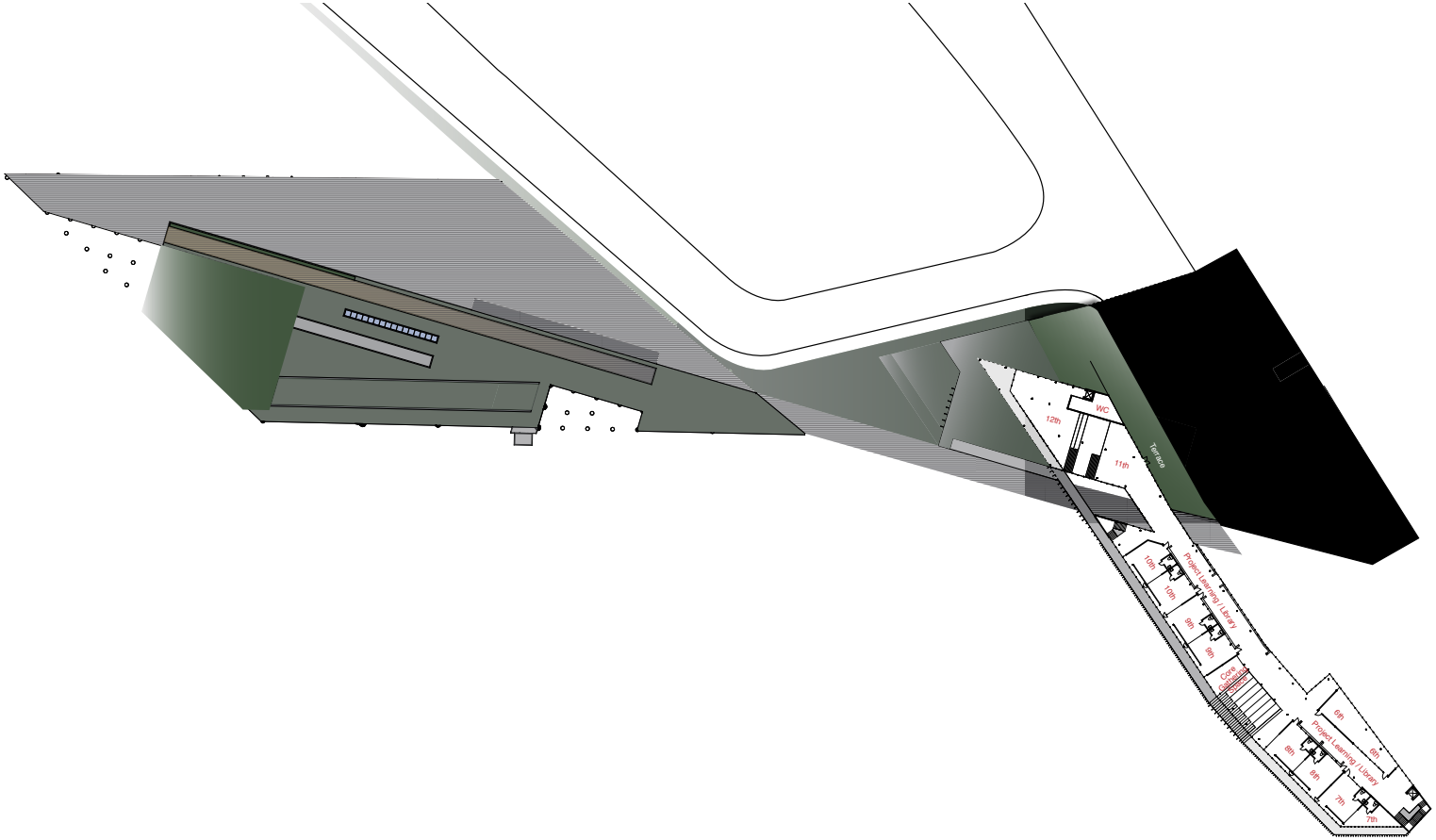
Figure 72: Site Plan - Ground/Pier Level



2nd Floor Plan

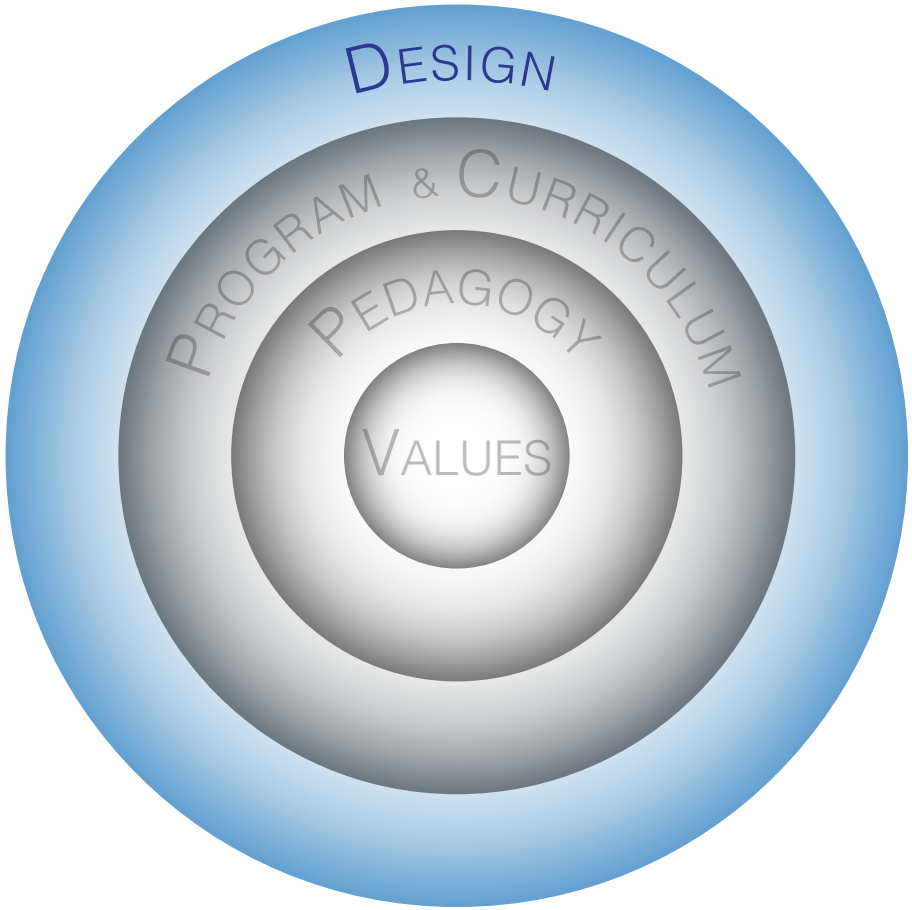
1” = 150’-0”

Figure 73: Site Plan - 2nd Floor



3rd Floor Plan
1” = 150’-0”

Figure 74: Site Plan - 3rd Floor


DESIGN
PROGRAM & CURRICULUM
PEDAGOGY
VALUES

Chapter V:
Design

Building Concept

As was evidenced in the determination and placement of the program, the guiding principles of the school directed the design principles of the buildings. Because the connection to the greater context of the site and the relationship with the public realm was valued, the building tectonics also followed the same principles. Conceptually, the floors of each building were regarded as planes of the public realm (i.e., the plaza, the terrace, and the pier) which were lifted and folded to create the levels of the buildings. Materially, glu-lam beams, girders, and wood decking were used as the lateral system to emphasize the structure and to resemble the exposed 'skeleton' of these planes that were lofted from the ground. Unfinished concrete was used for the finished flooring material to connect with the public hardscape outside as well as provide a durable surface for highly trafficked areas. These lifted planes were then minimally supported by thinnest possible columns in order to emphasize the loftiness of these spaces. Among the columns, the program was inserted and organized. The structures were then cladded by curtain walls in order for the floor sections to remain visible and to maximize the amount of natural light. On the East and West facades of the buildings, a pattern of translucent green louvers were used that visually accentuated the floor sections and also inferred the idea that the occupiable green roofs that topped each building had draped over the sides of the structures. On the South side of the buildings, a translucent green screen with a pattern that mimicked the louvers was used for shading when necessary (Figure 75). Figure 76, Figure 77, and Figure 78 depict a typical section of the school, terrace, and pier buildings. The main floors are highlighted in red to emphasize the lifted and folded forms.

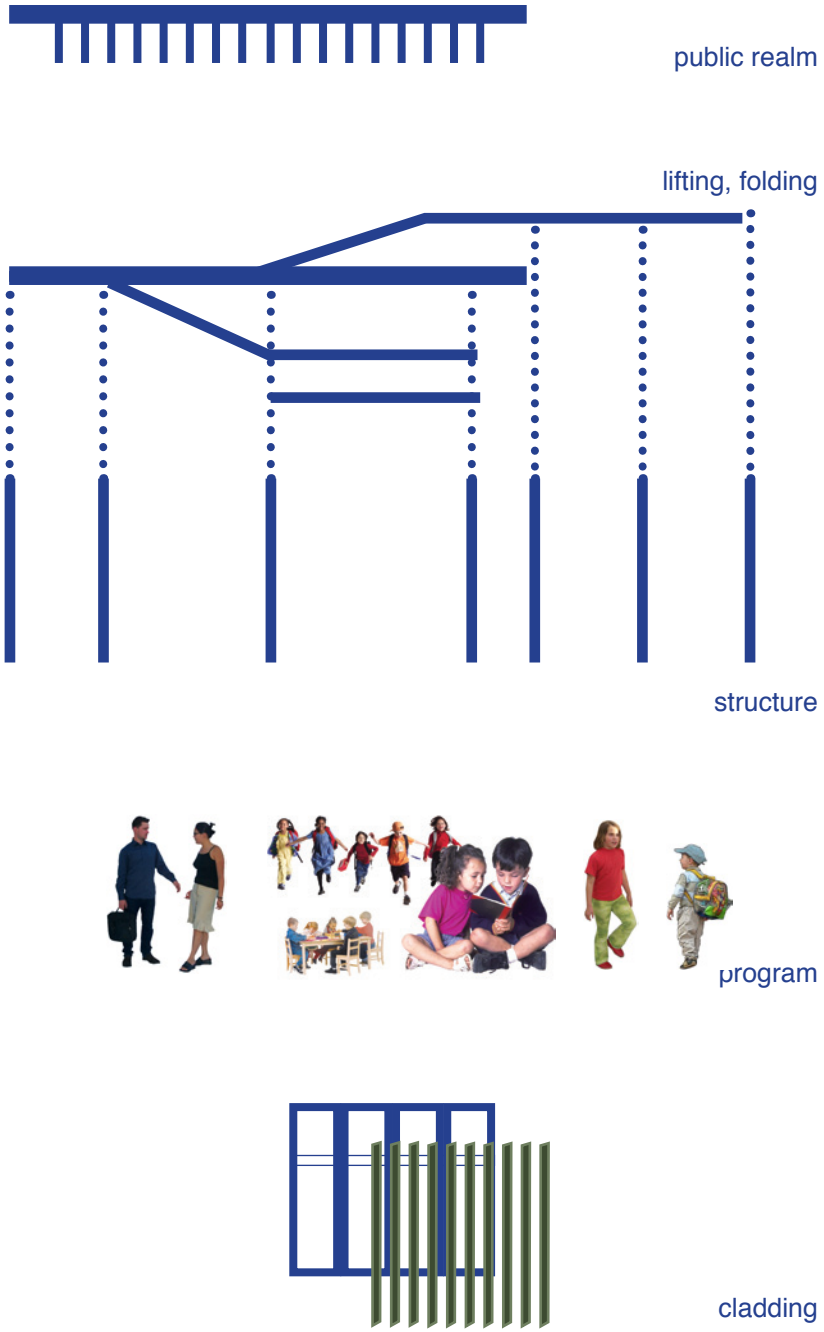
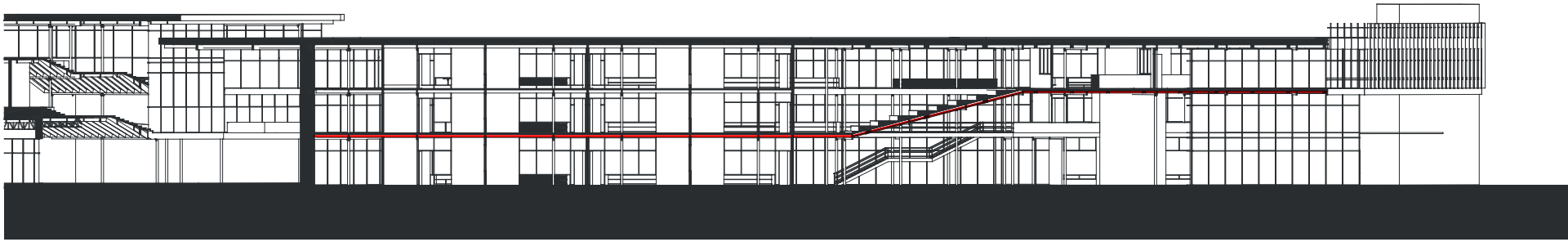


Figure 75: Building Concept Diagram

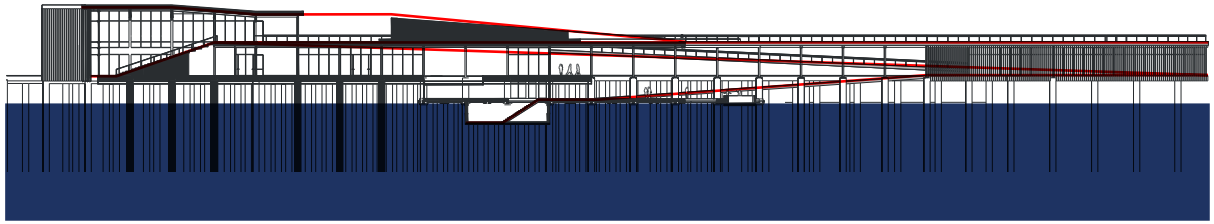


Section - School
1” = 40’-0”

Figure 76: School Section

Section - Terrace
1” = 40’-0”

Figure 77: Terrace Building Section



Section - Pier
1” = 40’-0”

Figure 78: Pier Section

The primary school building is located in Aquarium Plaza, across from the Seattle Aquarium. The drop-off zone for the school is located off of Alaskan Way and also serves as the drop-off for the Aquarium. The entrance to the school is on the South side of the plaza, in line with the entrance to the Aquarium. The third floor of the building extends over the entrance, creating a deep overhang that resembles the entry structure of the Aquarium. When one arrives at the school, one enters the spacious atrium that has an angled ceiling. The administration and receptionist are located directly off of the entrance, who greet guests and monitor access to the school. The large atrium serves as a 'living room' for visitors, where they can stay and meet with students and staff without having to venture into the private school spaces. The atrium is also the music hall for the school, and large operable windows within the curtain wall can open up this space to the adjoining plaza where student concerts and performances for the public can occur.

Each grade is organized around two core learning classrooms that have views of the plaza and the water to the West or of the city skyline to the East. It is assumed that these rooms are used primarily in the morning, and in the afternoon, the students shift to the adjacent project learning spaces or offsite to minimize exposure to the Western heat and light. There are no corridors in this school, but rather students circulate through shared project/group learning areas that also contain the library for the school. Informal social and learning spaces like these that also function as additional work areas or extended classroom spaces are emphasized throughout to promote social and academic relationships and collaboration among the students.

The heart of the school is a large, tiered gathering space that looks over the plaza. This space, also known as the 'Core', is aligned with the Pike Street Hill Climb such that as one is coming down Pike Street, they can see through the building to the waterfront. The floor of this space extends outside of the building, creating a walkway where the students and the public can enjoy the views from this elevated level. The extension of this floor to the outside also emphasizes the building concept as well as provides an outdoor link to the terrace building.

The Kindergarten, 1st, and 2nd grades are located on the ground floor to be close to the drop-off zone and the administration areas, and direct access the small park behind the school for outdoor play and learning. The 3rd, 4th, and 5th grades are located on the second floor, which functions as the main common and circulation space for the school. All grades come together at this level to gather at the Core or to access the cafeteria which is located in the terrace building via a bridge. The ends of the bridge are secured points of entry/exit, since the cafeteria is accessed by the public during off-school hours. The 6th, 7th, and 8th grades are located on the third level South of the Core, and the 9th and 10th grades are located to the North. The 11th and 12th grades are located in the upper level of the terrace building. These grades can be accessed via a covered walkway that connects to the project learning areas of the third level. Because it is assumed that the 11th and 12th grade students will primarily be offsite for their education at internships or other adjunct learning facilities, this area is designed to function like open studios where the two grades freely mix and collaborate, and the space serves as a 'homebase' for the students. This space also connects directly to the public terrace, from which the students travel to their sites in the city. All grades have access to the green roof, which serves as an expansive outdoor classroom as well as a private play area for the students.

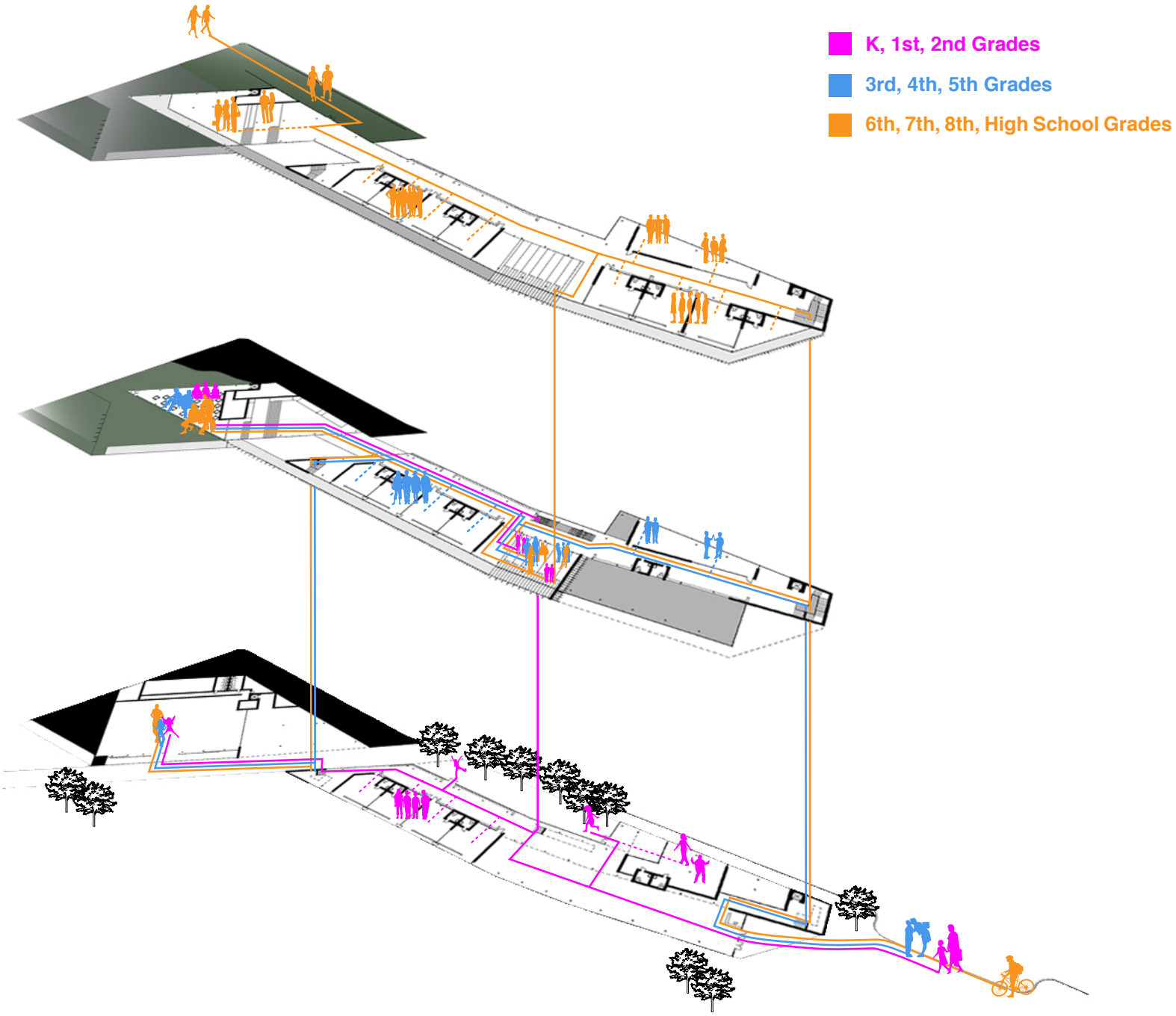
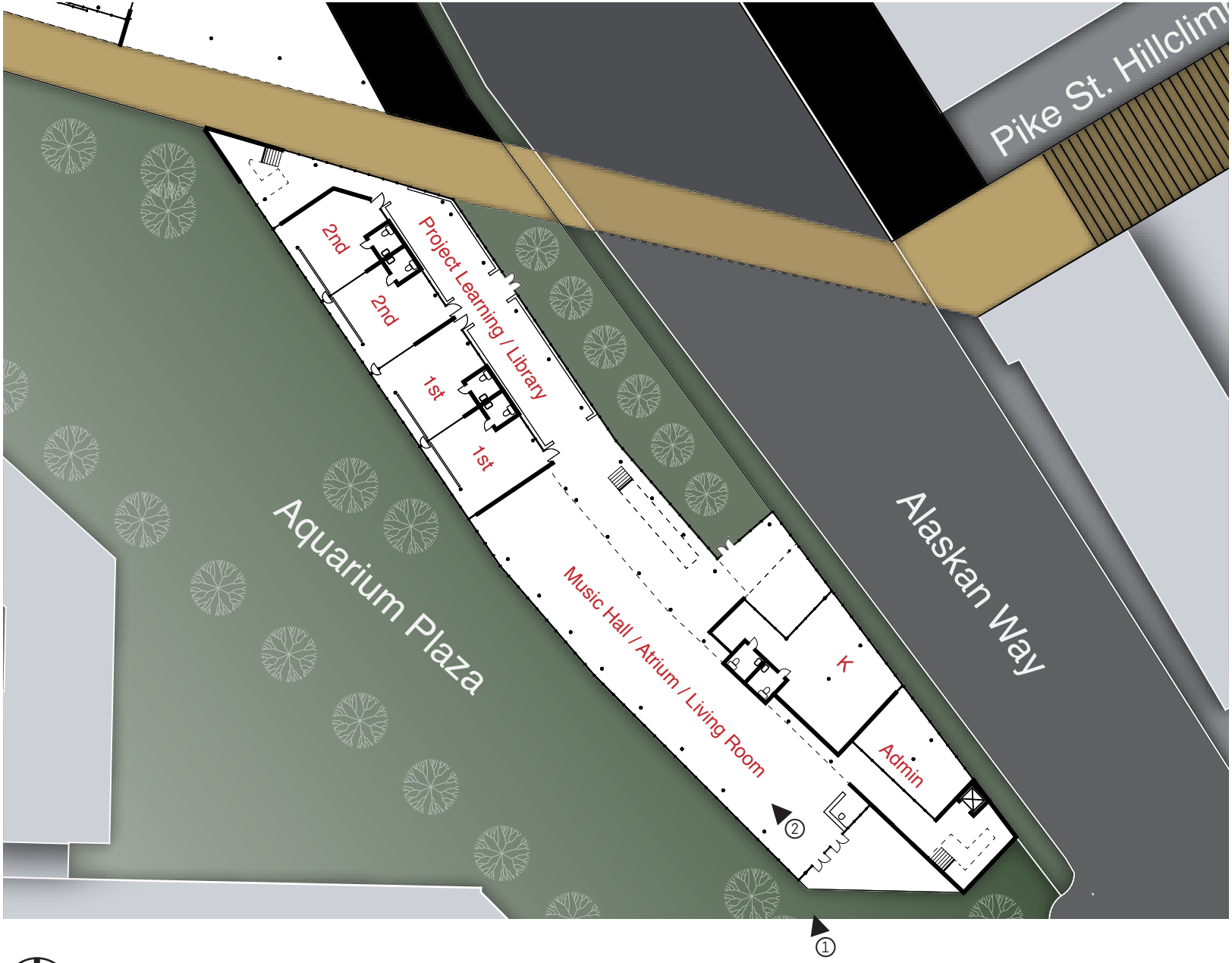
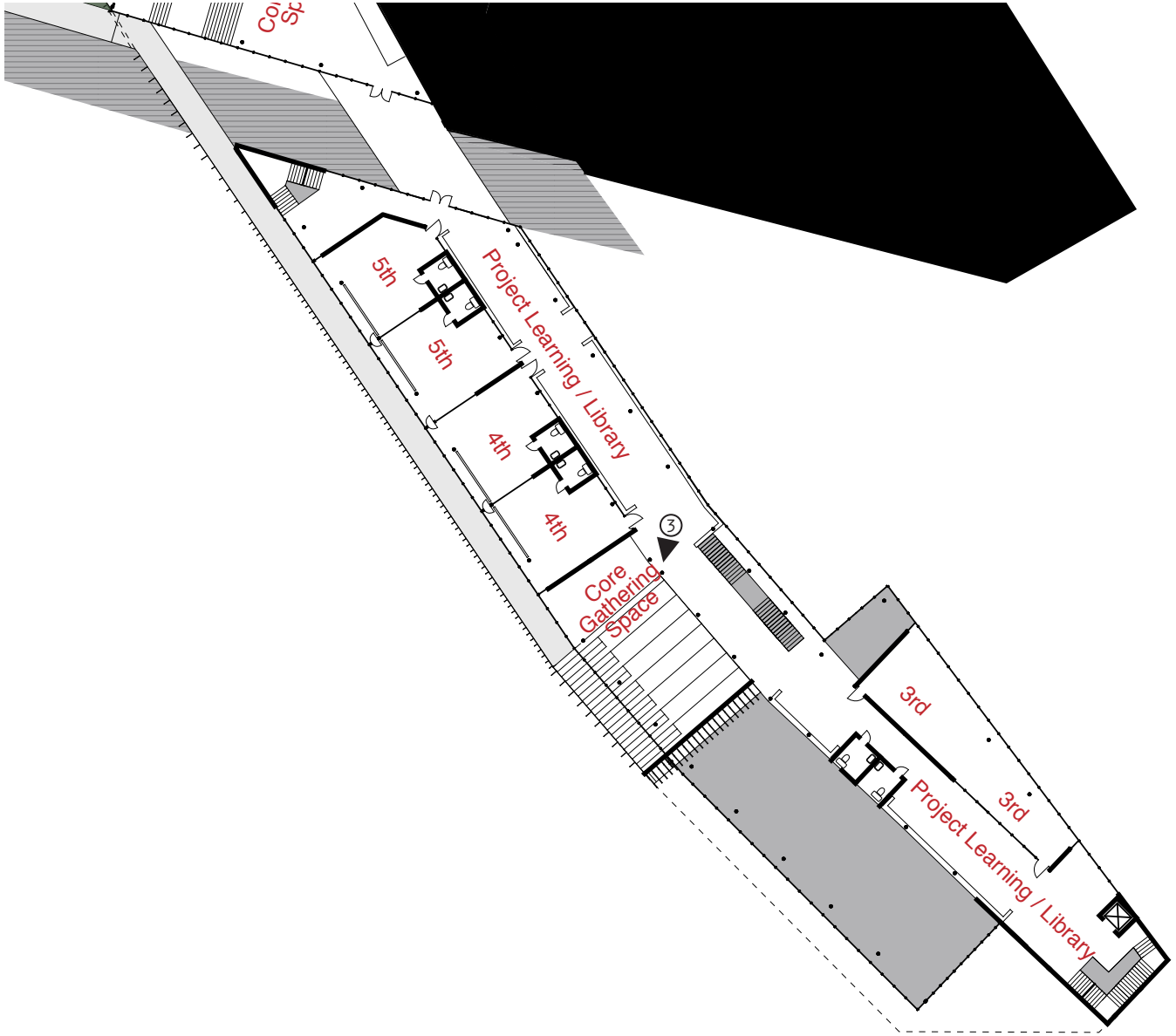


Figure 79: School Operation Diagram



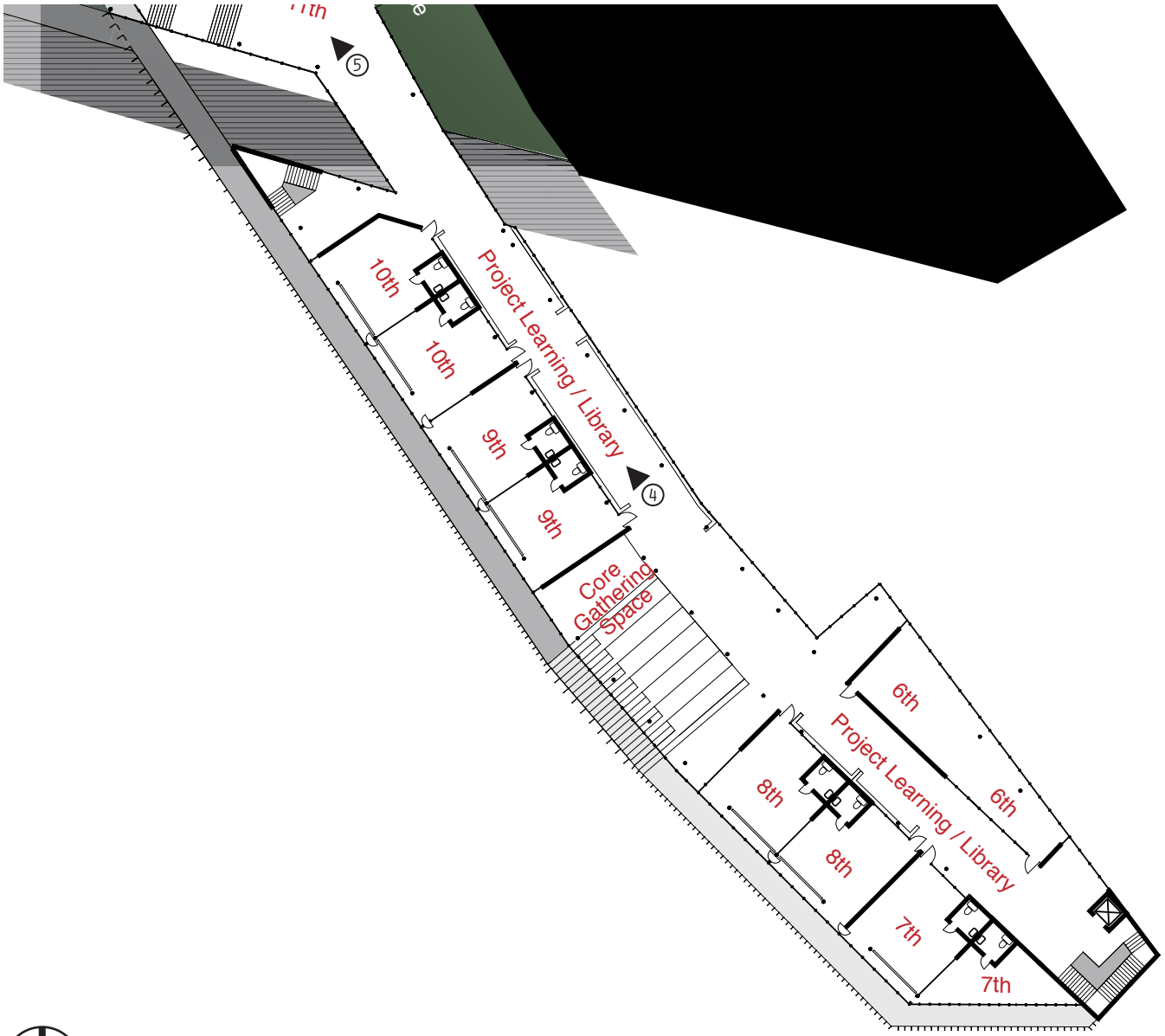
School - 1st Floor Plan
1” = 50’-0”

Figure 80: School - 1st Floor Plan



School - 2nd Floor Plan
1” = 50’-0”

Figure 81: School - 2nd Floor Plan



School - 3rd Floor Plan
1" = 50'-0"

Figure 82: School - 3rd Floor Plan

Figure 83: (1) Approaching the Waterfront School from South of Aquarium Plaza

Figure 84: (2) Entrance / Atrium / Living Room

Figure 85: (3) The 'Core' Gathering Space

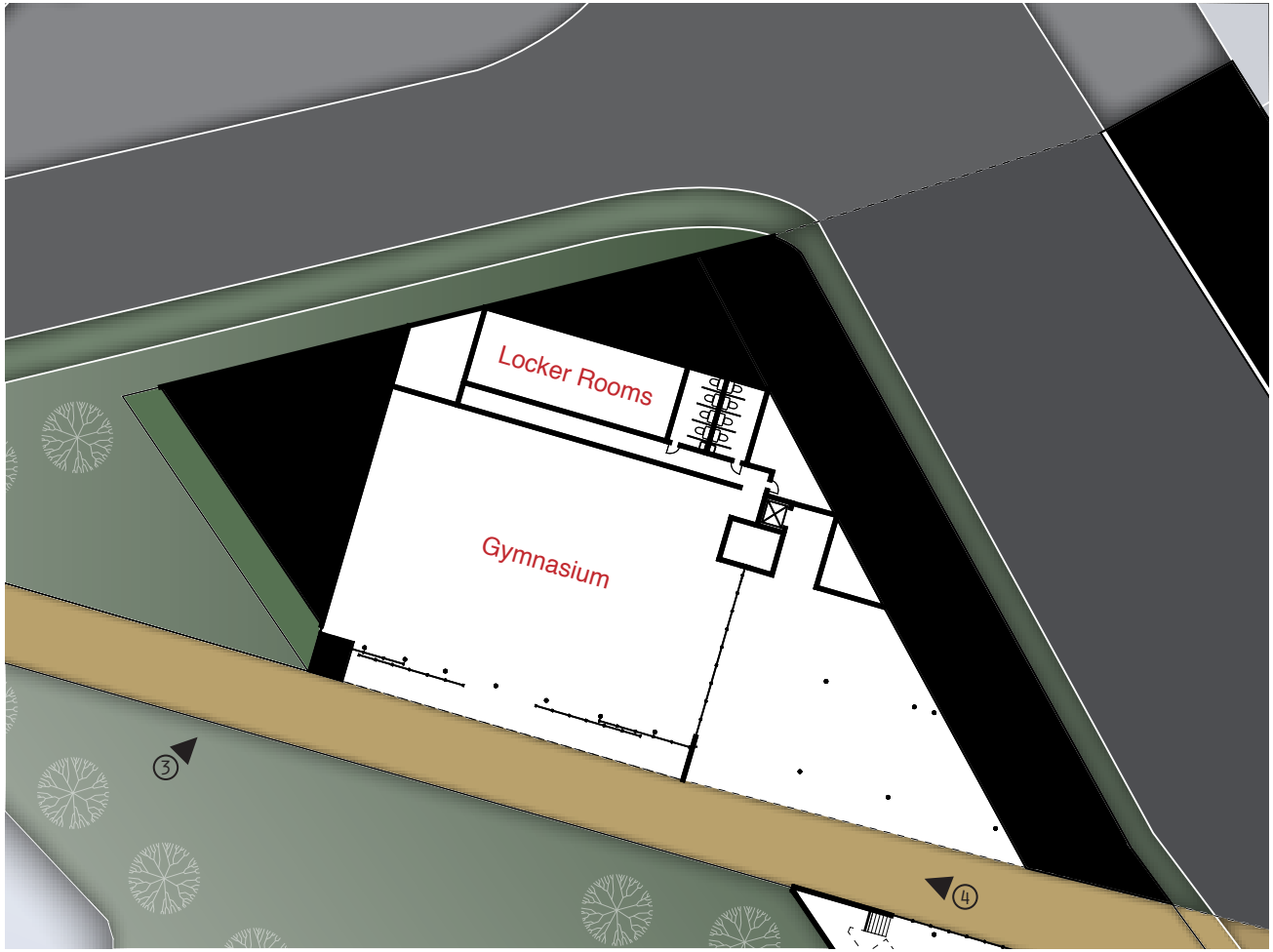
Figure 86: (4) Core Learning and Project Learning Spaces

Figure 87: (5) 11th and 12th Grades Studio Space

The facilities housed in the terrace building are spaces that are accessed by the public during school off-hours. With the exception of the 11th and 12th grade studios, these spaces include the cafeteria, which also functions as a small restaurant and a culinary academy, and the gymnasium. When approaching the terrace building from Victor Steinbreuck Park, one descends down the terrace path and arrives at the cafeteria on the second level. This space takes advantage of the views to the pier and Elliott Bay. Adjacent to the cafeteria and planted into the terrace is a small garden from which ingredients are grown and lessons are given in horticulture.

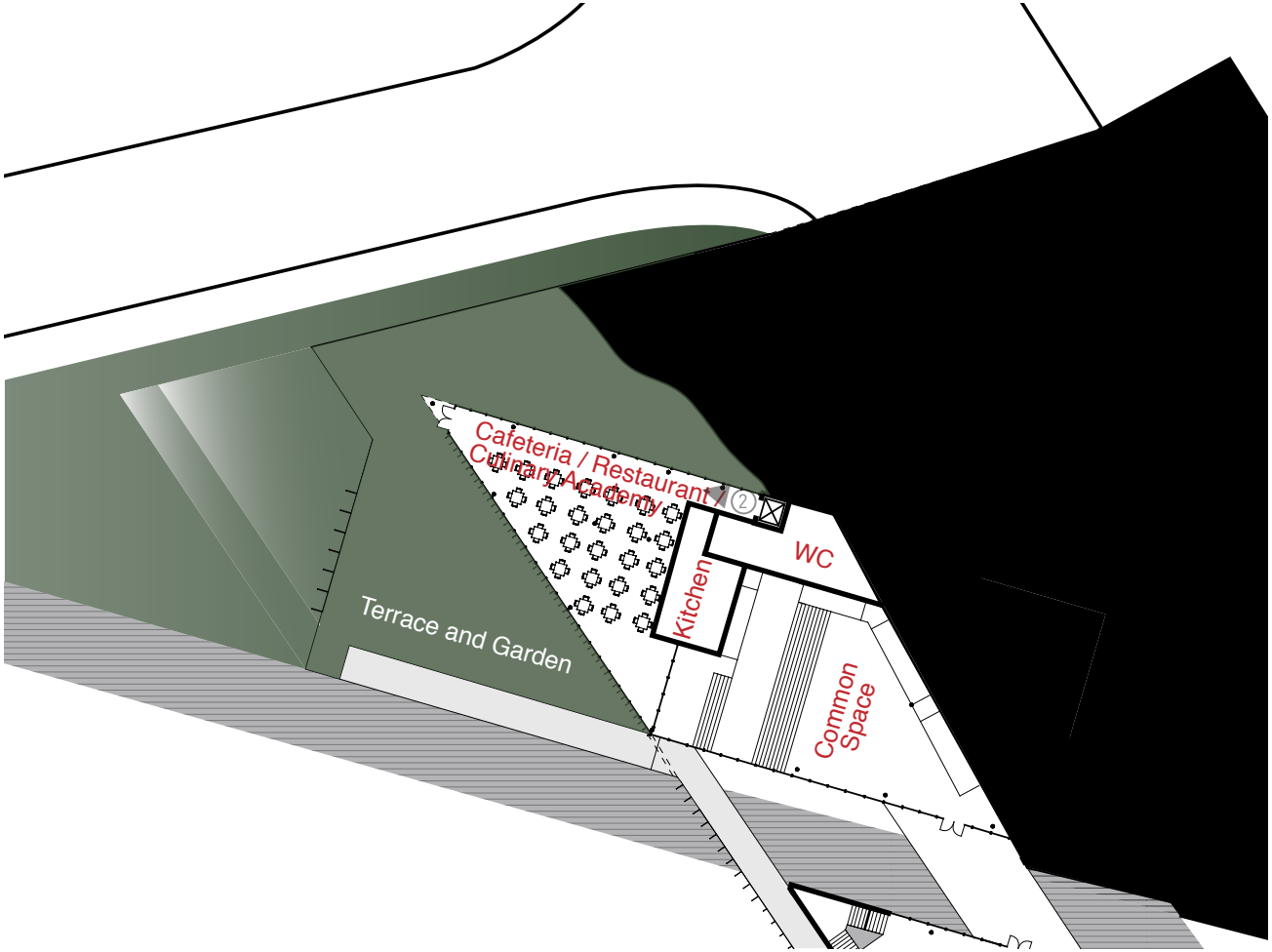
From this outdoor area, one can travel along the ramp that connects to the elevated walkway outside the school, or can return to the terrace to descend down to the waterfront. This part of the terrace wraps around and reveals the gymnasium, which is built into the hillside. The gymnasium fronts Aquarium Plaza to the North, and large sliding doors opens this space to the public plaza for possible community events and gatherings.

Aquarium Plaza can also be accessed on the ground level by a wide walkway that links the base of the Pike Street Hill Climb to Pier 62/63. This walkway separates the school and terrace buildings, but it is traversed by bridges on the upper levels. When approaching the plaza from the Hill Climb, this walkway passes through the small park behind the school and along a covered gathering space outside the gymnasium, before reaching the waterfront. A view of Pier 62/63 is framed from this walkway, which connects directly to the main pier ramp.



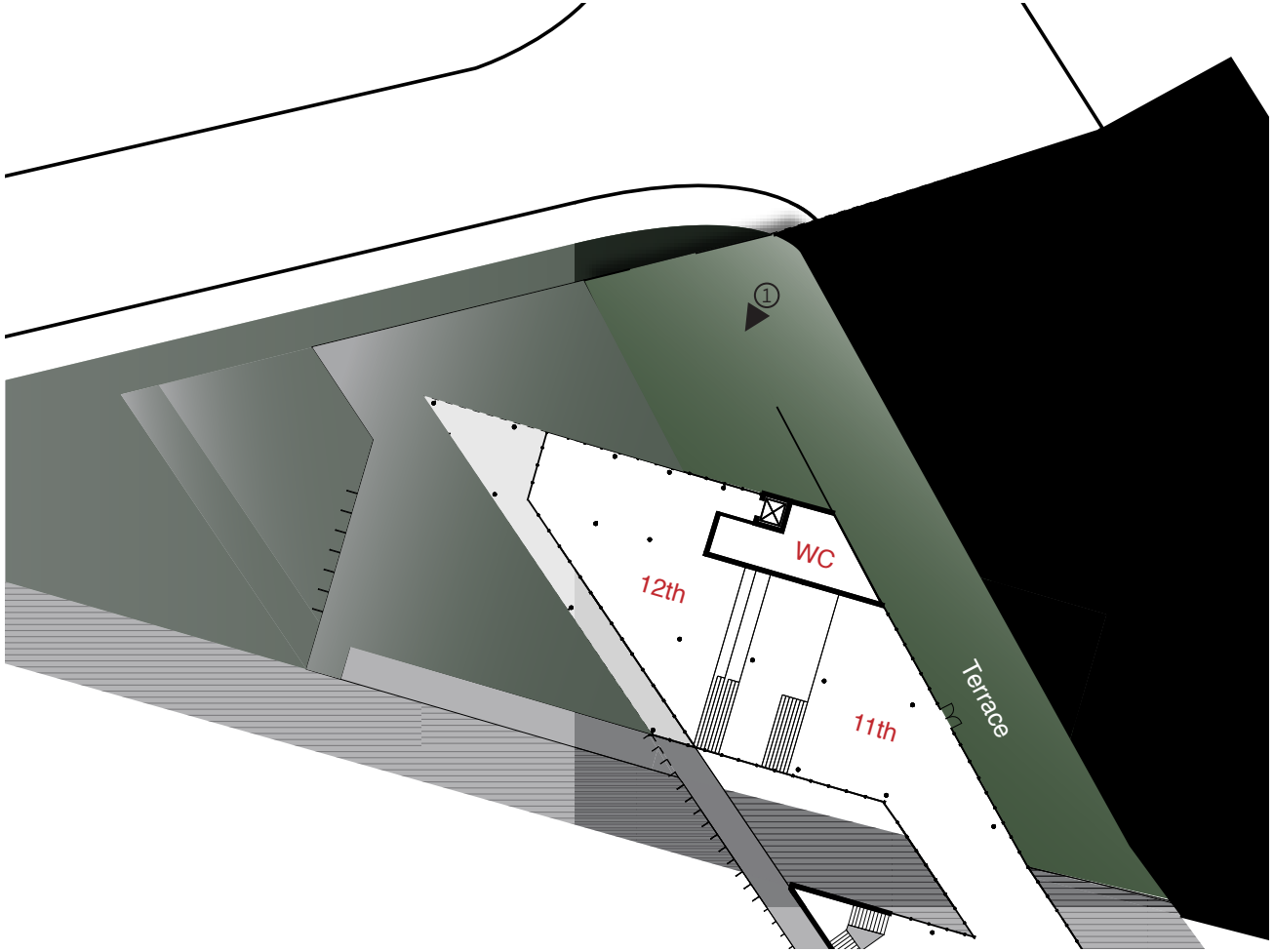
Terrace - 1st Floor Plan
1” = 50’-0”

Figure 88: Terrace - 1st Floor Plan



Terrace - 2nd Floor Plan
1” = 50’-0”

Figure 89: Terrace - 2nd Floor Plan



Terrace - 3rd Floor Plan
1” = 50’-0”

Figure 90: Terrace - 3rd Floor Plan

Figure 91: (1) View from the Terrace

Figure 92: (2) Cafeteria / Restaurant / Culinary Academy

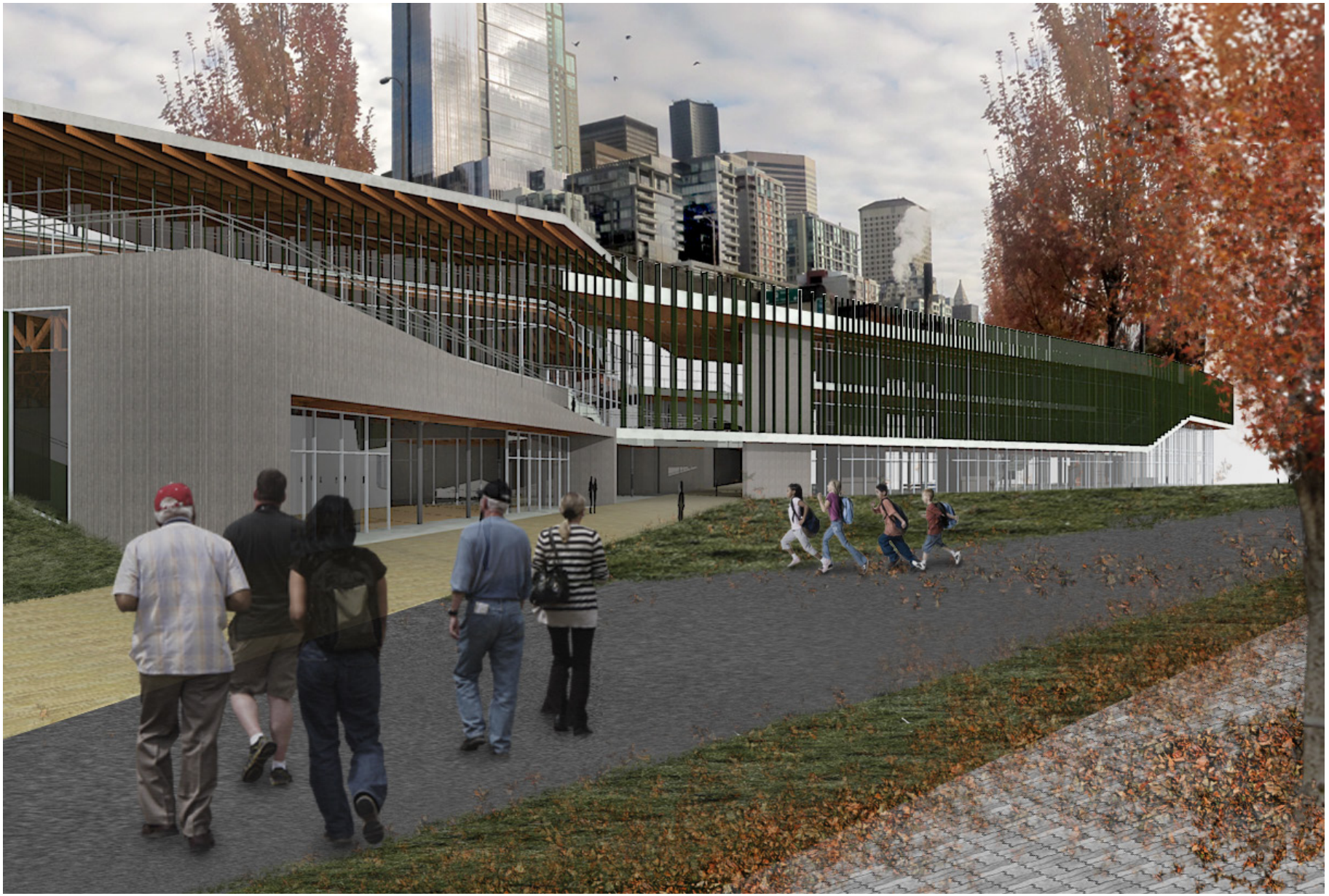


Figure 93: (3) Approaching the Waterfront School from North of Aquarium Plaza

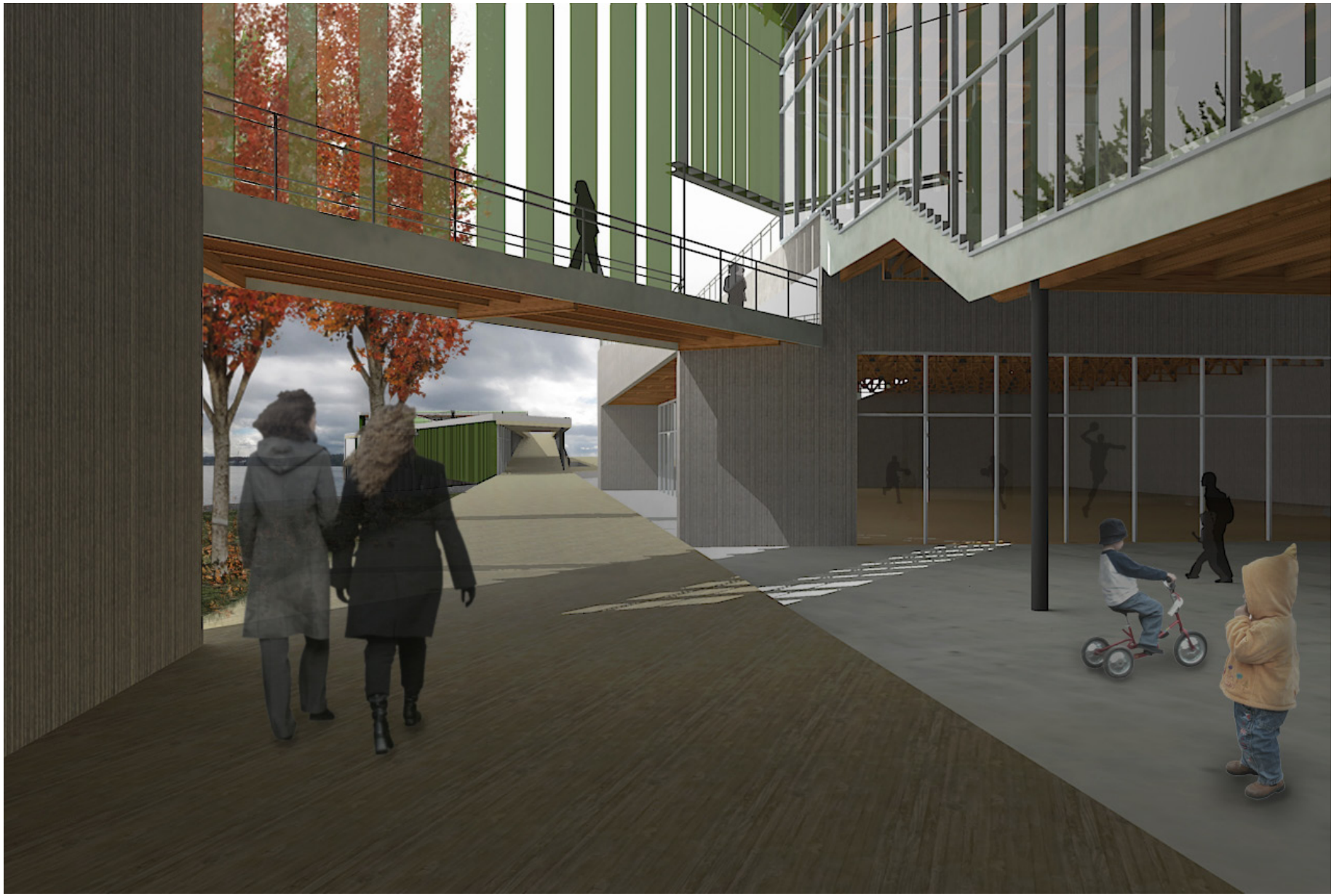
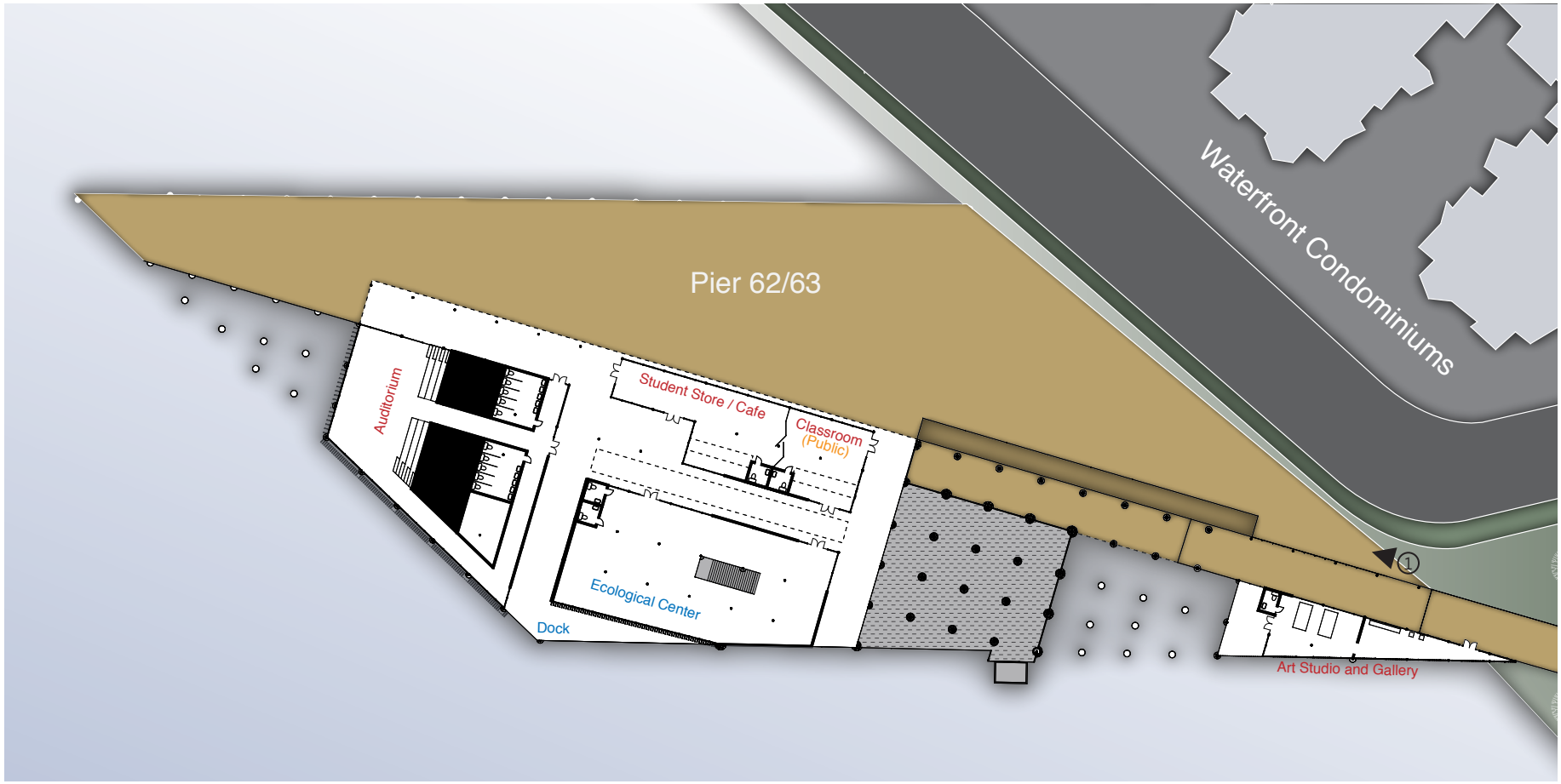


Figure 94: (4) View of Pier 62/63 from the Pedestrian Walkway

A strong public presence is already established on Pier 62/63, and therefore the design intervention of this site endeavored to maintain the pedestrian scale and retain a large portion of the original pier. Facing Aquarium Plaza, the student art gallery and adjoining art studio create a welcoming public streetfront. From the pier, one can access the student-run store and cafe, the public classrooms, and the auditorium. A port is also located on the pier level which is where the science barge and other vessels can dock. Because of the access to the water, the pier serves as a base for an ecological center that studies the ecosystems of the waterfront. In 2013, construction will commence to replace the Elliot Bay Seawall. The new seawall has the potential to introduce new aquatic habitats for salmon that migrate between the Duwamish River in the South and Puget Sound. An eco-center located here can positively contribute to this development, as well as provide direct learning opportunities for the students.

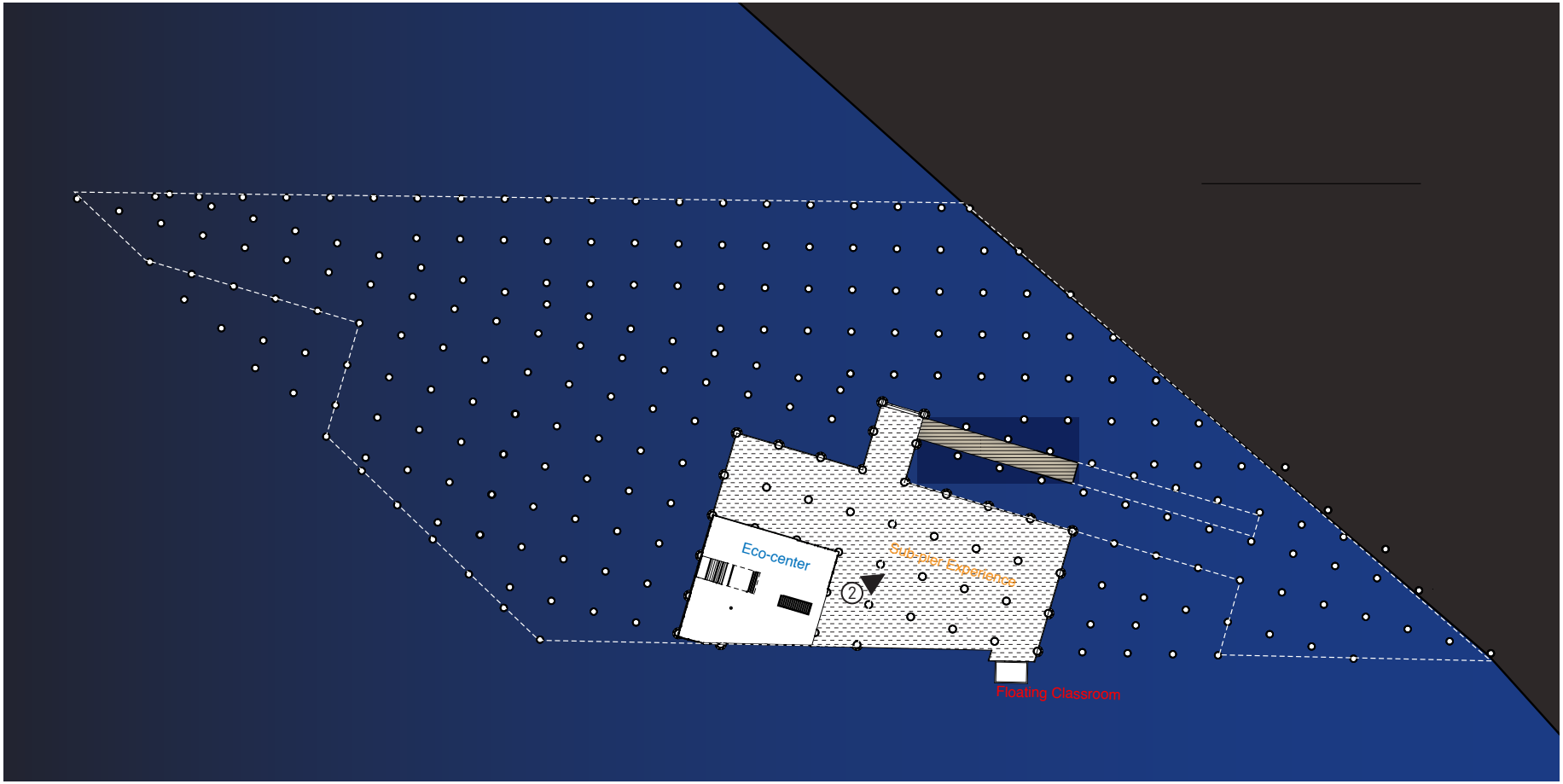
A ramp descends below the pier, where the public can have a unique sub-pier experience and come closer to the water. The school's floating classroom, which uses the pier's pilings to direct its route and allows students to take direct water samples and observe shallow habitats, is accessed from this level. The sub-pier entrance to the eco-center is also located here. Inside the eco-center, the students and the eco-center staff can descend into the underwater classroom, which is used to study aquatic life in the photic zone.

Returning to the pier level, the pedestrian walkway connects to a ramp that ascends to the second level of the pier. From this level, one can access the upper entrance of the auditorium, which projects out over the water. This level offers a large public area that can host community events or leisurely activities. A ramp from this level connects to the green roof of the auditorium, where the public can appreciate the spectacular views of the water and of the city.



Pier - 1st Floor Plan
1” = 75’-0”

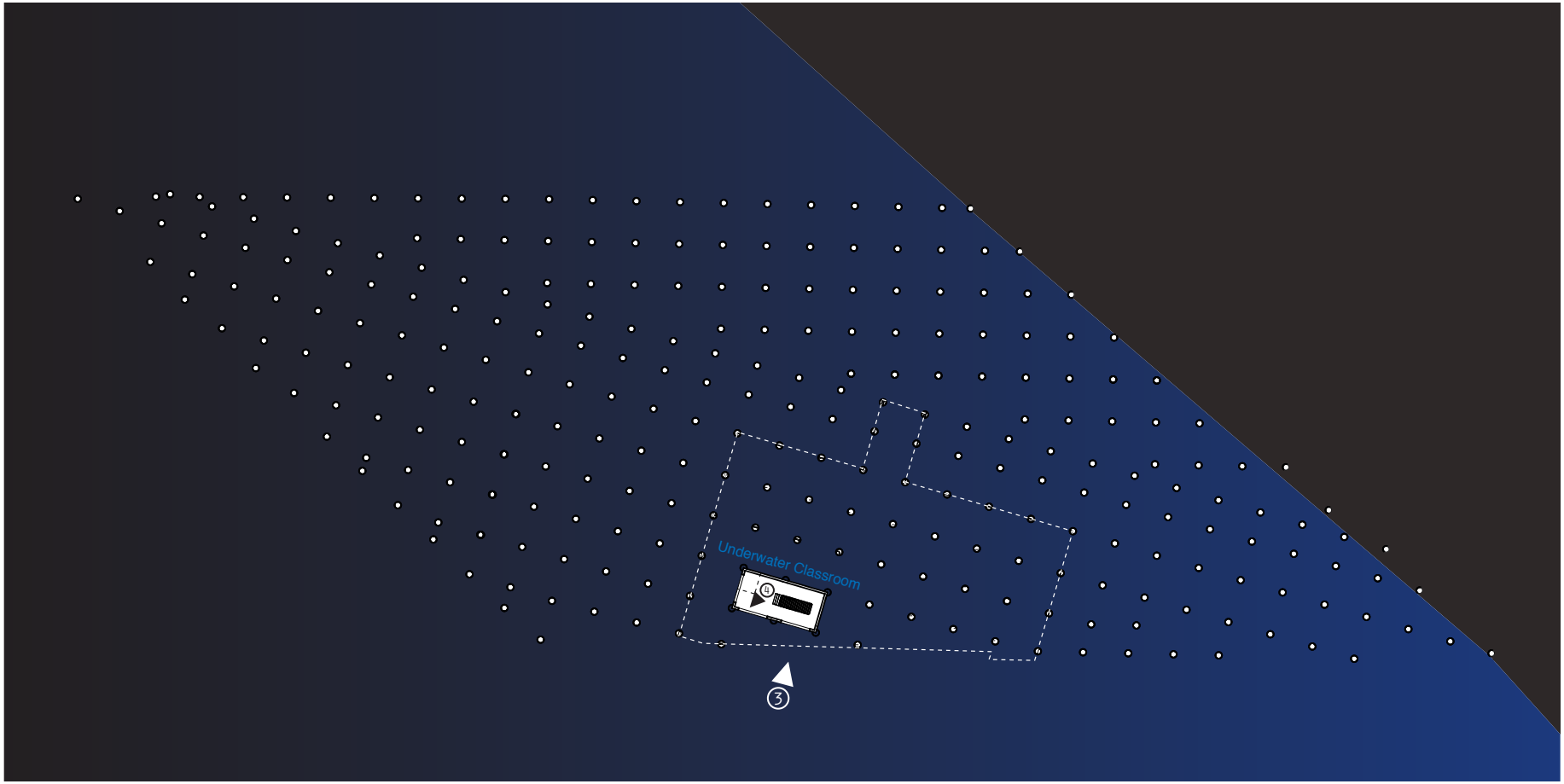
Figure 95: Pier - 1st Floor Plan



Pier - Sub-Pier Floor Plan

1” = 75’-0”

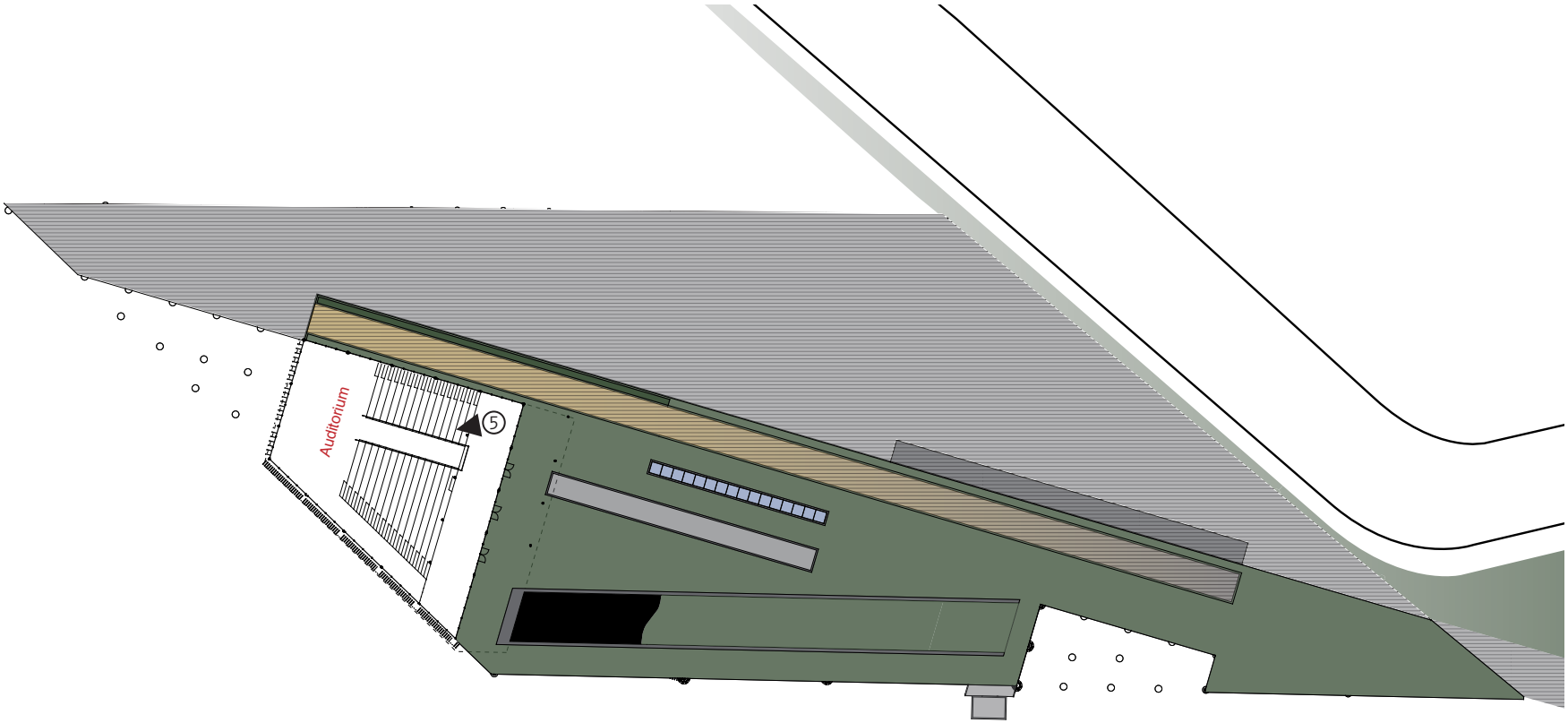
Figure 96: Pier - Sub-Pier Floor Plan



Pier - Underwater Classroom Floor Plan

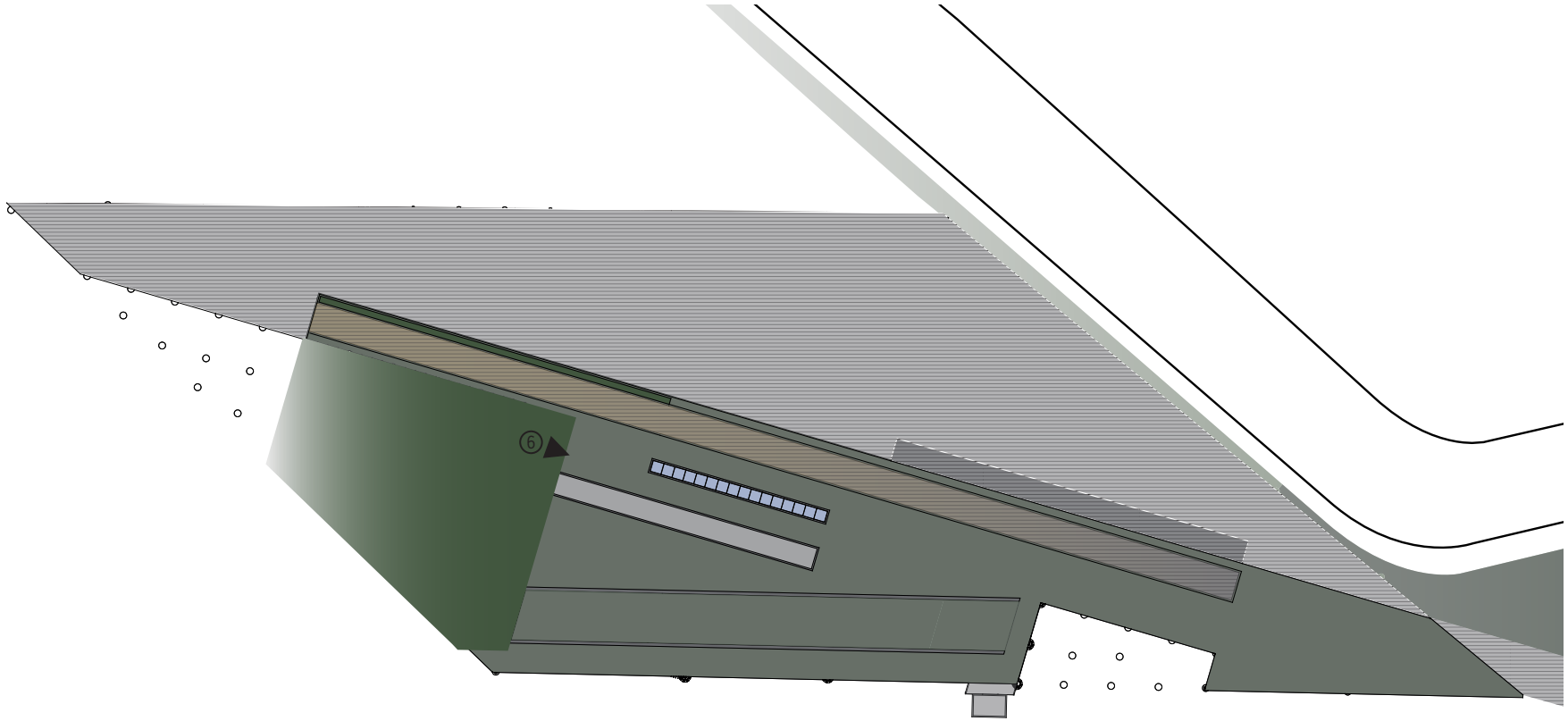
1” = 75’-0”

Figure 97: Pier - Underwater Classroom Floor Plan



Pier - 2nd Floor Plan
1” = 75’-0”

Figure 98: Pier - 2nd Floor Plan



Pier - 3rd Floor Plan
1” = 75’-0”

Figure 99: Pier - 3rd Floor Plan

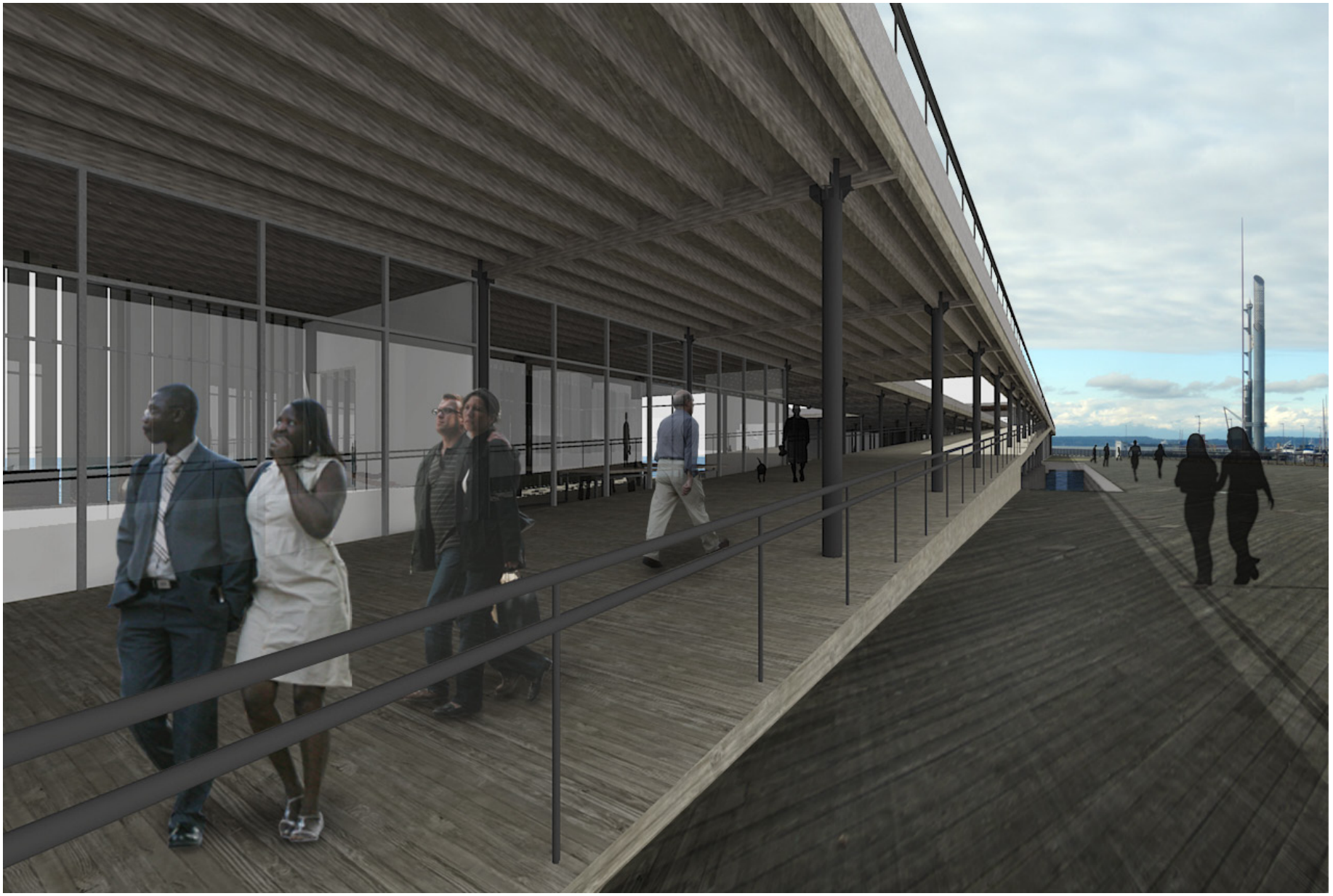


Figure 100: (1) Pier 62/63

Figure 101: (2) Sub-pier Experience

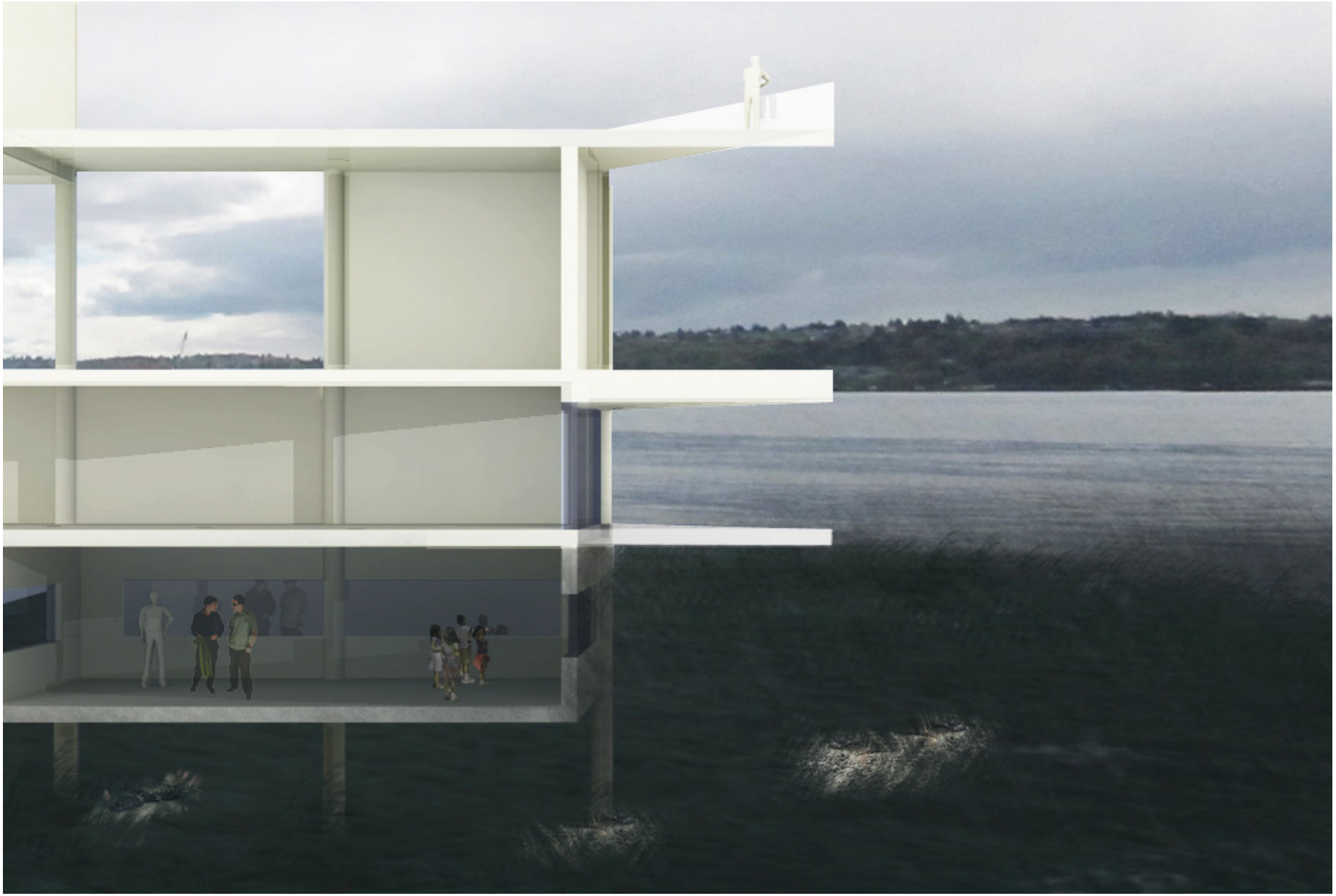


Figure 102: (3) Building section showing the Underwater Classroom

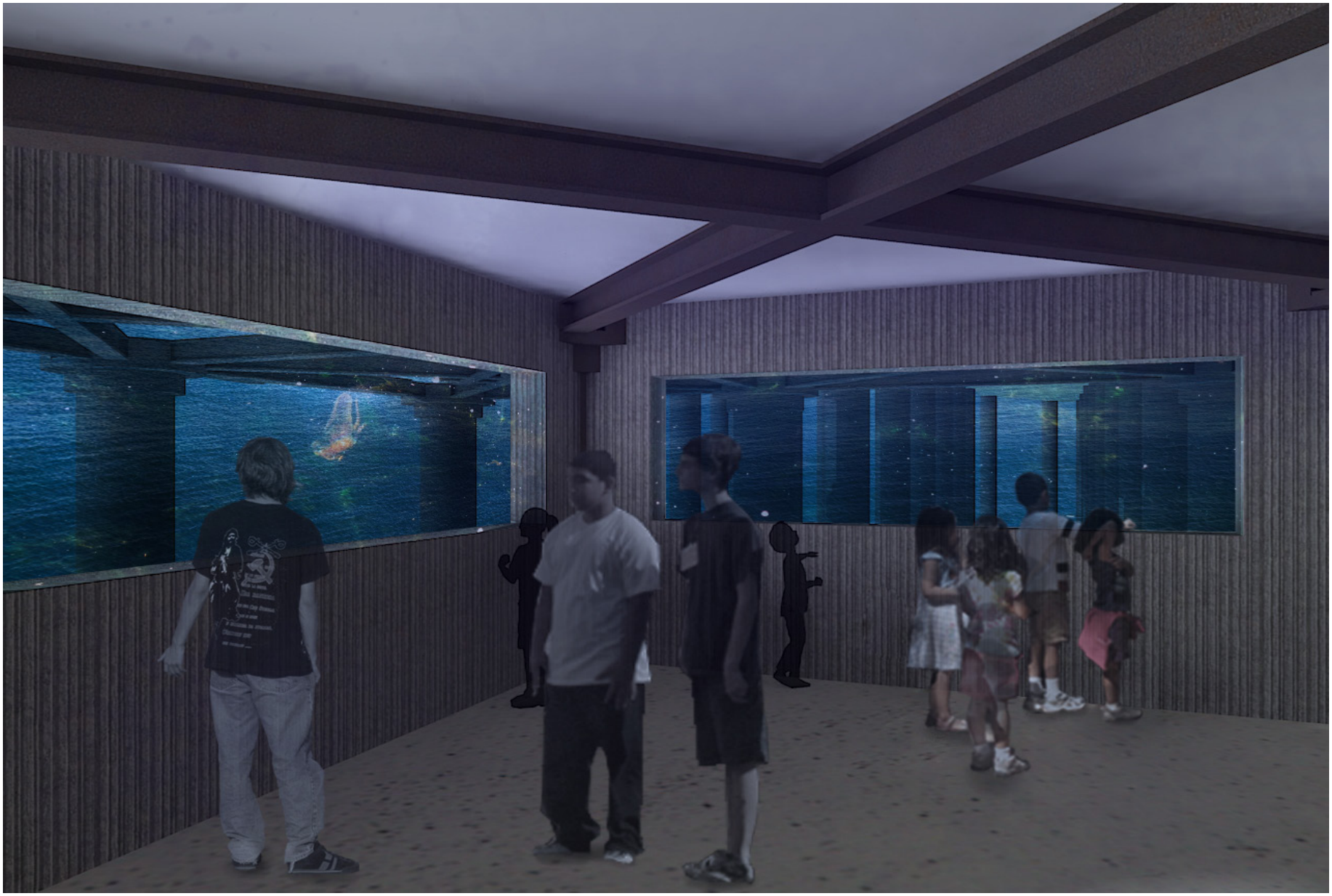


Figure 103: (4) Inside the Underwater Classroom

Figure 104: (5) The Auditorium

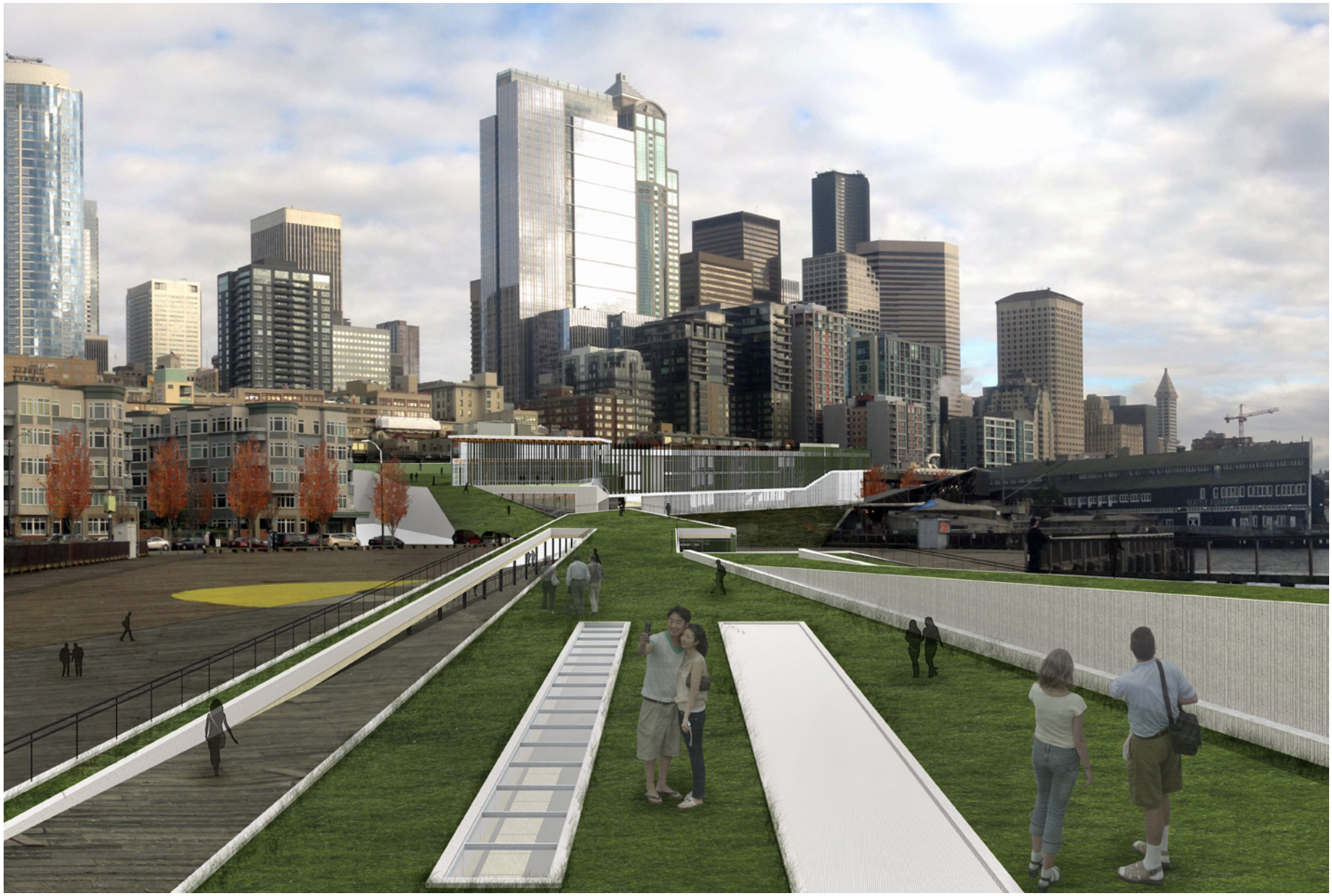


Figure 105: (6) View from Pier 62/63

Conclusions

Two initial questions framed this thesis process:

What is the link between architecture and education?

How does one design a dynamic learning environment?

Schools are being redefined as holistic environments that extend the learning boundaries beyond the confines of a built structure and that also recognize the social resources already existing within the school community. From educational facilities, like IslandWood, where the curriculum is intimately tied to the site, to UCDS, where collaborative learning among peers is highly valued, there is an opportunity to design an environment that allows children to become actively invested in not only what they learn but in how they learn as well. The curriculum also expands to include lessons beyond what is academically defined; these are lifetime lessons that benefit the social and personal well-being of the child: "Over time, children's interactions with the environment and the assimilation of environmental experiences would produce a feeling of competence and confidence. As the children develop, new place experiences and opportunities need to become available to support the growth of competence. . . . Children need to cultivate and be satisfied with their place experiences to support their healthy development and to maximize their developmental potential"[42].

For youth to become responsible adults, values must be instilled in them that encourage them to be socially-minded leaders and conscientious stewards of the natural environment. They must understand, appreciate, and be engaged in what they learn in order for positive lessons to become ingrained and beneficial actions to become habit. They must recognize their part, role, and responsibility in the larger context of environmental awareness and social sustainability; that is, a greater connectivity to their surroundings must be emphasized. One way to achieve these goals is to enhance the learning environment of their school, such that the context contributes to and is integrated into their curriculum. Rather than questioning the link between architecture and education, the role of architecture and its potential impact on the development of youth is one to be examined and applied. The potential exists for architecture to have a positive and lasting effect. As Peter Zumthor stated, "In order to design buildings with a sensuous connection to life, one must think in a way that goes far beyond form and construction"[43]. The positive impact that architecture can create for a child is captured by a young student reflecting on her experience at IslandWood, " . . . I think I have the power to make a change in the community"[44].

In conclusion, this thesis project explored the link between architecture and education by proposing a learning facility that was designed on a core set of educational values. These values also influenced the pedagogy of the school, the integration of the greater social and physical context into the programmed spaces as well as into the curriculum of the school, and ultimately the design of the building. The result of this framework was a dynamic learning environment that encapsulated the potential learning opportunities existing at the site. A possible future direction of this project is to study the interactions of the student with this built environment to determine if architecture can truly make a difference in the life of a child.

[42] Lim, Miyoun and Angela Calabrese Barton. "Exploring Insideness in Urban Children's Sense of Place". Journal of Environmental Psychology. Vol. 30 (2010). p 329.

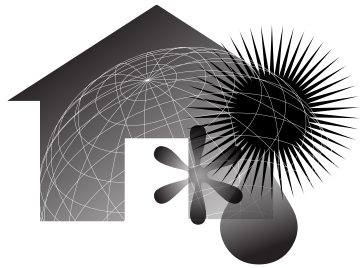
[43] Peter Zumthor, Thinking Architecture, 1998.

[44] "What I Learned at Islandwood" video, http://islandwood.org/about

Appendix:

Sample K-8 Science Curriculum for the Waterfront School

Grade	Course and Description	Science Standards
K - 1	**Habitats at Home I** (K - Myrtle Edwards Park, Garden, Olympic Sculpture Park) **Habitats at Home II** (1st - Floating Classroom, Pier, Underwater Classroom, Aquarium) Identify and describe the habitats found along the waterfront. Observe and describe animals and plants that live on the waterfront (avian, marine, terrestrial). Classify animal and plants by characterizing their adaptations to the habitat. Observe how the habitats change with the weather and seasons, and how animals and plants survive. Compare habitats and the species that live in them. Hypothesize what is needed for "happy" and "healthy" habitats, and what we can do to maintain them. Lab: Examine water and earth samples and macroinvertebrates using different magnifying tools. **Space, Earth, and Here** (Weather Station, Myrtle Edwards Park, Seawall, Olympic Sculpture Park) [SPACE] Observe and describe the motion of the sun at different times of the day and month. Observe the moon at different times of the day and month. Observe and describe weather conditions (temperature, wind, rain). [EARTH] Describe Mt. Rainier and what it is made of (rock). Describe Myrtle Edwards Park and what it is made of (soil). [HERE] Describe the waterfront and what it is made of (man-made). Lab: Sun charts, telescopes, weather tools, geologic specimens, soil samples, magnifying tools	**Physical Science** PS1 Push-Pull and Position PS2 Liquids and Solids **Earth and Space Science** ES1 Observing the Sun and Moon ES2 Properties and Change **Life Science** LS1 Plant and Animal Parts LS2 Habitats LS3 Classifying Plants and Animals 
2 - 3	**Water, Water, Everywhere** (Atrium, Floating Classroom, Underwater Classroom, Weather Station, Rainwater System, Pacific Science Center, Aquarium) Observe and describe the different forms of water. Describe and model how water shapes landforms (Puget Sound, Mt. Ranier). Describe why water is essential to habitats. Identify and describe the different parts of the watershed, and trace the path of a raindrop. Observe and describe water samples taken from different parts of the waterfront and on different days, and hypothesize causes for the differences. Identify and describe the habitats found at different water depths, and hypothesize causes for the differences. Identify and describe the animals and plants that live in the different water habitats. Identify the characteristics that enable species to live in the water, and describe how these characteristics work together. Describe a "healthy" water system and what we can do to maintain this. Describe how water is in the weather. Measure and record changes in weather. Trace the path of a raindrop on the school building. Lab: Examine water samples and aquatic macroinvertebrates using different magnifying tools, weather tools **Cycles** (Garden, Weather Station, Underwater Classroom, Aquarium) Observe and describe the life stages of a plant (Seed - Sprout - Full Grown - Dying - Decomposition). Describe the variations among plants. Describe the offspring of the plants and compare with the parents. Identify and describe the parts of the compost pile and what each part does (fuel and nutrients). Observe and describe the life stages of a salmon (Egg - Alevin - Fry - Parr - Smolt - Ocean - Spawn). Describe the variations among the salmon. Describe the offspring of the salmon and compare with the parents. Describe what is needed to support a healthy life cycle of plants and salmon. Observe and describe how ecosystems change with the weather and seasons. Describe how we can maintain healthy ecosystems. Observe, describe, and track the motion of the sun and make a sun chart. Describe and track how fossils come to be. Lab: Dissect seeds, examine salmon stages using microscope, sun charts and sun dials, examine soil samples from compost	**Physical Science** PS1 Force Makes Things Move PS2 Properties of Materials PS3 Forms of Energy **Earth and Space Science** ES1 The Sun's Daily Motion ES2 Water and Weather **Life Science** LS1 Life Cycles LS2 Changes in Ecosystems LS3 Variation of Inherited Characteristics 

Grade	Course and Description	Science Standards
4 - 5	**Prof. Building** (Building, Weather Station, Benroya Hall, Pier) Identify, describe, and measure the forces and motions found in the building (structure - truss, columns, beams, rainwater system). Describe sound energy and draw the vibrations. Identify and describe the materials that make up the school and hypothesize why these were chosen. Describe the light that comes through the different types of windows. Observe and describe how the pier is "weathered". Identify the fossils that are found in the school, describe the event that caused the formation of the fossil, and infer the environmental conditions that existed when the fossil was formed. **Weather Wonders** (Weather Station, Garden, Building, Myrtle Edwards Park) Describe how matter changes state in terms of the weather. Identify and describe different forms of energy and how energy can be transferred from one place to another - identify "hot spots" in the school and infer why this is. Study and make energy generators (wind, solar/heat, water). Identify and describe the parts of a circuit using a photovoltaic panel. Trace the path of the sun and the earth, and describe why seasons happen. Describe how weather causes erosion, and trace how soil is formed. Describe how people can reduce erosion. **Webs, Networks, and Populations** (Floating Classroom, Underwater Classroom, Garden, Living Machine, Myrtle Edwards Park, Pacific Science Center, Aquarium) Illustrate the different parts of the ecosystems around us (plants, animals, habitats), and describe the connections - how different parts depend on each other for survival and the flow of energy. Describe the processes of the Living Machine. Sort plants and animals according to their structures and behaviors. Use a dichotomous key to identify aquatic macroinvertebrates. Relate salmon stages and behaviors to the needs of salmon at different points in their life cycle. Describe how the salmon habitat and food sources are affected by wetland plants, animals and soils. Track populations (salmon, birds). Identify the sources of pollutants of the watershed. Test the water quality of samples taken from different parts of the waterfront. Describe how people impact water quality, ecosystems, and salmon. **5th Grade - Assist K and 1st Grade**	**Physical Science** PS1 Measurement of Force and Motion PS2 States of Matter PS3 Heat, Light, Sound, and Electricity **Earth and Space Science** ES1 Earth in Space ES2 Formation of Earth Materials ES3 Focus on Fossils **Life Science** LS1 Structures and Behaviors LS2 Food Webs LS3 Heredity and Adaptation 
6 - 8	**6th Grade - Assist 2nd** **7th Grade - Assist 3rd** **8th Grade - Assist 4th** **The World in Motion** Calculate the average speed of cars on Alaskan Way. Calculate the average speed of boats in Elliott Bay. Describe the forces present in water, and describe how fish and boats overcome these forces.	**Physical Science** PS1 Balanced and Unbalanced Forces PS2 Atoms and Molecules PS3 Interactions of Energy and Matter **Earth and Space Science** ES1 The Solar System ES2 Cycles in Earth Systems ES3 Evidence of Change **Life Science** LS1 From Cells to Organisms LS2 Flow of Energy Through Ecosystems LS3 Inheritance, Variation, and Adaptation

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