TERMINAL VACANCIES IN THE INDUSTRIAL VOID :

A Combined District Heating Power Plant and Public Bath in the Port of Tacoma

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Brian Mclaren

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Abstract

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This thesis contends that industrial infrastructure can transcend its prescribed function as raw utility and offer the extension of a public amenity for the city. The working waterfront is a celebrated ideal by the city of Tacoma, but new development tends to deny an honest depiction of the active industry in the port today. There remains a stark delineation between the industrial and public realms in Tacoma, a city that identifies as industrial. Industry has a significant role in the city but often masks its presence with an architecture of industry that obscures the operations within from public view. The argument made by this thesis is that the working waterfront can become an urban environment where industry and public space coexist. Architecture can serve as the threshold between industry and the city by offering a place where the public can safely engage an active industrial process. This design proposal makes a concerted effort to neither dissolve nor preserve as artifact the historical remnants of industry in Tacoma. But rather repurpose discrete utilitarian elements for renewed functions that incorporate both industrial and public uses. This is one interpretation of a model that can be observed by other port cities encouraged to redevelop the working waterfront. This thesis posits that public functions can be framed by industry to curate an urban environment where industry and public functions can coexist.

TERMINAL VACANCIES IN THE INDUSTRIAL VOID:

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Connor Irick

fig. 1 Port of Tacoma, Ted Warren

fig. 2 Port of Tacoma, Ted Warren

I

INTRODUCTION

The common urban waterfront is hardly approachable, much less swimmable, encrusted with wharves, switching yards, sewage outfalls and other industrial barnacles. It is the true civic outcast, the ghetto of ghettos, familiar only to longshoremen, sanitary engineers and carp.

Wesley Marx[1]

This thesis explores the growing seclusion of the urban waterfront in the modern industrial port. This issue is most pertinent to Tacoma, Washington, a city that emerged from the tide flats as a harbor and today continues to be defined by its industrial origins. This port city serves as a conduit for international trade and commerce, subject to the global forces that seemingly refute local interests. These forces have created an industrial vacuum, the “civic outcast” described by Wesley Marx above dissociated from the surrounding. How then can Tacoma continue to identify as a port city if the urban core is severed from the industrial waterfront? The common approach to new waterfront development has been to manufacture a past maritime heritage that romanticizes the historical past, obscuring the active industries that constitute the port today. These conditions perpetuate the industrial seclusion of the port, effectively ignoring it as a built environment that is a part of the city.

fig. 3 The Machine, Philip Wiper

This thesis proposes that industrial infrastructure can transcend its singular prescribed role as a raw utility and take on the additional purpose of a public amenity. The architecture of industry has the ability to evoke a sense of monumentality and energy by removing the shell that houses the machine. A new architectural typology that honestly expresses the inner mechanisms of industry makes possible an active engagement with the working waterfront. The immersion of the public in the bellows of this machine will restore the link between the port and the city. Such an effort will contribute to sense of industrial pride in Tacoma's heritage and encourage public involvement with the industry of the future.

The site for this investigation explores the tension between where the city ends and the port infrastructure begins. The analysis of the mechanics of the port provides insight into how the industrial and public realms can coexist. The flows of materials and cargo paired with the engineered movement of machinery reveal a built infrastructure that is in constant flux. The Thea Foss Waterway, Tacoma's first industrial waterway is chosen to be the site where the convergence of industry and city is most prevalent. The foreclosed Martinac Shipyard on the east shoreline is a convincing site for this proposal, where the zoning for heavy industry meets mixed-use development. This site has the potential to serve as the threshold between city and industry providing the opportunity to blur the existing distinction between the two realms.

fig. 4 American Landscape, Charles Sheeler

The design project is a new architectural typology that incorporates a public amenity with a combined utilitarian function. The intent is to expose the mechanics of operations of the port industry in Tacoma by using built form to offer the public insight into the operations of the port. This thesis employs the language of industrial infrastructure to formulate an architectural typology that narrates the past and future of production along Tacoma's waterfront. It will use architecture to portray an open transparency of industry and narrate the operations and role of the machine within the larger context.

The project will blend the operations of an active industry and public space to better secure the relationship between city and industry in Tacoma. It will adaptively repurpose a foreclosed shipyard, utilizing the fragments of the existing industrial infrastructure as the framework for the design intervention. This thesis proposes a combined district heating power plant and public pool in the Port of Tacoma. It further argues that industrial infrastructure can transcend its prescribed function as raw utility and offer an extension of a public amenity to further enrich the urban ecology of the working waterfront.

II

TACOMA AS A PORT CITY

THRESHOLD BETWEEN LAND AND SEA

A port serves hinterland and horizon alike, its functional architecture defining that unique meeting of land and sea

Perter Quartermaine[2]

Tacoma, Washington firmly identifies as a port city. The city was founded on the prospect of the land, the lush resources of the region and the ease of access to the water's edge. Defined by its topography. Tacoma's naturally deep water bay allows for large vessels to make landing close to the shoreline. The surrounding hillsides offer safe harbor for the ships that make passage through the Puget Sound. These natural characteristics have shaped Tacoma as the robust industrial port it is today.

fig. 5 Tide Flats, Tacoma, 1919

The original settlement of Old Tacoma took form at the water's edge on the southwest shoreline of Commencement Bay. The geography here is defined by a steep bluff at the water's edge that protected the first rail line of 1874 that traced the shoreline at the base of the hillside. Historically the water's edge was defined by wharves, grain silos and coal bunkers that extended out to allow ships to land. Tacoma's motto "when rail meets sail" reflects the city's origins as a port city, the threshold between land and sea.[3] The actuators of development at the urban waterfront are rooted in the resources procured from the land. Timber was the most abundant resource in the region resulting in a number of prominent lumber mills. Grain grown in the farmlands in the valley was transported to the shore by rail mined in the Cascades. Stored and processed at the water's edge in order to power both the cargo ships and rail cars. The water's edge has historically been defined by the active convergence of intermodal transit and the exchange of

fig. 6 Elevator A Wharves and Ships, Tacoma, 1892

goods.

The tide flats where Commencement Bay meets the Puyallup River Delta at the base of Downtown Tacoma was initially seen as having no value. The land was not useful for agriculture and had no timber to be logged. These tide flats would however prove to be prime real estate for industrial development after the transcontinental rail carved passage from Chicago to Tacoma's wharf. When the city became the Western Terminus of the Northern Pacific Railroad in 1873, the value of the tide flats took a dramatic shift.[4] The arrival of rail connection to Midwest markets brought the promise of economic prosperity and rapid industrial development to the waterfront.[5] Named "the City of Destiny," Tacoma began to take shape directly adjacent to the tide flats. The untouched terrain of the river delta landscape would be carved away by deep waterways and filled for buildable land. The urban waterfront was transformed by the industrial

fig. 7 Coal Bunkers, Tacoma, 1870

A CONDUIT FOR GLOBAL TRADE AND LOCAL ECONOMY

Ships can be marginal places but they are also the instruments of normality - the lifeblood of the modern world system. They carry the stuff we consume and carry oil to keep us moving.[6]

Tim Casswell

Port cities are a vital fixture in the global economy. They bring imports to vast portions of the continent and export of local goods, sustaining both the local and regional economies. Tacoma is the largest port in the Pacific Northwest, netting billions dollars in international trade annually with room for expansion. The international trade partners include China, Japan, South Korea, Southeast Asia, Indonesia and Australia. Annually, Tacoma moves 21 million shipping containers, 2.8 million tons of grain and 41.7 million board feet of wood.[7] The sheer volume and scale of these figures provides a clear indication of the magnitude of operations at the port that extend into the city itself. The infrastructure built to facilitate this global trade also caters to the local operations. Tacoma is more than just a platform for transshipment. Like all port cities it is a dynamic built environment comprised of a range of manufacturing and raw material processing industries that are dependent on the infrastructural network of the port. As the hub for global transshipment and of local industries, the Port of Tacoma has a tremendous impact on the local urban condition.

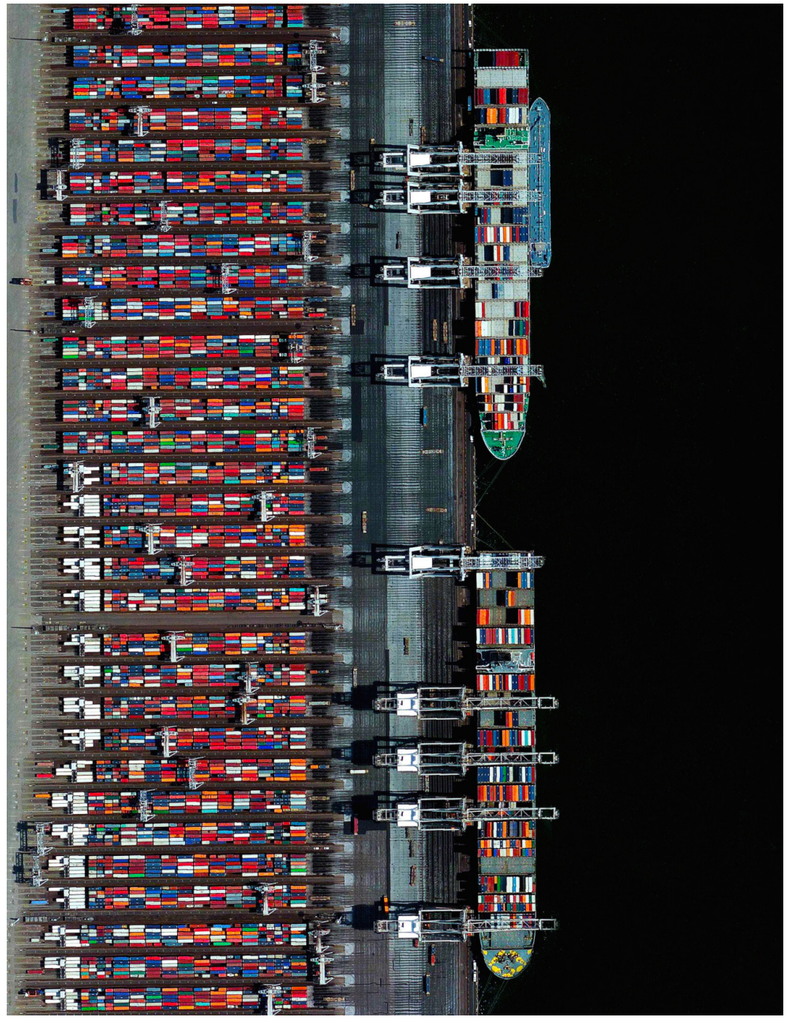


fig. 8 Transshipment

fig. 9 Port Infrastructure
fig. 10 Shipbreaking #49, Edward Burtynsky

The current trend however is that the global influences on the port infrastructure far outweigh that of the local interests. Urban historian Caroline Hein describes this current situation stating, “Ports have turned into secluded worlds, separated from the urban context, spatially and mentally severed from the city, with their own employment, operators and administration structures.”[8] She points out that local authorities are losing control as international logistic firms are increasingly becoming the sole proprietors of the modern port. The resulting effect on the city can often be an industrial built environment that functions as a utility for the global trade network but is completely disassociated from the local network.

This has become evident in a recent development in Tacoma where a foreign-backed company has proposed that the city become the methanol capital of world. The proposal was to build the largest methanol plant in the world in the Port of Tacoma producing liquid methanol from natural gas to be shipped to China to supply the plastics industry.[9] But public outcry questioned the authenticity of this proposal as a prosperous venture for the city. Redline Tacoma, a grassroots organization formed to oppose this project, identified the city’s newfound desire to reclaim the industrial waterfront as its own.[10] The cancellation of the proposed methanol plant was not due to public outcry, but to the cost prohibitive environmental review process of the brownfield site.[11] This event is a striking indication of the power of the global forces that shape the Port of Tacoma and of the strength of the city’s desire to take control of its waterfront.

fig. 11 A River Bank, Laurence Stephen Lowry

THE RELATIONSHIP BETWEEN INDUSTRY AND THE CITY

From the economic point of view, industrial areas, railway stations, ports, unsafe residential neighborhoods, and contaminated places are where the city is no longer...In short, they are foreign to the urban system, mentally exterior in the physical interior of the city, its negative image, as much a critique as a possible alternative.[12]

Ignasi de Sola-Morales

Tacoma presents a unique example of port cities in the scale and location of its harbor relative to the downtown area. Port infrastructure often occupies the waterfront adjacent to the downtown. With the industrialization of transshipment and the emergence of massive container ships, typical port infrastructure requires vast swaths of unclaimed land close to the water's edge.[13] Historically industrial ports were dependent on their close proximity to the city core and therefore were more integrated within the city fabric. In the past bulk cargo was unloaded by hand and goods were sold at the city wharf, making the waterfront forum where public life and industry coalesced.[14] Today goods are moved by large machines and stored in vast empty spaces void of all human scale and habitation. This has resulted in the increasing separation of the modern port from the city center.

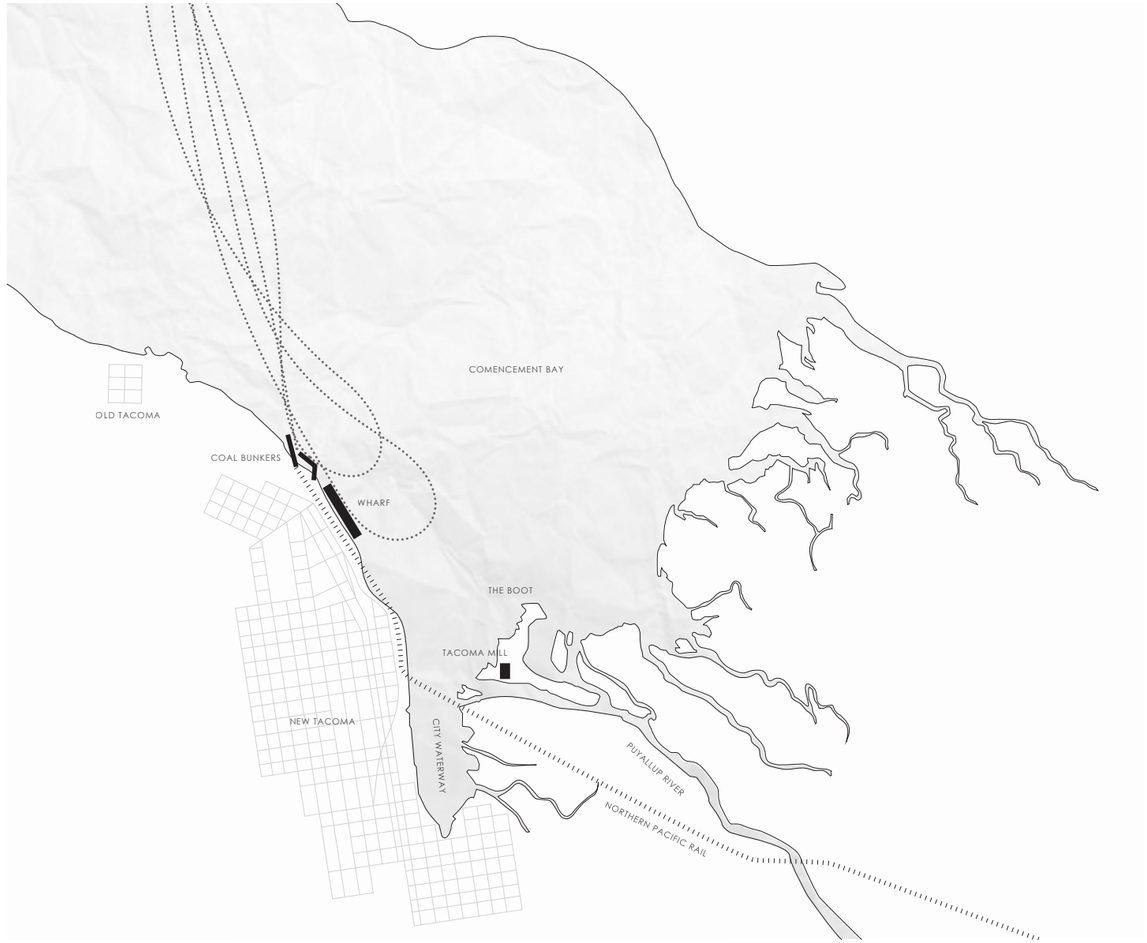
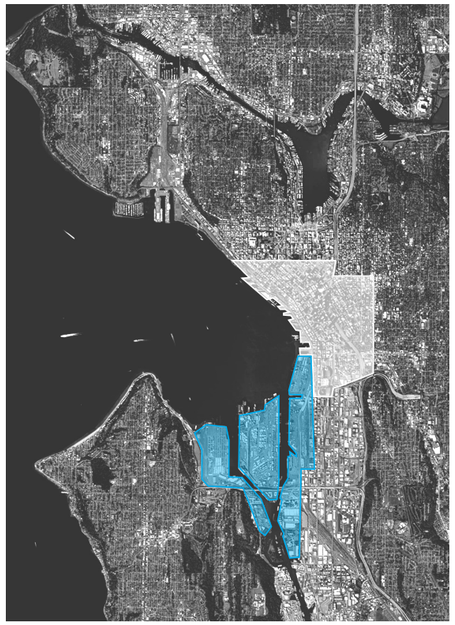


fig. 12 Map of the Puyallup River Delta Tide Flats, Tacoma, 1900

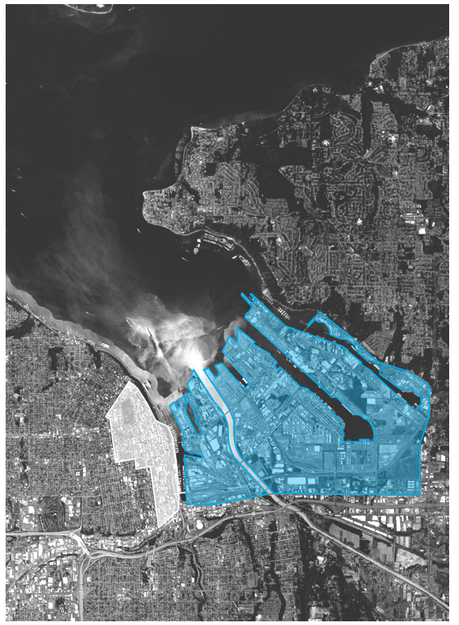
The city Tacoma however is centered around its industrial tide flats today as it was in the past. The Thea Foss Waterway continues to serve as the boundary between the port and downtown Tacoma. The 11th street bridge that connects the downtown core to the port, acts as a historic marker of the deep relationship between the city and industry. Christened in 1913, the bridge was celebrated as a symbol of future economic prosperity to come by connecting the tide flats to the city center.[15] Yet the scale of operations at the port would eventually bring about the obsolescence of the bridges utility. But despite its abandonment, the bridge was saved from demolition by public demonstration and reopened in 2013 in an effort to preserve the industrial identity of the city.[16]

fig. 13 Tacoma Waterfront and Skyline, 1910
fig. 14 Tacoma Tide Lands, 1910

fig. 15 Map of the Industrial Tide Flats, Tacoma, 2016



Port of Seattle



Port of Tacoma

The industrial identity of Tacoma is even more pronounced when compared to Seattle. The Port of Seattle occupies only 1400 acres of land compared to that of the Port of Tacoma which extends over 4500 acres.[17] The size of downtown relative to the port illustrates how downtown Tacoma is largely dwarfed by the extent of the industrial tide flats as seen in figures 15-16. Yet the most iconic view of the city is often taken from downtown looking toward Mt. Rainier and over the industrial port, framed by the 11th Street Bridge. The historical identity of the city is reliant on its connection to heavy industry and the port infrastructure.

fig. 16 Map of Downtown Seattle and the Port : Port Adjacent
fig. 17 Map of Downtown Tacoma and the Port : Port at Forefront

fig. 18 Industry, Philip Wiper

THE CURRENT CONDITION

> *The kinder-and-gentler treatment seems to work only for bygone industries. An old mill with a waterwheel is charming; a modern power plant is merely menacing. When it comes to industrial operations still running today, the effect of our alienation and unfamiliarity is to make the industrial infrastructure seem all the more sinister.*[18]
>
> *Brian Hayes*

With the increasing automation of port infrastructure, the industrial tide flats of Tacoma continue to descend into a state of urban seclusion, completely disassociated from the city. And yet the city is continuously confronted by the open-air machine that churns away at its forefront. The port currently caters far more to the global network than to its local population perpetuating the isolation of industry which is of particular concern for this, a city defined by industry. Redevelopment, as note by Brian Hayes above, is often veiled by the romanticized version of a past maritime heritage that neglects its actual. The city of Tacoma now stands as a bystander to the global interests of the port that has become an industrial void. The architecture furthers this notion as the built convention is a shell that encases the machine, hiding the operations from public view. The outcome is a vast catalogue of manufactured landscapes void of all public occupation that constitute the industrial tide flats of Tacoma. Thus a deeper investigation of the port as a living built environment offers the potential to reveal a strategy that will resonate with the city's true identity.

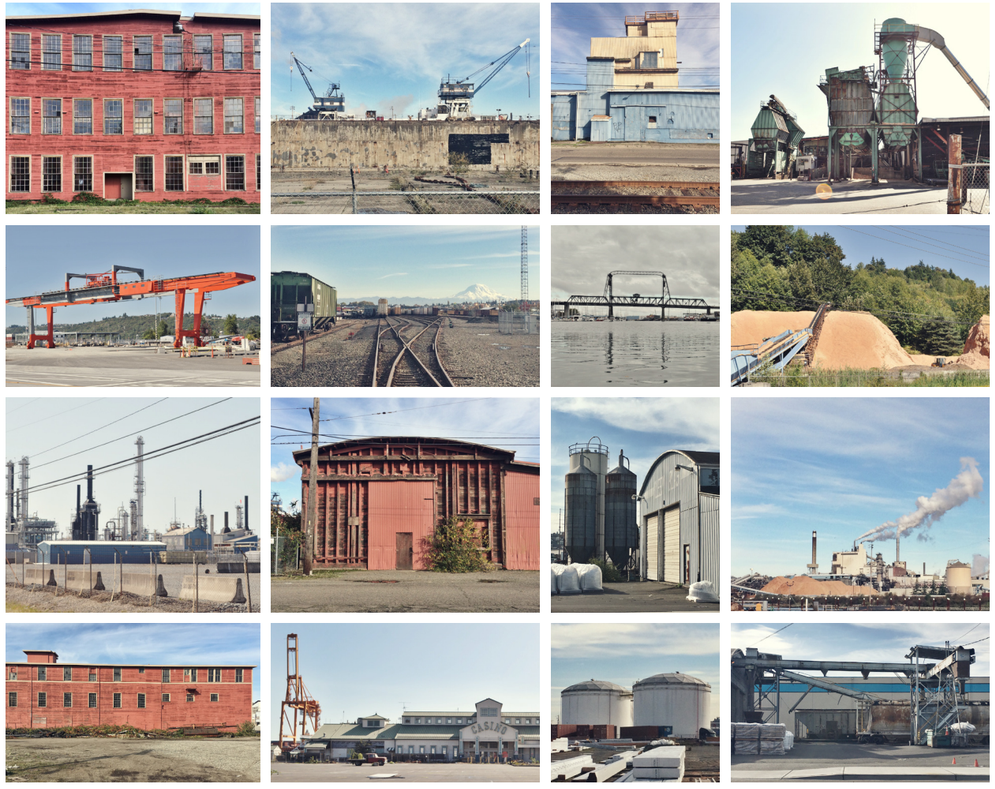


fig. 19 Port of Tacoma Catalogued

III

THE PORT AS A BUILT ENVIRONMENT

Because most of us are unaware of either the historical or the contemporary significance of ports culturally, as unique configurations of the social as well as the architectonic structure of the constructed world, we uncomprehendingly accept the separateness of the modern port and its world from other elements of daily life: ignorance compounds invisibility.[19]

Peter Quartermaine

Maritime historian Peter Quartermaine contends that the port has evolved into a built environment that has been largely ignored in the current city. He suggests that this is in part a deliberate omission to maintain an optimized efficiency of the transmission of goods and the refinement of raw material. However Quartermaine argues that treating port architecture as strictly utilitarian neglects its deeper cultural significance. This diverse urban environment is in constant flux, driven by the mechanized infrastructure that supports the movement and flows of material, the storage and containment of goods and the processing and refinement of raw material. All of these functions are interrelated to one another and together shape the built environment of the modern industrial port.

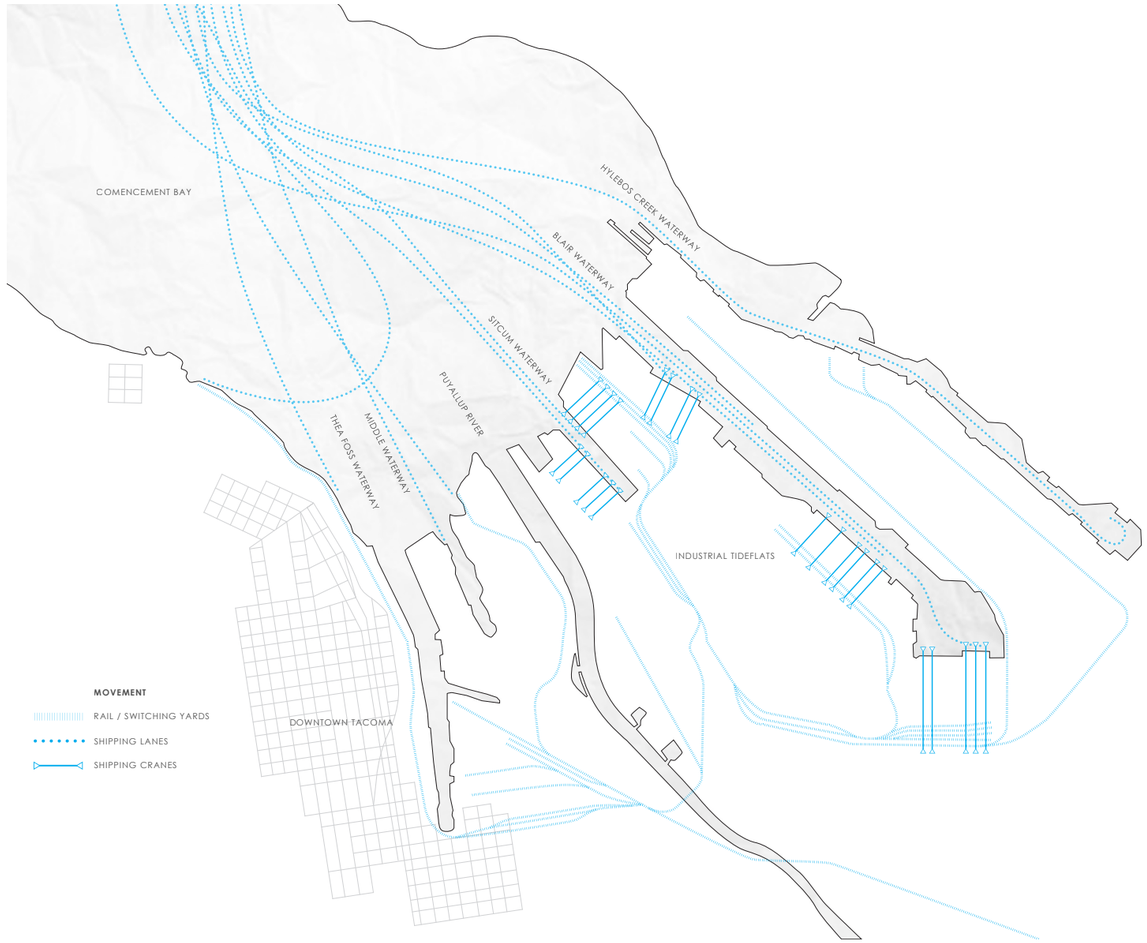


fig. 20 Port as a Built Environment : Movement

MOVEMENT : THE WHARF

The built landscape of the port is determined by the cargo that is received and delivered, the modes of its transport changing through history. The wharf is the place where ships land, marking the edge where land meets sea, this horizontal extension into the water makes possible the transfer of material from rail to sail that enable the port to operate. The remaining historic wharfs of Tacoma no longer receive ships and material but instead stand as relics of the city's maritime heritage. Tacoma's active industrial waterways are lined with massive gantry cranes that are controlled by a single operator. The cargo containers are moved from the ship to land where they are placed in orderly rows by the saddle loaders that scurry across the flat landscape to transfer containers to rail or truck.[20] The choreography of this movement is restricted to horizontal and vertical exchanges as the mechanics are driven by the shape and stacking of the standardized container.[21]

The Port of Tacoma also transports bulk material that does not conform to a standard cargo container. These raw materials include timber, wood pulp, grain, oil, natural gas, and coal that often undergo a process of refinement. Raw material is often processed at the water's edge because processing relies on heavy infrastructure and benefits from the intermodal delivery provided by the port. Raw material is often transported in specialized break bulk shipping freighters, a unique type of freighter that hauls bulk material in the cargo hold of the ship. These freighters are equipped with deck cranes to offload material to land by a conveyor or hopper.[22] The processing of such material introduces another flow of byproducts through the industrial waste streams. As material is received, these patterns of movement are marked by nodes of storage that occupy the majority of the port landscape.

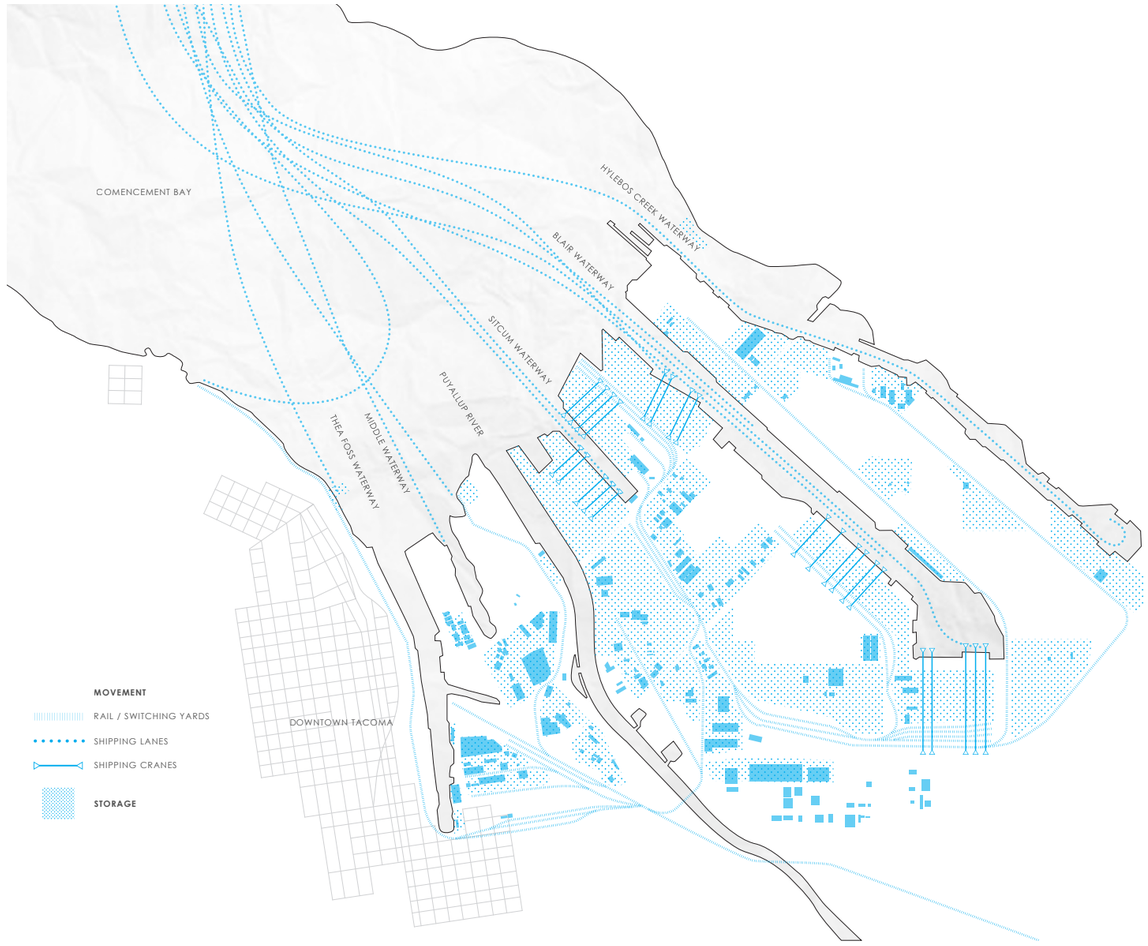


fig. 21 Port as a Built Environment : Storage

STORAGE : THE SILO

The operations of the port are heavily reliant on vast amounts of storage. The shipping container requires large areas of open flat land, paved for saddle loaders to move between railway and wharf. The storage of bulk material depends on the particular material. Timber and wood pulp can be stored outdoors, uncovered in large mounds, whereas grain, natural gas, and oil require silos. Other bulk materials and cargo often require large covered warehouses for processing and supply management. The industrial tide flats of Tacoma are littered with various types of storage that dominate the landscape. Rows of shipping containers line the Blair Waterway accompanied by the large gantry cranes. Open mounds of wood chips are located throughout the port adjacent to wood or paper manufacturing facilities. Silos containing bulk materials are discernible as monumental geometric forms that are engineered to maximize the storage capacity of a particular material. As Peter Quartermaine points out, all these methods of storage offer a live indication of the broader cultural patterns of the global and local economy.[23] These manufactured landscapes serve as active barometers of what industries are thriving and which are in decline.

Reading the landscape of storage reveals that the container can invoke a spatial memory of the procurement of resources from the land. Tacoma's waterfront once littered with log booms used to store the timber that fueled the saw mills. In the late nineteenth century, the waterfront transitioned to contain coal bunkers as ships and rail cars required coal for fuel. These structures were large elevated piers that carried the rail hopper cars out over the water, dropping raw coal to storage areas below to be loaded onto ships from chutes. These massive utilitarian structures revealed the passage of the raw material going from mine to storage and finally to combustion. Today Tacoma's waterfront is defined by the rows of shipping containers found in all ports as well as the tall mounds of wood pulp and stacks of lumber reflecting the prominence of the paper and timber.[24] This landscape of storage portrays the active operation of an industry that is linked to both the local and global networks served by the port.

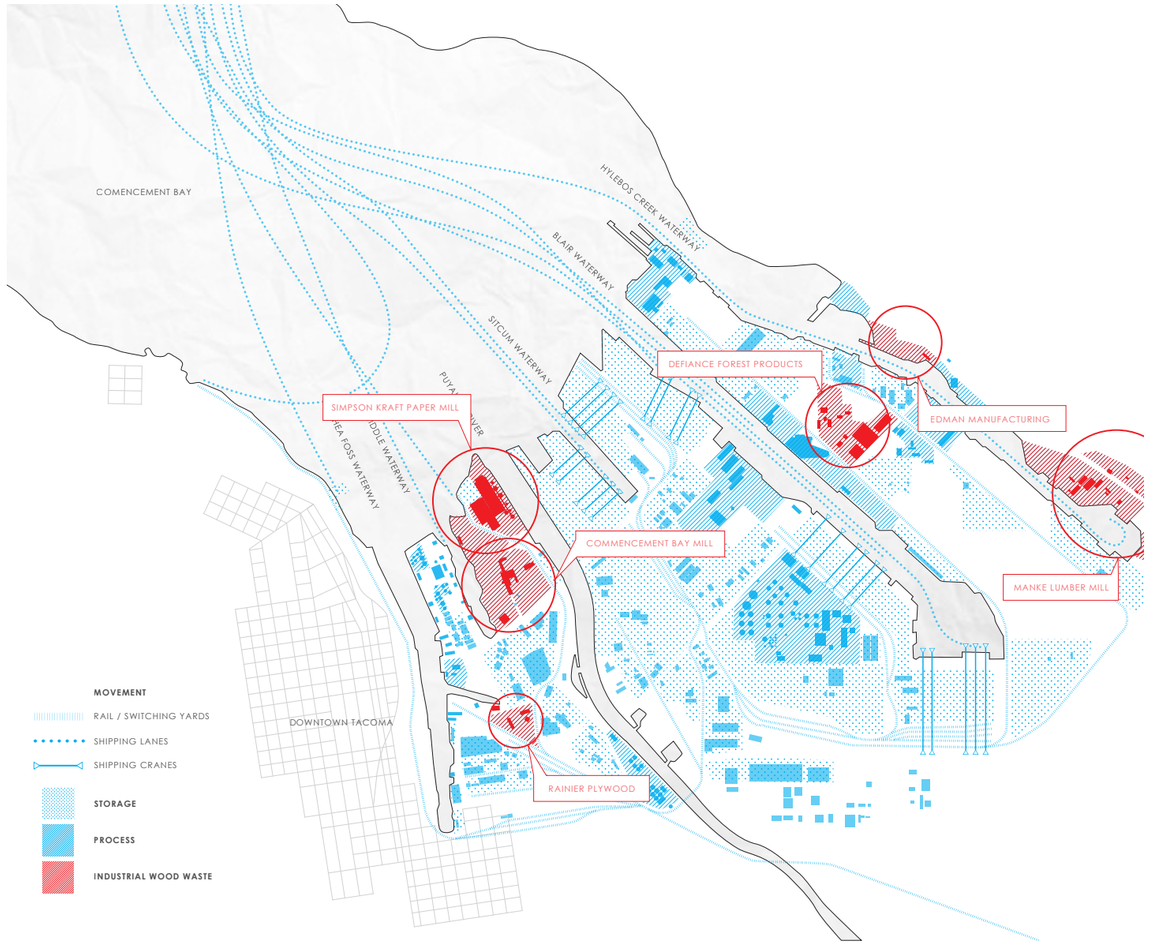


fig. 22 Port as a Built Environment : Process

PROCESSING : THE SMOKESTACK

The cyclical operations of the port revolve around the processing and refinement of goods and materials. Mechanized movement brings these objects first to storage and then to a refinery, processing plant or supply chain center. In the case of a raw material, it is brought to a processing plant that converts the commodity into a product of increased value. The smokestack serves as the statement of this act of processing and refinement. Tacoma's industrial skyline is populated with numerous smokestacks connected to paper mills, lumber mills, and once to smelters. From the early twentieth century, the stench of the city was given the name 'the Aroma of Tacoma,' the byproduct of paper mills and smelters, the more prominent industries within the port.[25] The smokestack is both a functional element of the machine and a symbolic gesture of industry that clearly identifies the port as a built environment.

Tacoma is populated by a number of paper and wood manufacturing plants around the industrial tide flats. The wood waste streams produced from these operations could potentially be used as a byproduct that could support the port and the city as a renewable resource. This introduction of an energy plant that functions as a combustion chamber with a defining smokestack offers an industrial typology that has the opportunity to be integrated with a public amenity. A biomass energy plant within the Port of Tacoma can describe the flows and metrics of the port as a built environment, provide public insight on the active industries that make up the port and function as a public resource for renewable energies in order to reinforce the relationship with the city and the industrial port.

fig. 23 Pit Head, Fosse Noeux No. 13, Bernd and Hilla Becher

CONCLUSIONS - THE NEW INDUSTRIAL

Without a sense of how materials and energy flow through an industrial economy, you miss something basic about the world you live in. To make good decisions about such issues, citizens need to get better acquainted with the technological underpinnings of their own communities. To allow that to happen, those who own and operate the various elements of the infrastructure will have to open up the gates and invite the people in.[26]

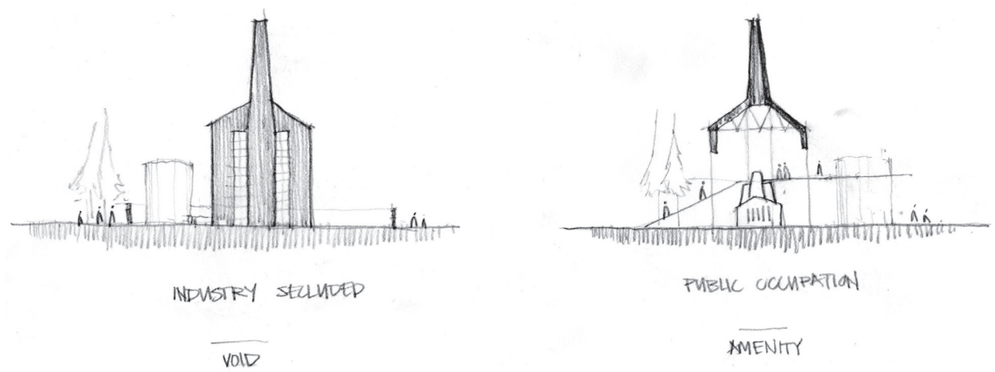
Brian Hayes

This thesis proposes that industrial infrastructure has the opportunity to transcend its singular prescribed conception of being a raw utility and assume a dual purpose to serve as a public amenity. The isolation of industry has been perpetuated by the built form of the shell that encases the machine and removes it from the public eye furthering the disconnect between the public and the industrial landscape of the city. The proposal is to dissolve the anonymity of industry in Tacoma and celebrate its functional role in society using architecture to define a new industrial typology that raises public awareness about energy infrastructure. The methodology of this thesis draws from the analysis of the built environment of the port in effort to reveal its potential to communicate beyond the utilitarian. The architectural language will make use of open transparency of the industrial form, include a public exposure of the inner-workings of the machine in order to express the industrial origins of Tacoma. A proposed district heating power plant will provide an aperture to reveal the flows and metrics of the active port industries that shape the tide flats. The power plant will portray a cyclical narrative of movement, storage, and energy transmission reflective of the port landscape as a threshold between land and sea.

fig. 25 Aerial Tacoma, 1948

IV

METHODOLOGY AND SITE ANALYSIS



METHODOLOGY

The goal of this thesis is to create a social cohesion within the working waterfront where public space and industry can coexist. This thesis draws from the utilitarian language of the port infrastructure to formulate an architectural typology that narrate s the past and future of production in Tacoma. By linking an active industrial process to public recreation, architecture can provide a condition where the utilitarian function of a specific industry can facilitate a public amenity space and promote an active engagement with the working waterfront. The design proposal is a combined district heating power plant with a public pool, a program derived from an industrial process that exists in the port today but offers an extension of a public amenity that can benefit from the excess heat of a power plant.

fig. 24 Industrial Void vs Amenity Diagram

THE THEA FOSS WATERWAY

The site for this design proposal makes use of the spatial tension between where the city ends and the port infrastructure begins. It requires both a visual and physical connection to the urban center of Tacoma to facilitate the prospect of attracting public interest. The connection to the industrial waterfront is also a critical site consideration due to the land to sea intermodal exchange. The proposed biomass plant sources its biofuels from industrial wood waste generated by wood manufacturing sites and the demolition of wood construction. Therefore the site will be best situated in a condition close to existing wood manufacturing plants and as well as near public access for wood debris disposal. The Thea Foss Waterway was determined to be the site where the convergence of industry and city is most prevalent and historically significant.

fig. 26 Port of Tacoma Aerial

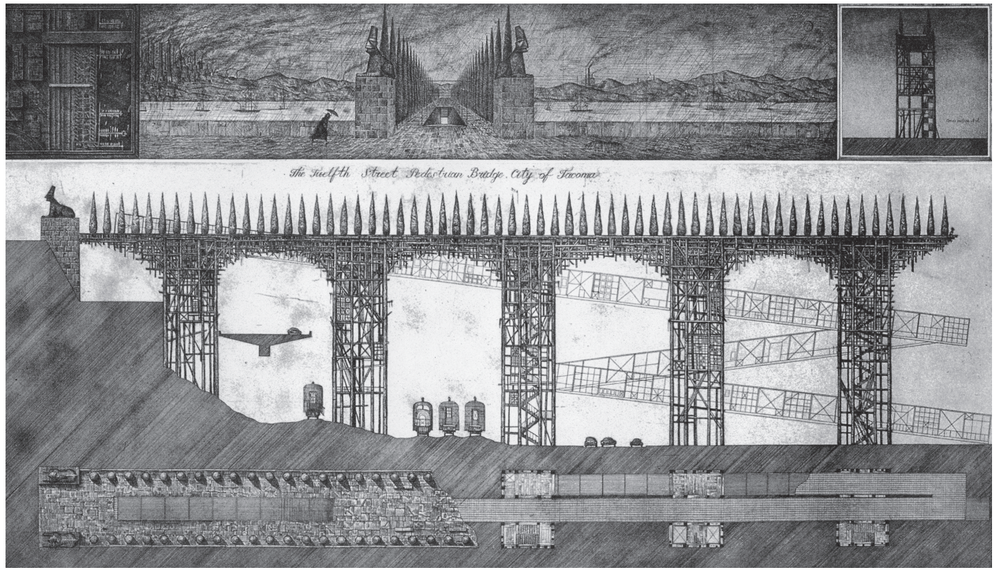
fig. 27 Thea Foss Waterway Aerial

The Thea Foss Waterway is historically relevant because it originated as the industrial core of the city, where rail met sail. Tacoma's first industrial waterway. The waterway was historically flushed with log booms, lumber mills, fishing vessels, and rail lines. This historic center of industry continues to separate the industrial port. The 11th Street Bridge (figure 28) remains the only direct connection from the downtown core to the port. The waterway remains a clear delineation between city and industry.

This stark urban contrast was examined by Russian Paper Architects, Brodsky and Utkin in 1995 where they proposed a timber trestle pier (figure 29) with the intent of connecting the downtown to the working waterfront below.[27] The proposal confronted the steep grade change from downtown to the waterfront as well as the elevated highway and rail infrastructure (figure 30) that further obstructs a direct connection. Despite being only a conceptual project, it identifies the city's desire to reconnect the broader urban context and reclaim the urban waterfront.

The city has worked to reclaim portions of the working waterfront with new development along its edge but is intent upon preserving an industrial presence along the industrial edge. Recent developments include the Glass Museum, luxury housing and mixed-use development with private marinas to the south end of the waterway, as well as the renovated Foss Waterway Seaport Building, a reclaimed historic cold

fig. 28 11th Street Bridge



storage warehouse, and the new Center for Urban Waters Building to the north end of the waterway. The city's effort is to expand public access along the waterway with a public boardwalk and connect the downtown and university to the waterfront with the proposed Prairie Line Trail that will cut under the highway to the waterfront below (figure 31).[28] This thesis contends that the network of public space can extend across the waterway and beyond to infiltrate the broader industrial landscape of the port.

The waterway is zoned extensively for mixed-use development but retains industrial zoning along the north east shoreline to ensure the Thea Foss Waterway remains an active working waterfront (figure 32). Because it is a historical waterway, the shoreline zoning classifies that all future development shall mimic the maritime trade industry of the past to continue the historical narrative of Tacoma as a boat building city. The issue with this prescribed genre of development is that it does not respond to the current trend of industrial development in the city as the ship building industry has recently expired in Tacoma and moved elsewhere.[29] The current trend of development is therefore a romanticized version of the working waterfront. Currently there are no public access points to the true working waterfront. This thesis takes advantage of this opportunity by proposing to redevelop the site of the foreclosed Martinac Shipyard. A site located at the edge of the zoning distinction. Offering the potential to serve as the threshold between city and industry to provide the opportunity to blur the existing distinction between the two realms.

fig. 29 12th Street Bridge Proposal, Brodsky and Utkin, 1995

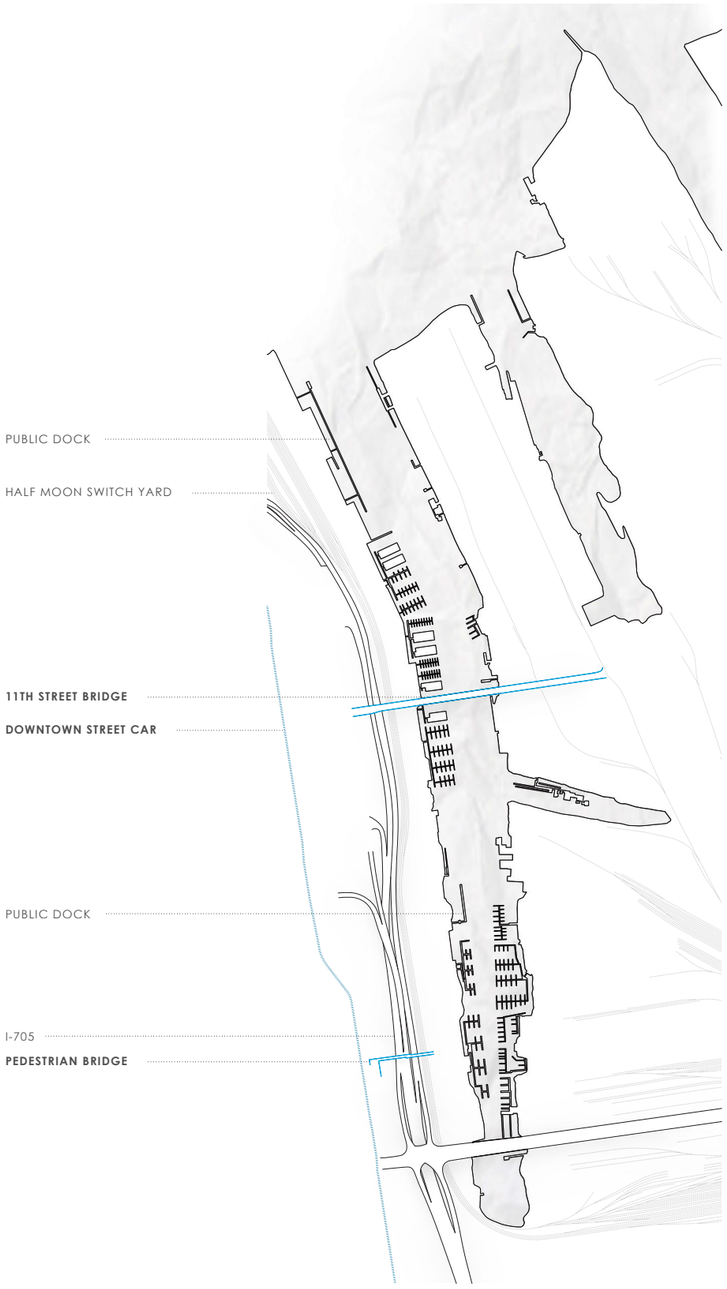


fig. 30 Map of Thea Foss Waterway : Infrastructure

fig. 31 Map of Thea Foss Waterway : Figure Ground

fig. 32 Map of Thea Foss Waterway : Zoning

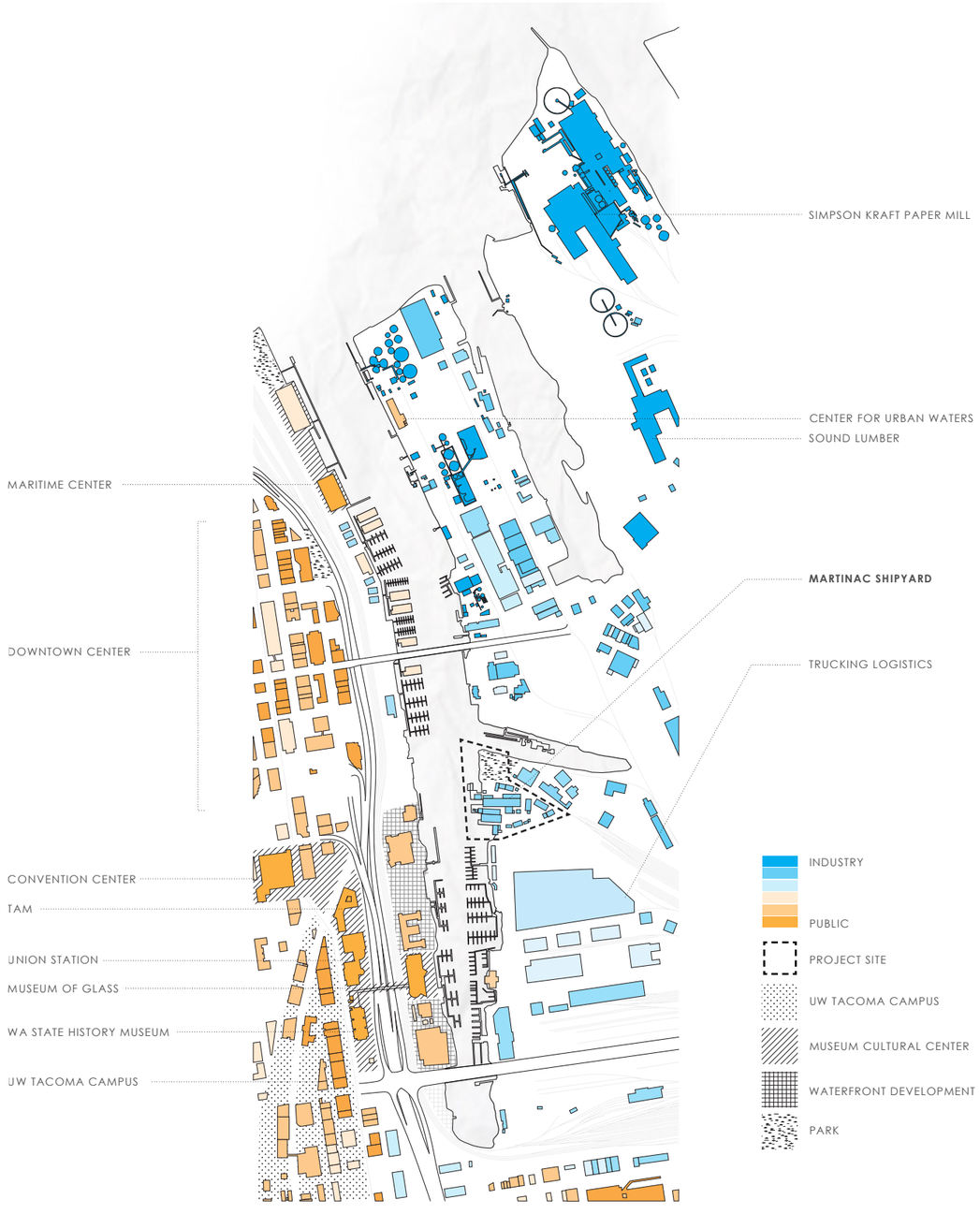
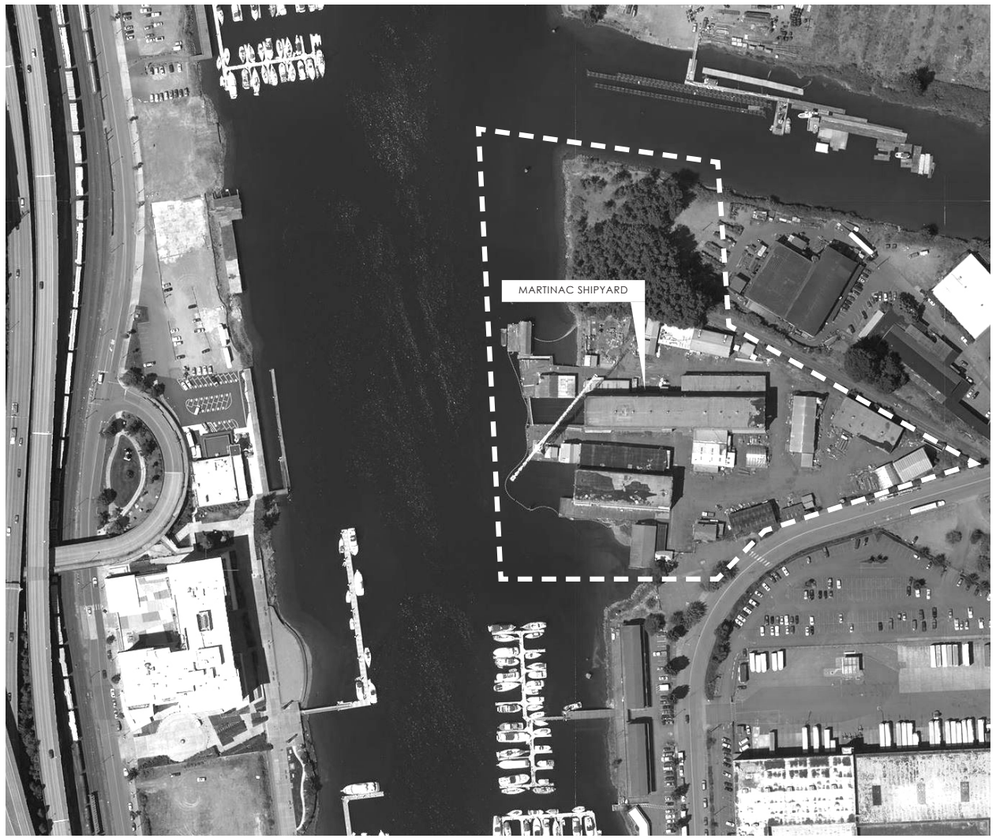


fig. 33 Map of Thea Foss Waterway : Industry to Public Gradient



THE FORECLOSED MARTINAC SHIPYARD

The site selected for this thesis is the foreclosed Martinac Shipyard, located on the east side of the Thea Foss Waterway, just south of the historic 11th Street Bridge. The Martinac Shipyard has occupied the site since 1924, known for building large commercial fishing vessels and military craft.[30] The company filed for bankruptcy in 2013 as the ship building industry faced steep decline in the area and the foreclosed property has remained for sale, advertised as both an opportune site for an existing ship building company to purchase or the potential for new mixed-use development.[31] This 6.8 acre site contains existing infrastructure, historical remnants, preserved green space and unique vantage of the downtown make it a compelling site for this design proposal.

fig. 34 Site Map Martinac Shipyard

fig. 35 Martinac Shipyard, Boat Shed #1

The existing infrastructure on the site include the wharf, two boat sheds that cover slipyards, and a large deck crane. There remains a preserved private green space to the north edge of the site that previously had only been accessible to the workers of the shipyard. This shoreline transitions to an adjacent waterway, the Wheeler-Osgood Waterway. This waterway was dredged to facilitate the Wheeler-Osgood Mill, one of Tacoma's most prominent lumber mills in the early 19th Century intended for storage of log booms for process.[32] Dividing the preserved green space from the shipyard is the retired rail line that terminates on site. This is the historic rail line of the Transcontinental Rail that was built on a berm that once crossed the waterway over a steel truss swivel bridge.[33] The rest of the site is occupied by sheds and warehouses of varying sizes, haphazardly scattered around the site.

The wharf marks the transition point from private marinas to industrial pier. The remaining working waterfront to the north of the site is occupied by various industries, the majority of which are natural gas storage and processing plants. These industries are cumbersome and require large infrastructure close to the waterfront that offer no public component or accessibility.

fig. 36 Martinac Shipyard, Wharf and Boat Sheds

The south edge of the site hosts a private marina, public storage facility and a local restaurant. The only street access to the site is 15th street, a major trucking route into the port. A large supply chain warehouse, large parking lot for haulers and rail switch-yard sit across the street from the site. To the other side of the retired rail line are a steel fabrication shop and door manufacturer.

The Martinac Shipyard is also located near at least eight existing wood and paper manufacturing plants making it optimal for sources of wood waste for biofuel. Companies like Simpson Kraft Paper Mill, Manke Lumber, and Rainier Richlite Plywood. These operations exhibit the prominence of the lumber industry in the Port of Tacoma that exports 41.7 million board feet of wood a year.[34] According to the Department of Energy, only 50 percent of the actual tree ends up as part of the final product in lumber manufacturing and processing revealing how much wood waste is available for wood biomass power.[35] Access to the industrial waterway and the connection to a major trucking route make it ideal for receiving wood pellets and construction debris to be burned for hog fuel by the district heating power plant.

fig. 37 Martinac Shipyard, View of Downtown

fig. 38 Martinac Shipyard, From the City Edge of the Waterway
fig. 39 Martinac Shipyard, Worker's Quarters

fig. 40 Martinac Shipyard, From the 11th Street Bridge
fig. 41 Martinac Shipyard, Remanants

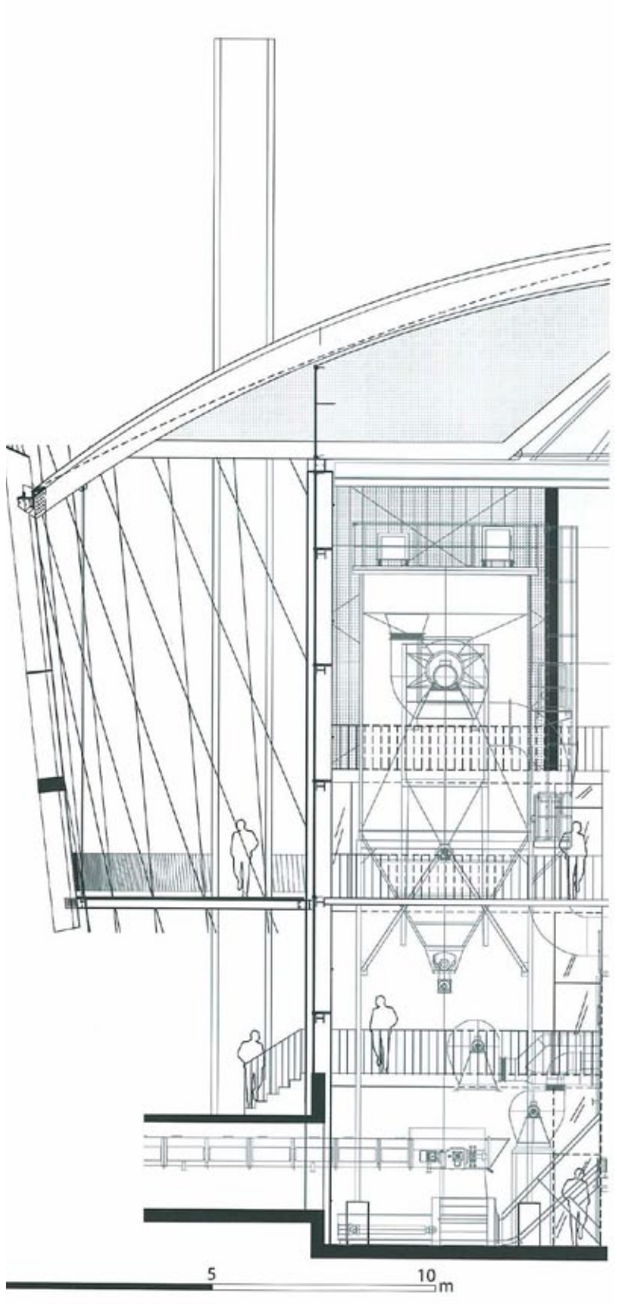


fig. 42 Schiling Biomass Power Station Section, Germany

V

DESIGN RESPONSE

PROGRAM DEVELOPMENT

To facilitate a medium between city and industry and draw from an existing industrial process found in the port, this thesis proposes a combined district heating power plant with a public pool. This program offers the opportunity to explore how an active industrial function can become openly transparent and inviting to the public. The architecture can be centered on exposing the inner workings of the machine and provide a safe environment for the public to engage with the operations of the industrial infrastructure. The built form is intended to embody the industrial narrative of Tacoma both past and future, and create public space framed by industry.

The Schilling Power Station in Schwendi, Germany is a compelling example of an industrial architecture that promotes a public engagement. Unlike the proposed design for Tacoma, this biomass energy plant designed by Matteo Thun & Partners is located in a rural setting in Germany.[36] Yet the architectural expression of the building provides a public awareness of how the industrial process works making it a relevant precedent to this thesis. Volumetrically, the building is highly legible because of its purity of

form and connection to function. The hog fuel storage and receiving is directly visible from the street. The main gesture is made at the core of the building where the combustion chamber is located.
The main volume is screened with a timber lattice sourced from the local sawmill that provides fuel for the power plant.[37] The screen supports an exterior porch to offer vantage over the landscape and into the internal workings of the machine. The combustion chamber is glazed to glow at night to further symbolize the presence of industry in the community. This building invites public knowledge of its role in the community and how it operates as one machine of a larger network.

Another pertinent case study is the Blackburn Meadows biomass plant in Sheffield, England. This power plant was built on the site of a retired coal power plant. The coal industry left a tarnished mark on the environment and community, so the intent of this new power plant was to establish a renewed connection between industry and the community.[38] The massing of the project is engineered to maximize the efficiency of the industrial process. Wood chips are brought by truck to the hauler for fuel receiving. The wood chips are processed a moved by conveyor to storage. The storage bunker houses the wood pellets. This is a separate structure from the mechanical operations of the power plant. Conveyors move wood fuel from storage to the boiler house. The boiler house is comprised of the furnace where the wood pellets are burned for fuel. The boiler produces steam that powers the generator for power. And the smoke stack filters the carbon produced from the furnace to be emitted back into the atmosphere.[39]

The form of this project is entirely utilitarian, illustrating the paths of material flows from storage to the furnace. The architectural details are driven to connect this industrial building to the broader context. The black steel panel siding and black brick exterior are reflective of the industrial heritage of the community.[40] The boiler house is clad in orange polycarbonate with the intent of being a visual landmark for the city, celebrating the presence of industry in the community.[41] While this utilitarian form is used to promote a renewed connection between the city and industry, the project does not offer any public space to actually engage with the industry. The power plant remains a symbolic gesture of utility for the community.

The proposal for Tacoma is a combined district heating power plant with a public pool that is heated by the excess heat produced by the power plant. The intent is to offer a public program as an extension of an existing industrial process to establish a dialogue between public activity and an active industry. The

fig. 43 Schiling Power Station Exterior, Germany
fig. 44 Blackburn Meadows Biomass Power Plant Boiler House, England
fig. 45 Blackburn Meadows Biomass Power Plant Exterior, England

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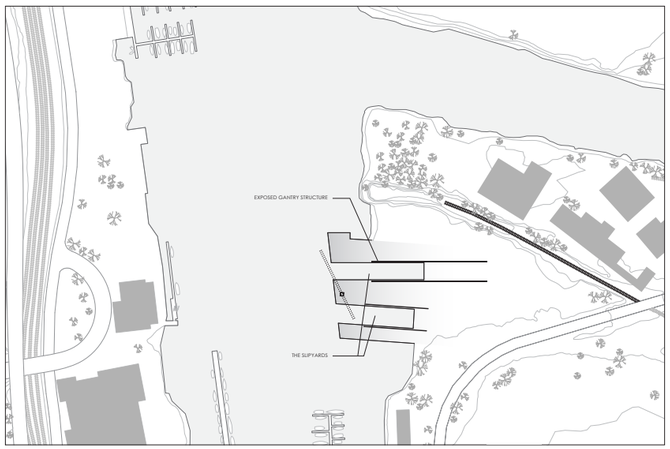

SITE RESPONSE

The site response begins with identifying the existing infrastructure that can be used as framework for the new design intervention. The shipyard offers two existing boat sheds that are built over slipyards. Slipyards are a cut made in the shoreline where a rail line dives into the water for hauling and launching ships for repair and construction. The slipyards are framed by the structure of a gantry crane. The gantry crane is used to move parts for assembly of the vessel being worked on. The structure of the gantry crane is heavy timber posts clad and roofed in corrugated metal completing the boat shed. The boat shed would be stripped leaving only the structure to frame the voids of the industrial slipyards.

fig. 46 Site Response Diagram #1 : Infrastructure
fig. 47 Site Response Diagram #2 : Framework

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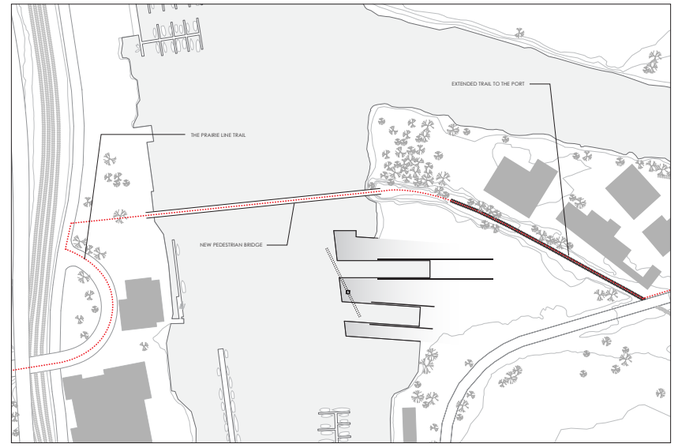

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PUBLIC ACCESS

Next the project introduces a pedestrian bridge in place of the historic rail line as an extension of the proposed Prairie Line Trail. This bridge would offer a direct connection from the public boardwalk across the Thea Foss Waterway to the Port's edge of the city, inviting the public to infiltrate the industrial landscape beyond. The bridge will activate the preserved trees to the north of the site and reclaim it as public green space, an amenity that is sparse in the city especially at the waterfront. The pedestrian bridge will offer landings for the public to take pause for views of the downtown and Glass Museum or industry and the 11th Street Bridge from the water's edge

fig. 48 Site Response Diagram #3 : Extend
fig. 49 Site Response Diagram #4 : Connect

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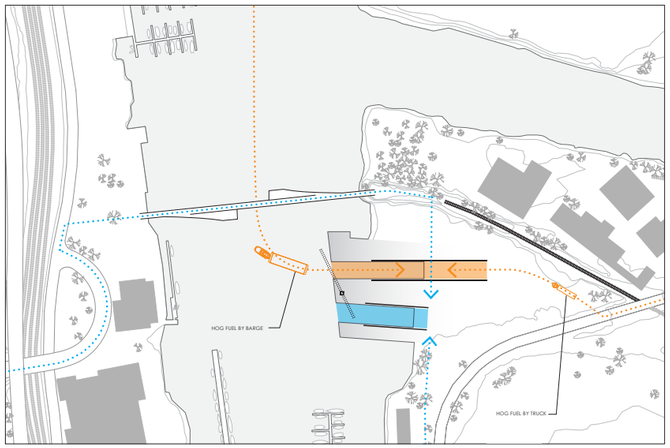

INDUSTRY AND PUBLIC

The voids of slipyards are divided by program. The larger of the two will remain utilitarian, while the other will be reclaimed for a public pool. The heavy timber structure of the gantry cranes are used as the framework for the design intervention, clad in polycarbonate and capped in galvanized steel to frame the void space of the slipyards. The industrial slipyard will function as the receiving for hog fuel for the district heating power plant, offering access for both barge and truck delivery of fuel. The pedestrian paths with overlap that of the material flows to construct a safe engagement for the public with the industrial process.

fig. 50 Site Response Diagram #5 : The Slipyards
fig. 51 Site Response Diagram #6 : Utility

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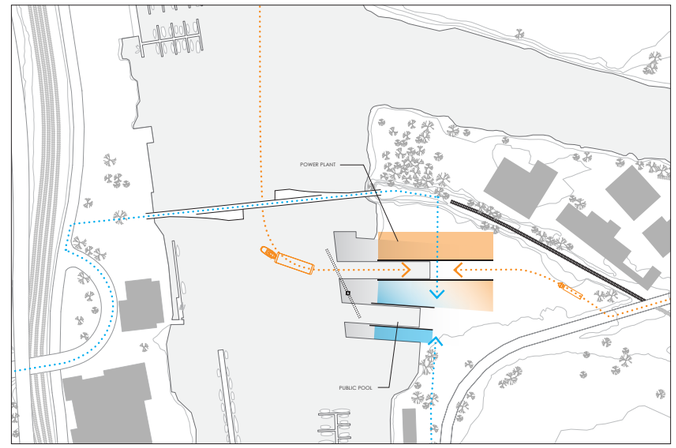

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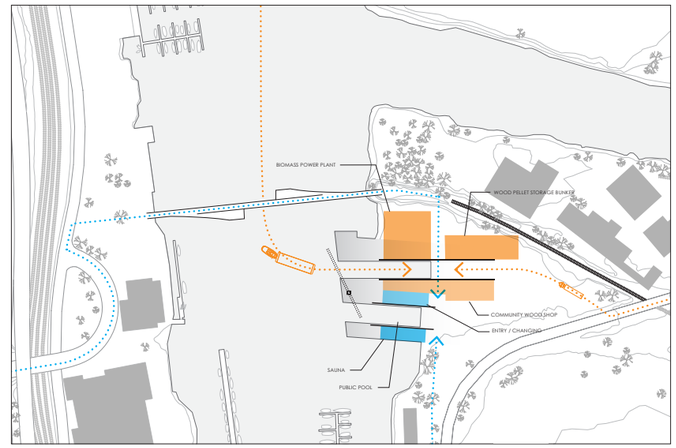

A COMBINED PROGRAM

The program builds off of the existing framework to establish a gradient from industry to public functions. The district heating power plant is situated on the port's edge of the site to the north, utilizing the industrial slipyard for fuel intake, while the public pool and sauna would frame the public slipyard on the south. The combined program functions will include a community woodshop that will correspond with the hog fuel storage. This is a public program that is inherently an industrial function that can benefit from the intake of reclaimed wood. Salvaged material can supply the community woodshop creating a secondary relationship between the established industrial process and a public function.

fig. 52 Site Response Diagram #7 : Industry to Public Gradient
fig. 53 Site Response Diagram #8 : Combined Program

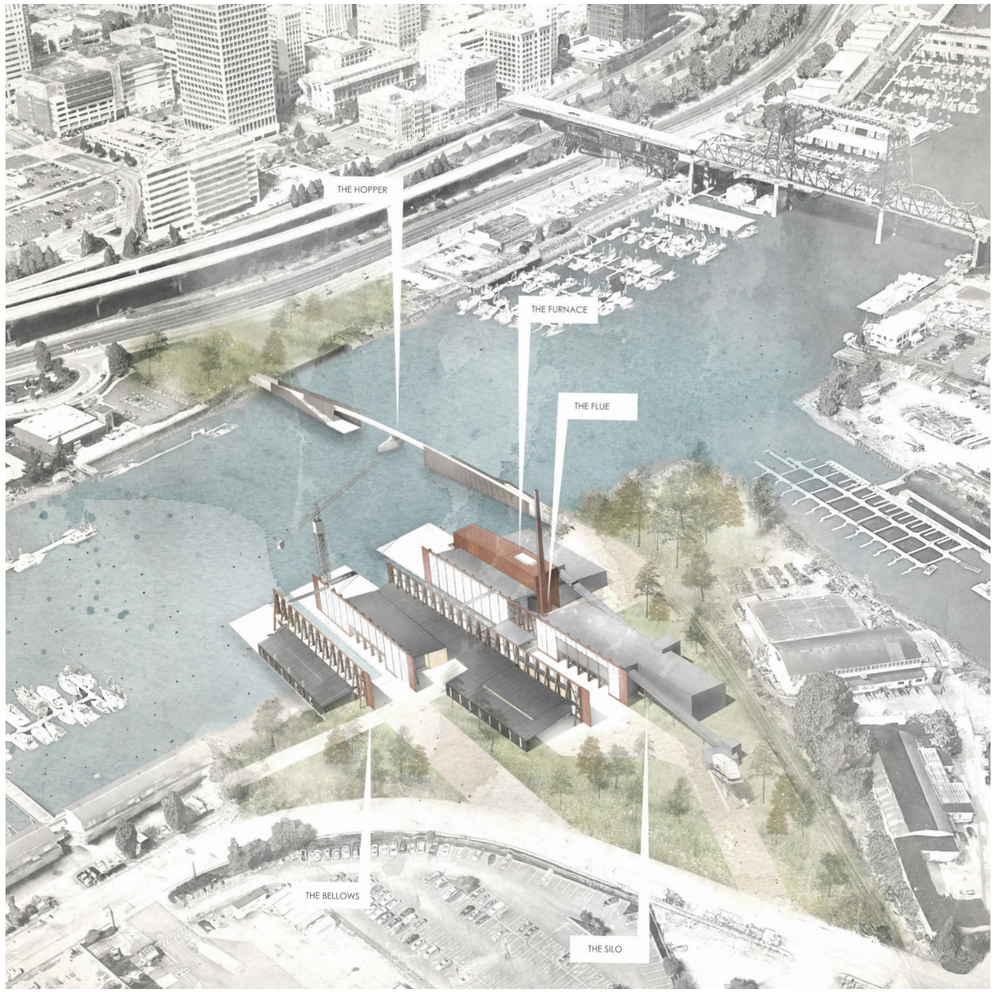

fig. 54 Design Proposal Aerial

THE PROGRAM

The program is comprised of five specific elements, referencing the industrial process of a wood biomass plant. The first is the hopper, where the public paths and material flows coalesce. This includes both the industrial slipyard and the pedestrian bridge. The hopper as a utilitarian function supplies the power plant with fuel. The hopper as a public function supplies public access into the site. The second is the furnace, the core of the power plant. The utility operates by burning wood biofuels to generate steam and power. The furnace also offers a public component symbolically lit as the lantern of industry for the city. The third is the flue, the industrial threshold for the public to move through the site and observe the industrial process that facilitates the public functions. The fourth is the silo, which includes both the storage bunker to house wood pellets as well as the community woodshop. An area where the public and industrial functions overlap, benefiting from the intake of hog fuel and reclaimed wood. The fifth is the bellows, the public hearth of the project. This is where the public pool and sauna is framed, fed by the excess steam of the power plant.

THE FORM

The form is driven by the design intention of using the existing industrial infrastructure to frame the public amenity space. The form of the structures reference the existing shed typology found on site. The boat sheds had been expanded upon by shed roofs extending off the main structure to provide additional space. This architectural language is continued in this design proposal to give emphasis on the framed void spaces of the slipyards and continue the narrative of Tacoma's historic maritime past.

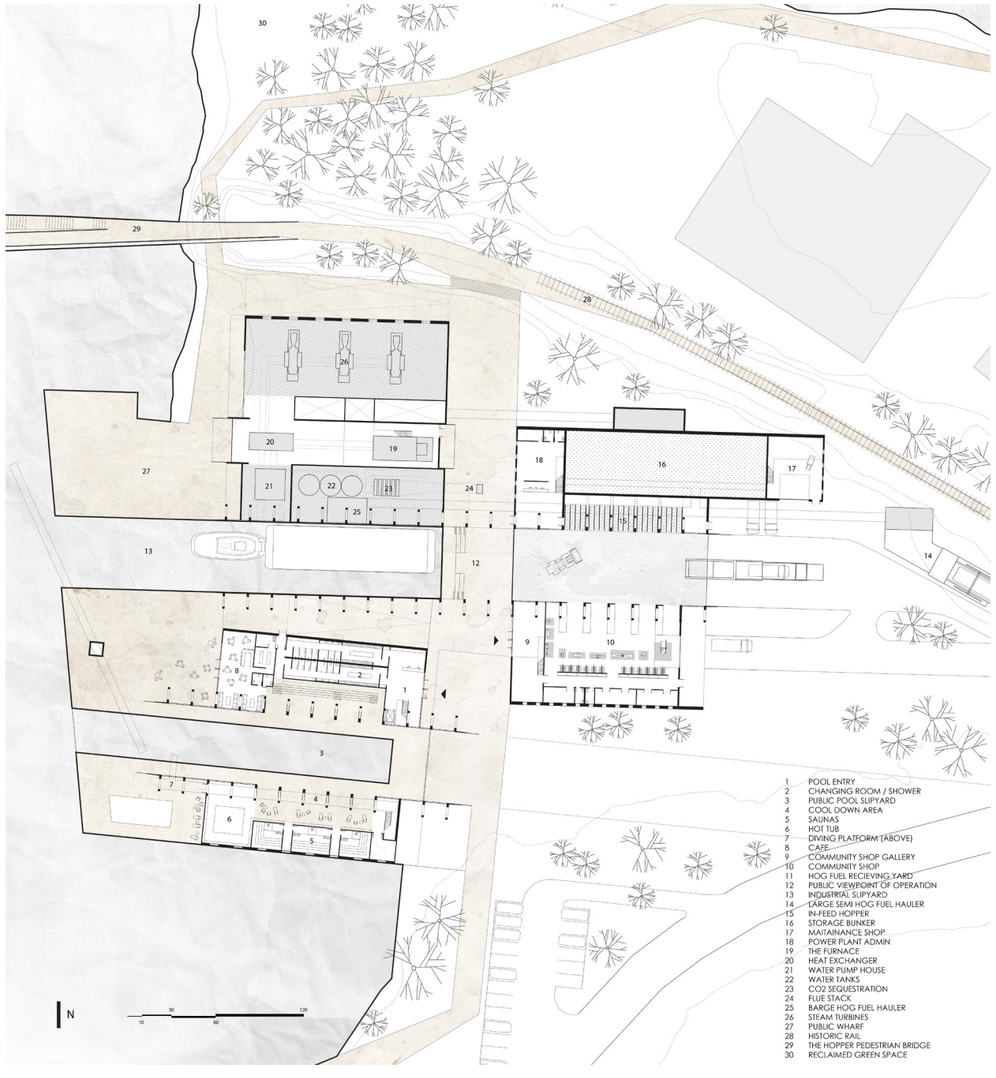

fig. 55 Ground Floor Site Plan

THE EXPERIENCE

The wharf is reclaimed for public use. The pedestrian bridge lands on the berm of the retired historic rail line, activating the railway as a pedestrian path that infiltrates the port's industrial landscape. The district heating power plant is divided by function. Fuel storage is placed on the industrial edge of the site while the furnace and mechanical operations of the power plant face the waterfront for visual access to the city. The threshold that bisects both the power plant and the industrial slipyard is the flue, the public passage through the industrial infrastructure to the public space beyond.

Barges will pass through the pedestrian swivel bridge to off load fuel in the industrial slipyard. On the opposite end, trucks will off load material by hauler into the in-feed hopper that supplies the storage bunker adjacent to the slipyard. This void space is framed by the storage bunker and community wood shop. The public will enter the community wood shop near from the flue. The gallery space fronts the community woodshop's entrance to further engage with the public. The accessory spaces of the shop frame the open shop floor that spills out into the industrial slipyard to establish a shared space with the industrial functions of the power plant.

Entrance to the public pool occurs at the intersection of the industrial and public functions. From the south, the public will enter the site with a framed view of the bellows, the public pool looking back toward the city. The public enters again off of the flue, moving through reception, changing, bath and showers to spill out into the public slipyard through the existing timber structure of the gantry crane. The public saunas are adjacent to the public pool, heated by the excess steam of the power plant. A cafe adjacent to the public pool offers an additional public amenity to the reclaimed public wharf.

fig. 56 The Hopper : The Pedestrian Bridge

THE HOPPER

From the city's edge, the public begins with the hopper. This pedestrian bridge references the coal bunkers of Tacoma's past. These massive utilitarian structures were wood trestle piers that rail hoppers traversed above to off load coal to storage below for ships landing. This design interpretation replaces the material flows of these utilitarian structures with that of the public. The bridge allows the public to move across the Thea Foss Waterway to the port's industrial landscape. It also provides pubic access to the waters edge for pause and recreation. It provides a historical lens to the working waterfront while offering an extension the public waterfront. The industrial hopper is where hog fuel is received, utilizing the industrial slipyard. The gantry crane can off load material from the barge to the storage bunker. At the opposite end of the slipyard, wood chips are received by truck, off loaded and moved by a hauler into the in-feed hopper for processing and storage. The threshold that punctures the industrial slipyard is a landing for the public to provide safe vantage of the operation of the surrounding industrial process.

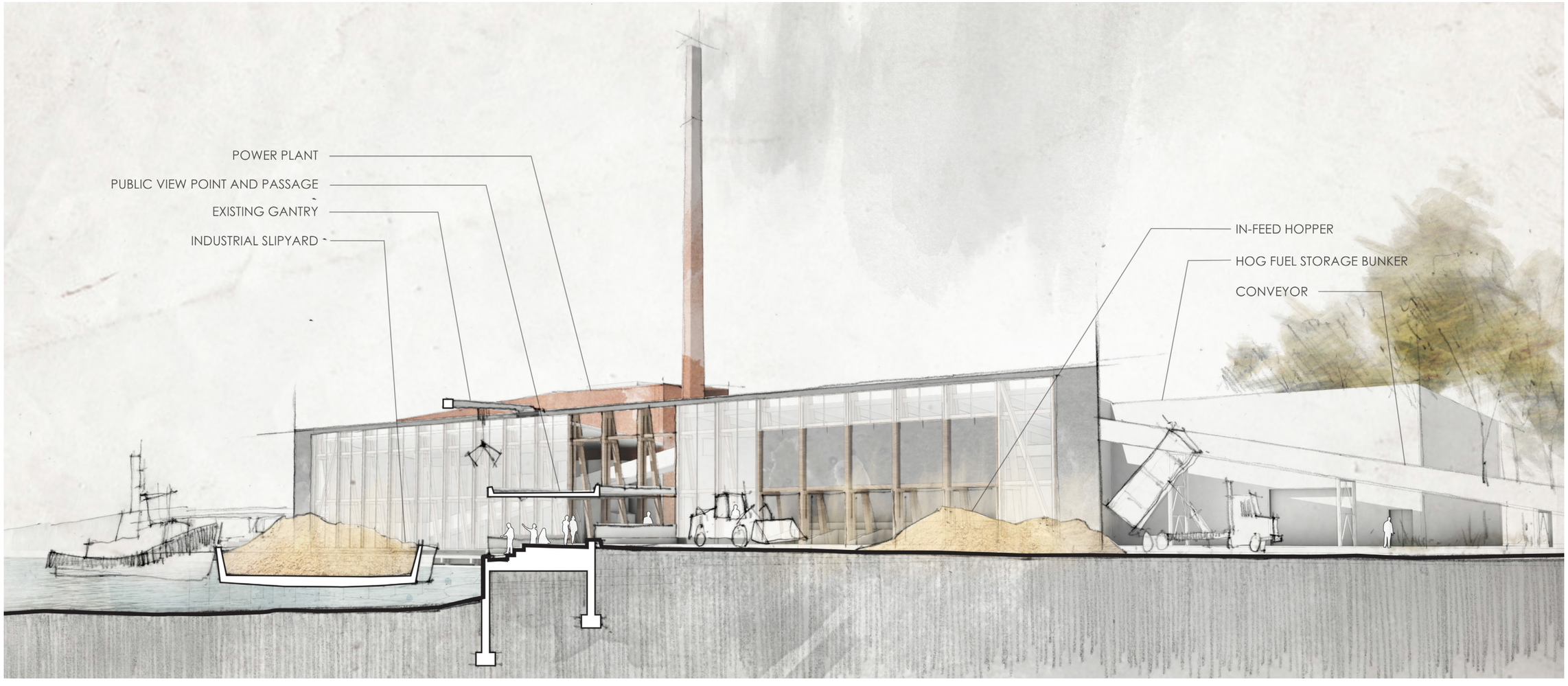

fig. 57 The Industrial Slipyard Section Perspective

fig. 58 The Furnace : The District Heating Power Plant

THE FURNACE

The furnace sits at the forefront of the power plant as a marker of industry. Here the hopper meets the rail line and the preserved green space is reclaimed for public use. The furnace houses the combustion chamber and boiler, the mechanical core of the power plant. This is where the hog fuel is burned to produce steam to generate power and heat for the district. Water is supplied from the industrial waterway and turned to steam in the boiler system. The excess steam produced is supplied to the public slipyard to heat the pool and saunas through radiant heat, establishing a direct utilitarian connection from industry to public use. This is the only monumental volume that responds to the size and scale of the void spaces of the slipyards. It offers a framed view back toward the city. The furnace serves as the lantern of industry for the city, a symbolic gesture that connects the industrial waterfront to the surrounding city.

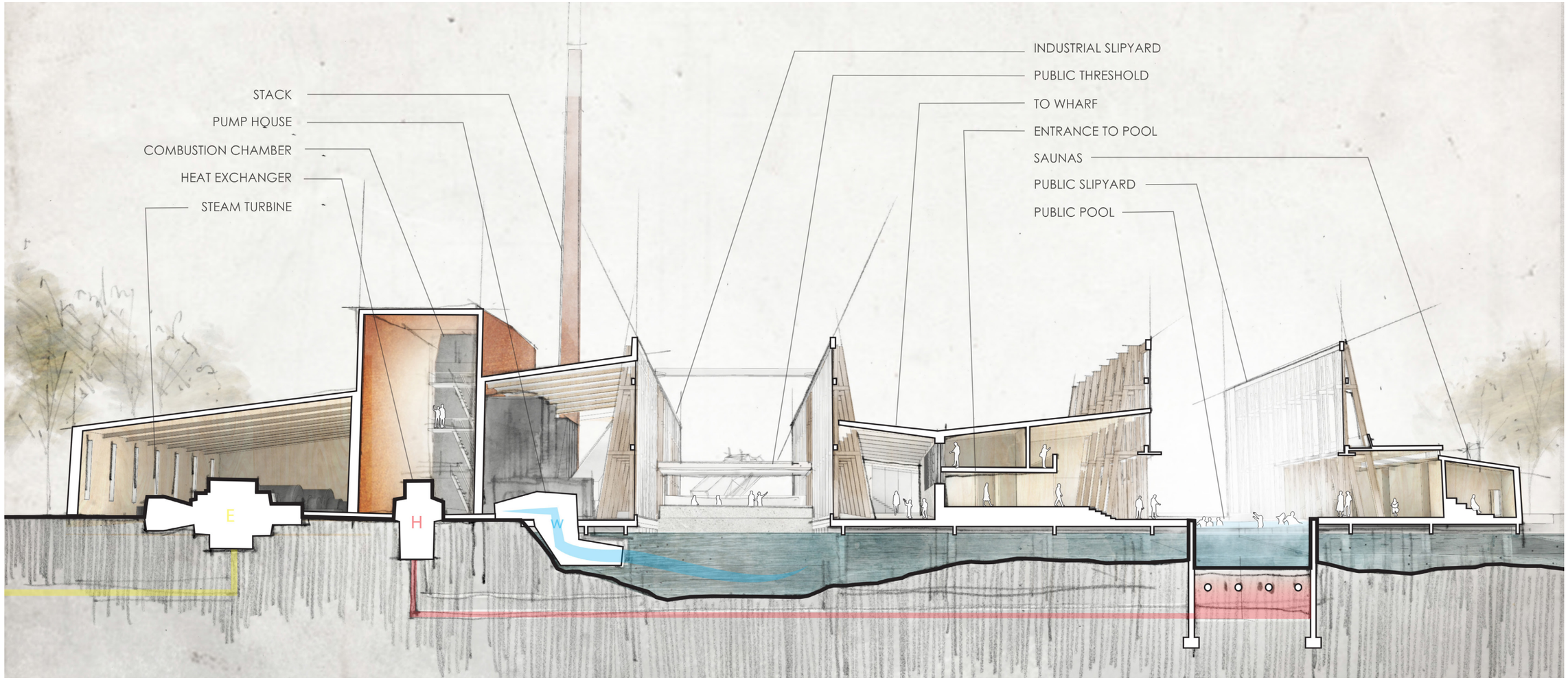

fig. 59 The Power Plant Systems Diagram Section Perspective

fig. 60 The Furnace : The District Heating Power Plant

THE FLUE

Next is the flue, the smokestack to the furnace. The burning of hog fuel in the furnace produces excess carbon. The utilitarian function of the flue is to filter and direct carbon emissions back into the atmosphere, effectively making the industrial process carbon neutral. Symbolically the smokestack serves as a stark reminder of the mark industry has on the environment.

The flue's public function is to serve as the threshold between the industrial realm and the public. This passage offers the public the opportunity to examine the operations and material flows of the industry, safely infiltrating the working machine. The flue allows the public to move underneath the conveyors that supply fuel to the furnace and past the smoke stack that expels the carbon. This passageway provides a public lens to the cycle of this industrial process, from fuel to energy to carbon and ash. The intent of this experiential moment is to provide an honest depiction of the lasting mark industry has on the environment. The threshold provides a place for the public to safely interact and observe the active industrial operations. This is the moment where the public and material paths converge and overlap. The threshold is an extension of the public access introduced by the pedestrian bridge that further contributes to a more vibrant urban ecology on the industrial edge of the waterway.

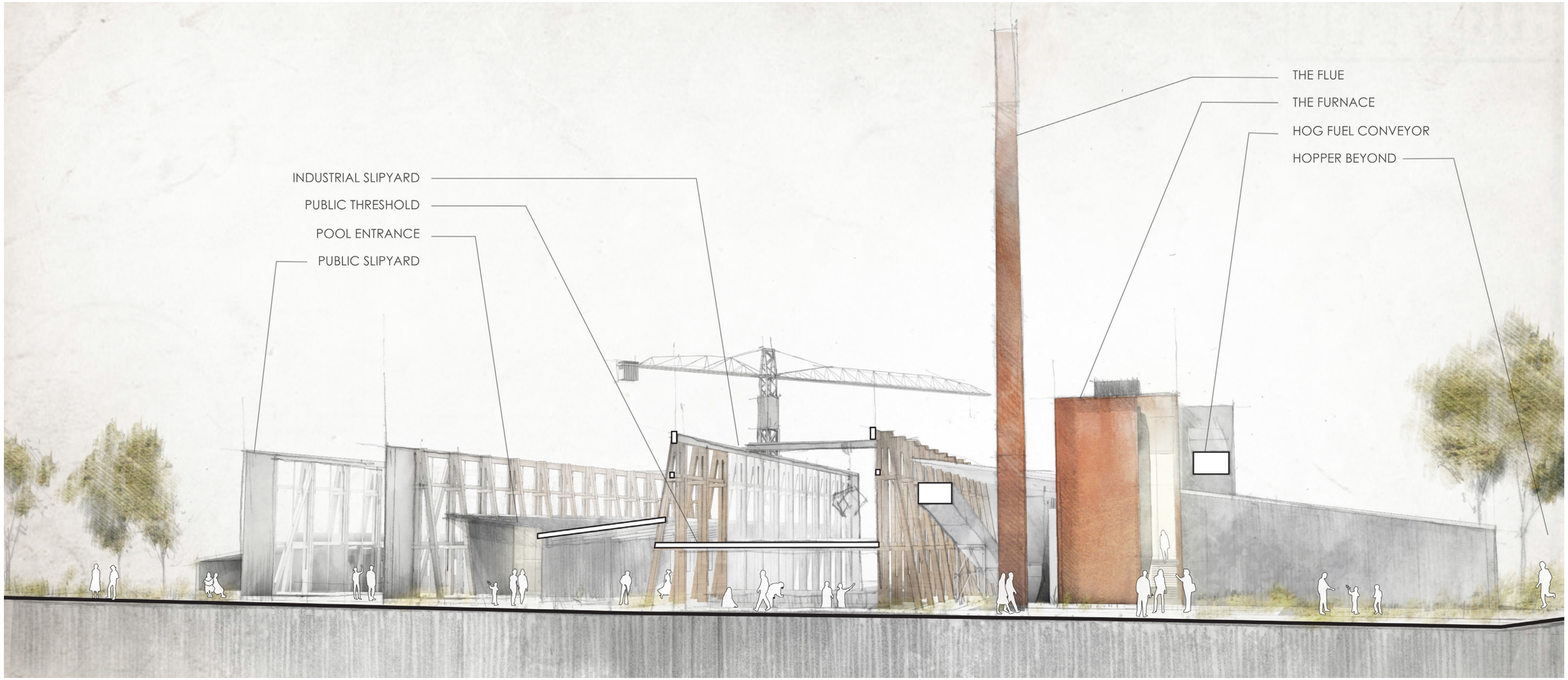

fig. 61 Public Access to the Industrial Realm Section Perspective

fig. 62 The Silo : Fuel Storage and Community Woodshop

THE SILO

Next is the silo, where the hog fuel is stored and processed. The silo is a functional component to the district heating power plant. The industrial slipyard is used to receive biofuel. Wood chips need to be processed through the in-feed hopper and stored for drying in the storage bunker. From the storage bunker, the hog fuel travels by conveyor to the furnace to burn for fuel.

The community woodshop serves as an extension of this operation. Both spaces spill out into the shared industrial slipyard. Material can be salvaged and reclaimed for public use and stored in the community woodshop to divert material from the industrial waste stream. While the excess waste material produced by a woodshop can be fed back into the fuel storage. The shed roofs of these spaces flank the industrial slipyard and utilize the existing heavy-timber structure of the re-purposed boat shed. The storage silo is representative of an industrial use in shear scale while the community woodshop is more modest in size by comparison. The heights of these spaces also respond to southern light exposure to maximize naturally lit public spaces.

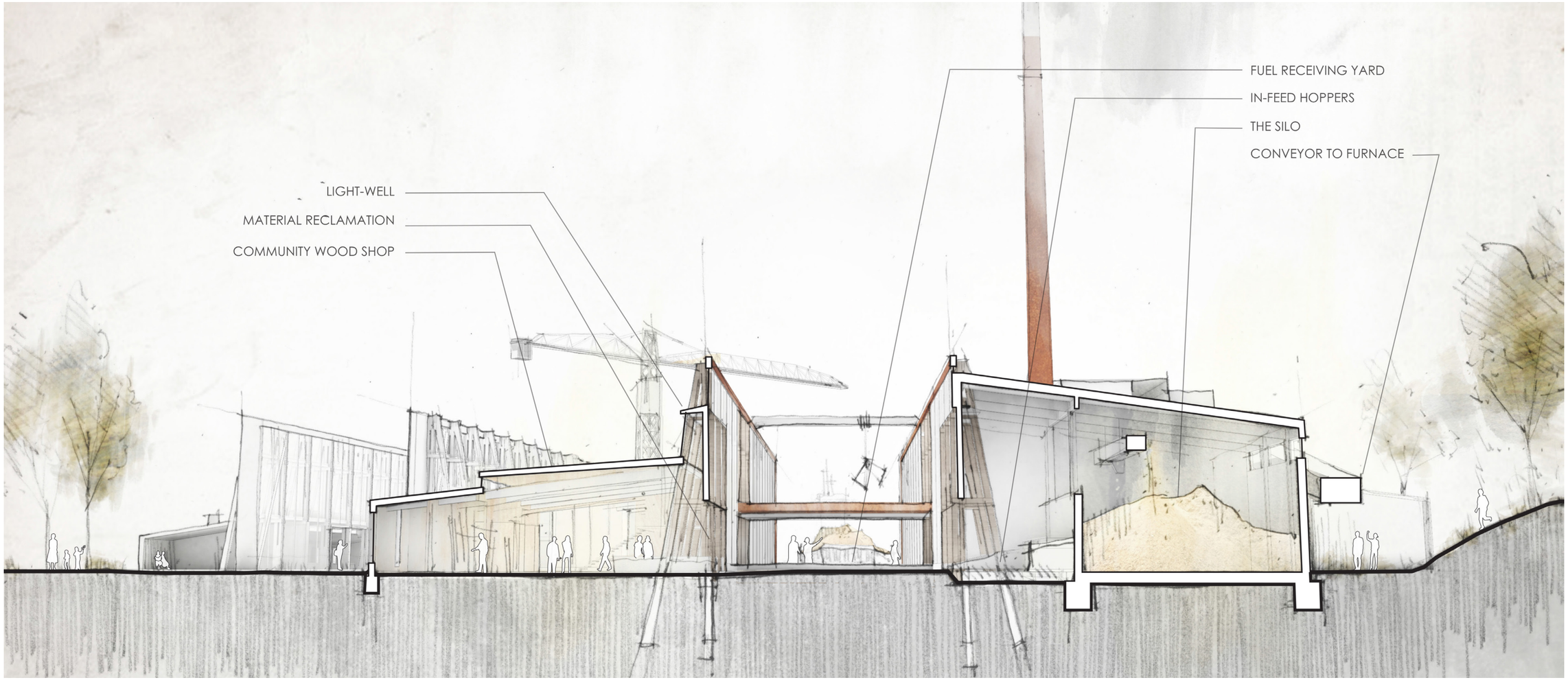

fig. 63 Storage Bunker and Community Woodshop Section Perspective

fig. 64 The Bellows : The Public Pool

THE BELLOWS

And finally the bellows, the public hearth of the project. The slipyard is adapted for public use, framed by the existing infrastructure. It offers a framed view back towards the city, while inviting public activity in an industrial landscape that is facilitated by the heat source of the power plant. The water will be captured in the slipyard but appear as though it were and extension of the waterway. The length of the pool provides varying conditions of either public inclusion or contemplative seclusion. The constant sound and rumble of industry in the background will serve as a reminder of the active industry and its role in the city.

The public will have vantage through the void space towards the city or back toward the port. The water is heated by the excess heat from the power plant establishing a direct relationship with the industrial process and the public amenity provided. The existing infrastructure frames the stage set for public recreation on the working waterfront with the presence of industry in the background fueling the public's renewed access to the industrial landscape.

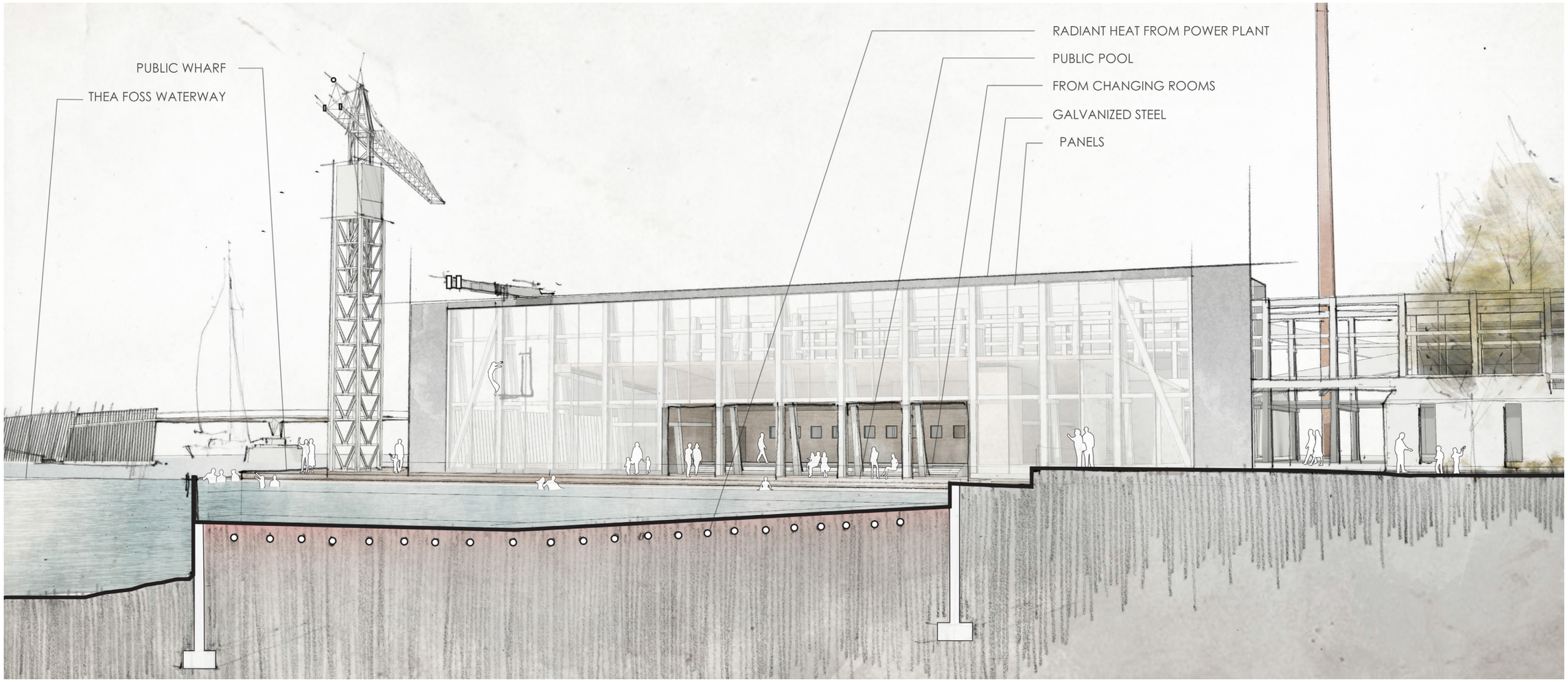

fig. 65 Reclaimed Slipyard for Public Pool Section Perspective

VI

CONCLUSION

This thesis contends that industrial infrastructure can transcend its prescribed function as raw utility and offer the extension of a public amenity for the city. The working waterfront is a celebrated ideal in the city of Tacoma, but new development tends to deny an honest depiction of the active industry in the port today. Industry has a significant role in the city but often masks its presence with an architecture of industry that obscures the operations from public view. The argument made by this thesis is that the working waterfront can become an urban environment where industry and public space coexist.

What was discovered in researching this proposition is how observing the port as a built environment can suggest truly unique opportunities for public space to occupy transitional or abandoned industrial spaces. Industrial development demands a vast amount of space that has historically been segregated from the city. But if more industrial sites sought to incorporate a public component, the city could benefit from restoring a connection to the working waterfront without displacing current industries. The broader investigation of this thesis explores the potential of how a port city such as Tacoma can take advantage of its industrial identity by exploiting a connection between industry and public space. The existing industrial infrastructure has the potential to be reinterpreted as a framework for public space that blurs the distinction between city and industry. The architecture can curate a place where the public can safely engage an active industrial process to achieve this urban connection.

The industrial zones of the city tend to be an overlooked part of the built environment. The growing seclusion is the prescribed outcome for these areas of the city. But if public space were to carve away at these industrial landscapes, vacant portions of the city can be reinvigorated with public life. As economies and technologies are in constant motion, many of these industrial sites become transitional and obsolete. The next step for this thesis is to look at how the city can take advantage of the broader network of transitional spaces within the industrial context. How can the city be responsive to the inherent flux of industry and take advantage of the unused sites by allotting temporary public space where industry has momentarily halted?

The research identifying the port as a built environment exposes how interconnected all of these industrial sites are. Evey industrial function within the port relies on transshipment and the exchange of a resource from land to sea. As cities such as Tacoma seek to incorporate public space within the industrial waterfront, how can the network of these reclaimed public spaces be informed by the established network of these industrial sites? The Port of Tacoma begins at the waterfront but the broader industrial zones extend through to the Auburn and Kent Valley where many of this region's heavy manufacturing is located. The proposition made in this thesis can work to inform an urban design that confronts these issues at a much larger scale.

This thesis observes that the utilitarian shell of many industrial structures can be advantageous for a future public amenity. Just as industries are increasingly pressured to reduce their environmental impact on the land, industries can also work to reduce the detrimental impact on the broader urban ecology of a city. Public life can extend beyond the city and penetrate the vast industrial landscape through the investigation of where public functions can appropriately integrate with existing industrial operations. Industry can be secured as part of the city rather then a zone completely disassociated from its surrounding. This design proposal serves as one example of how industrial infrastructure can extend a public amenity that integrates with an existing utilitarian function.

This design proposal makes a concerted effort to neither dissolve nor preserve as artifact the historical remnants of industry in Tacoma. But rather repurpose discrete utilitarian elements for renewed functions that incorporate both industrial and public uses. This thesis offers one interpretation of a model that can be observed by other port cities encouraged to redevelop the working waterfront. The common outcome of the restored working waterfront is a romanticized version of industry of the past that caters to tourism, public life and nostalgic appeal. This thesis posits that public functions can be framed by industry to curate an urban environment where industry and public functions can coexist. Industrial infrastructure can enhance the broader urban ecology by extending a public amenity to an existing industrial process to integrate public life in the working waterfront.

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FIGURE LIST

All images are created by author unless otherwise noted

APPENDIX

Iterations

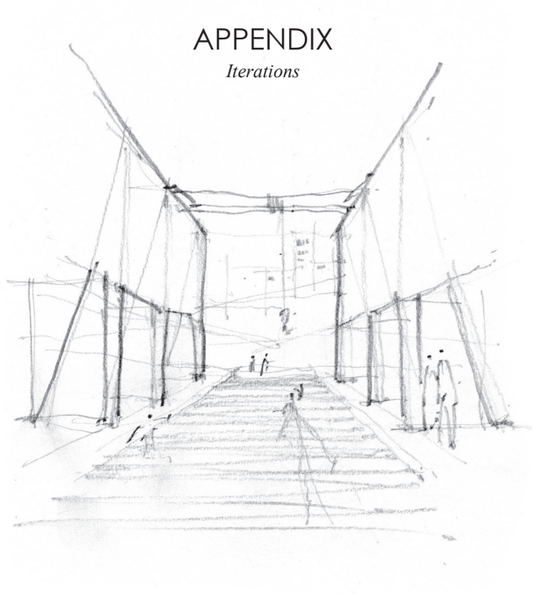


fig. 66 Sketch of the Reclaimed Harbor Bath

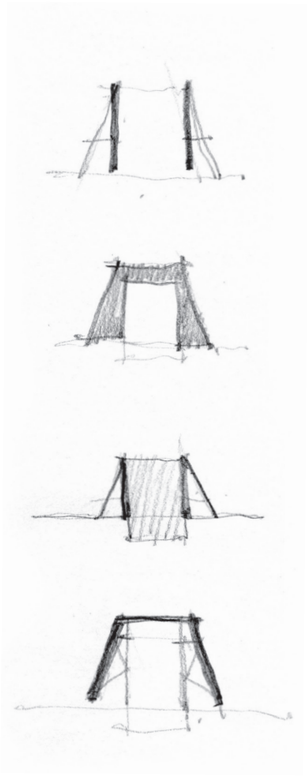


fig. 67 Iterations of Adapting the Boat Shed

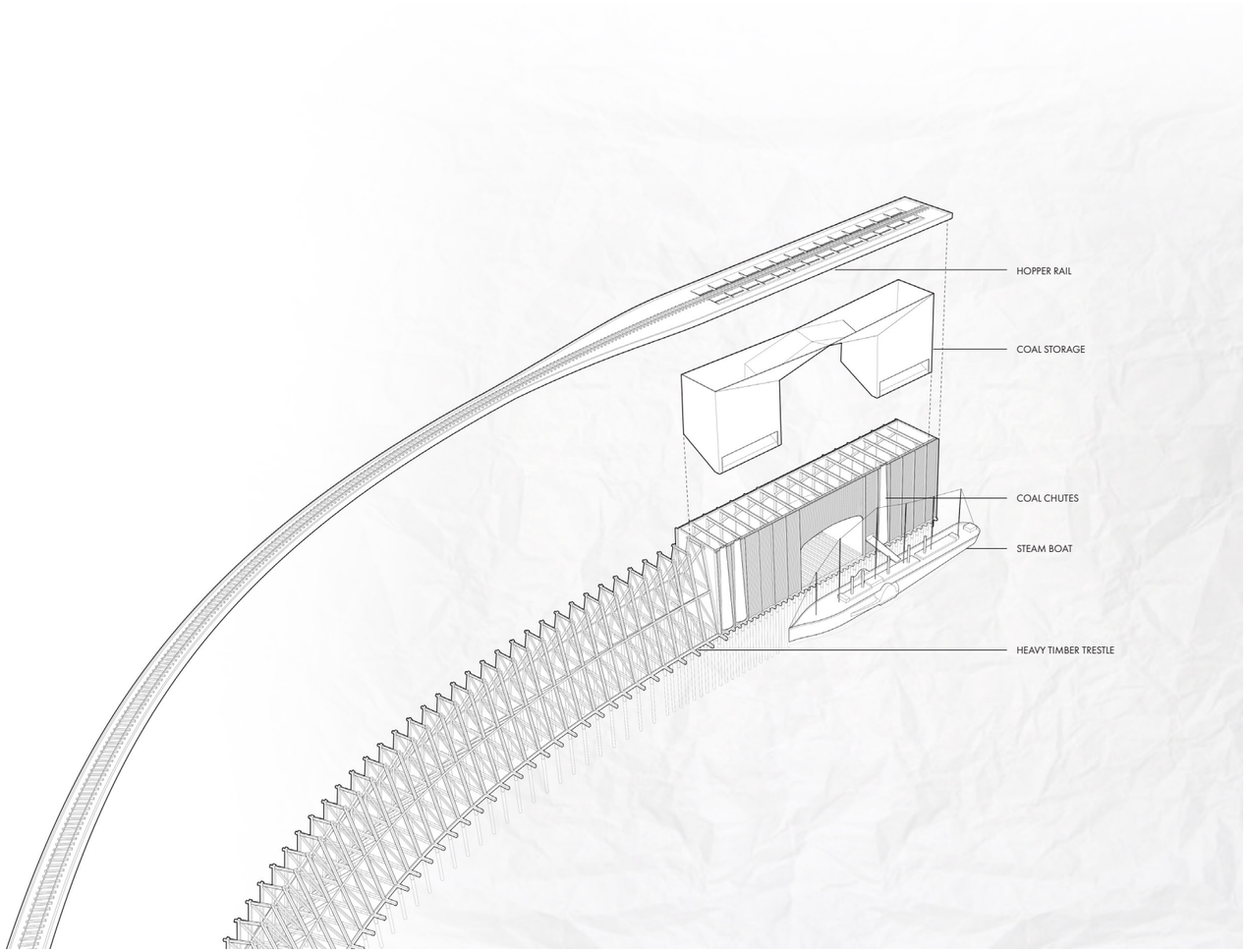


fig. 68 Exploded Axon of a Coal Bunker

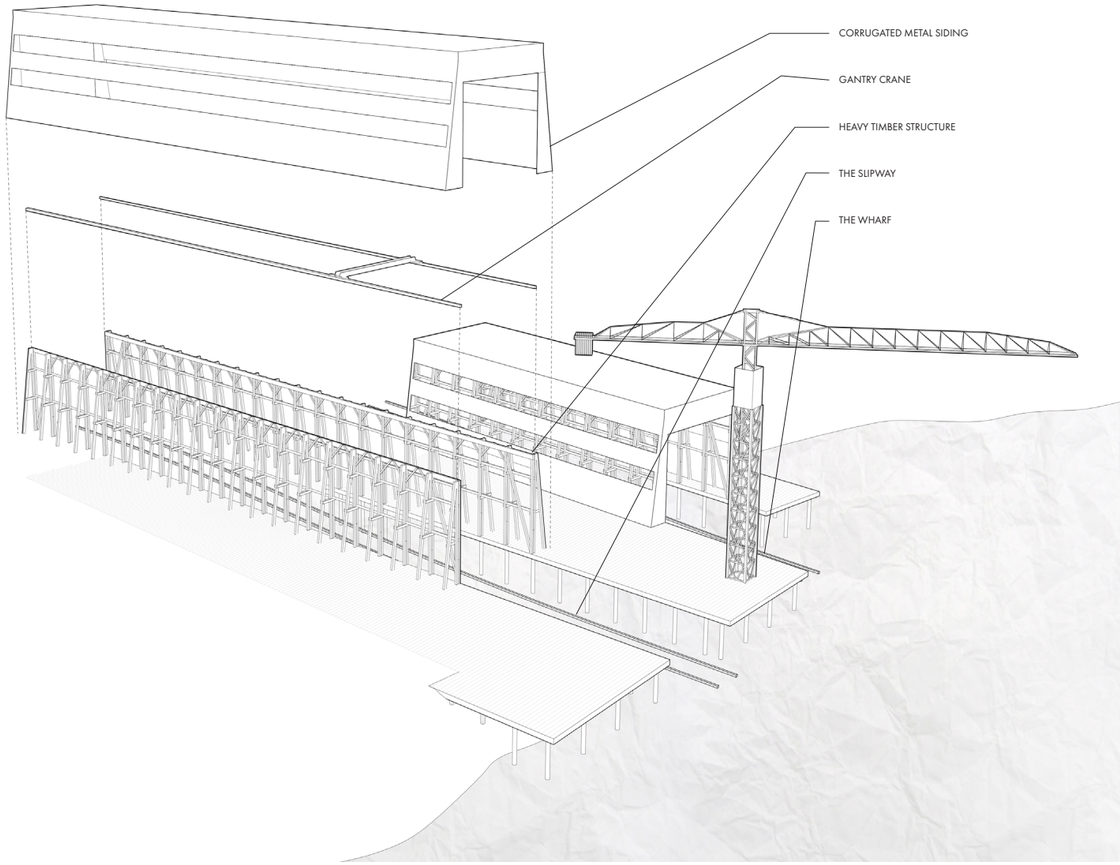


fig. 69 Exploded Axon of the Martinac Shipyard

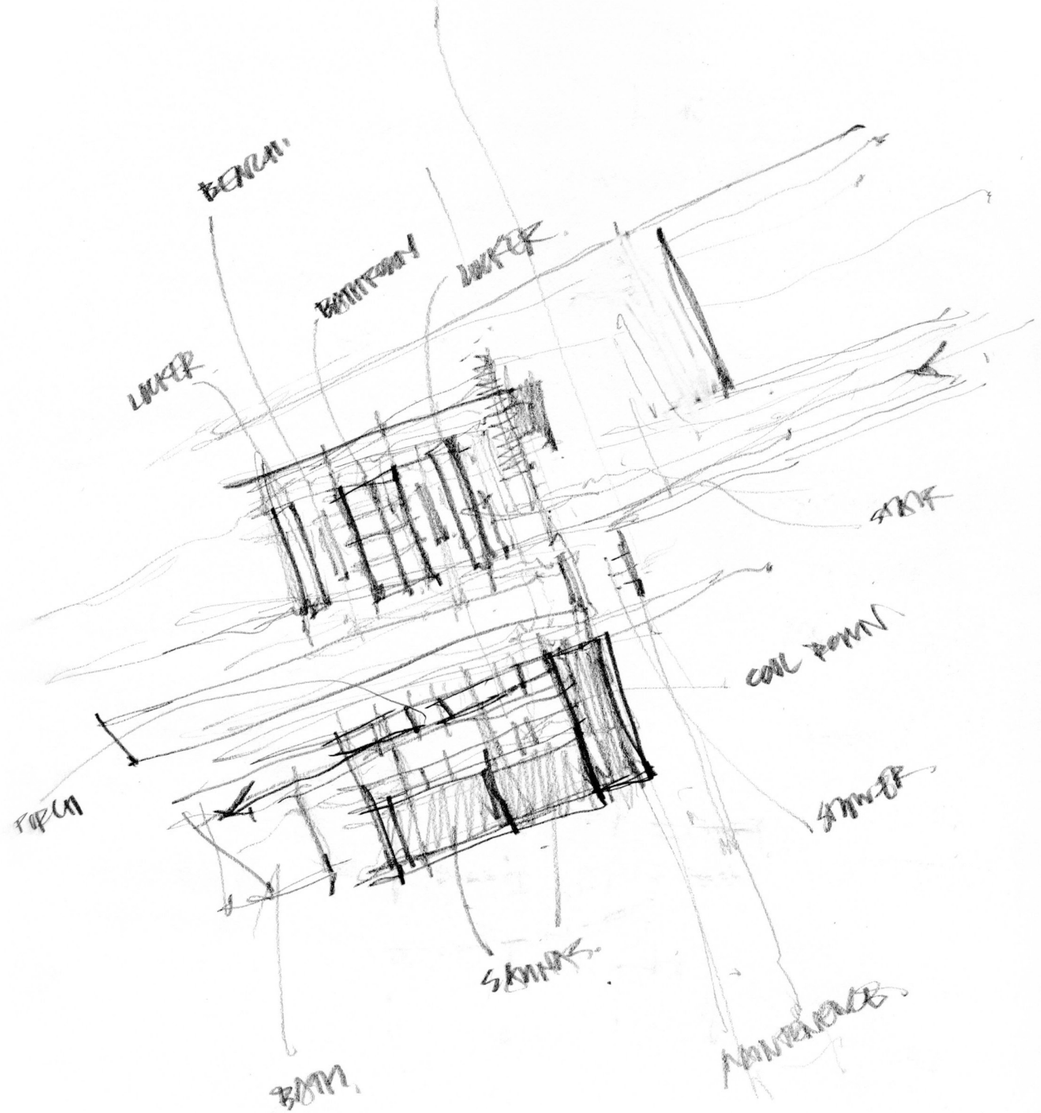


fig. 70 Developing the Harbor Bath Program for the Public Slipyard

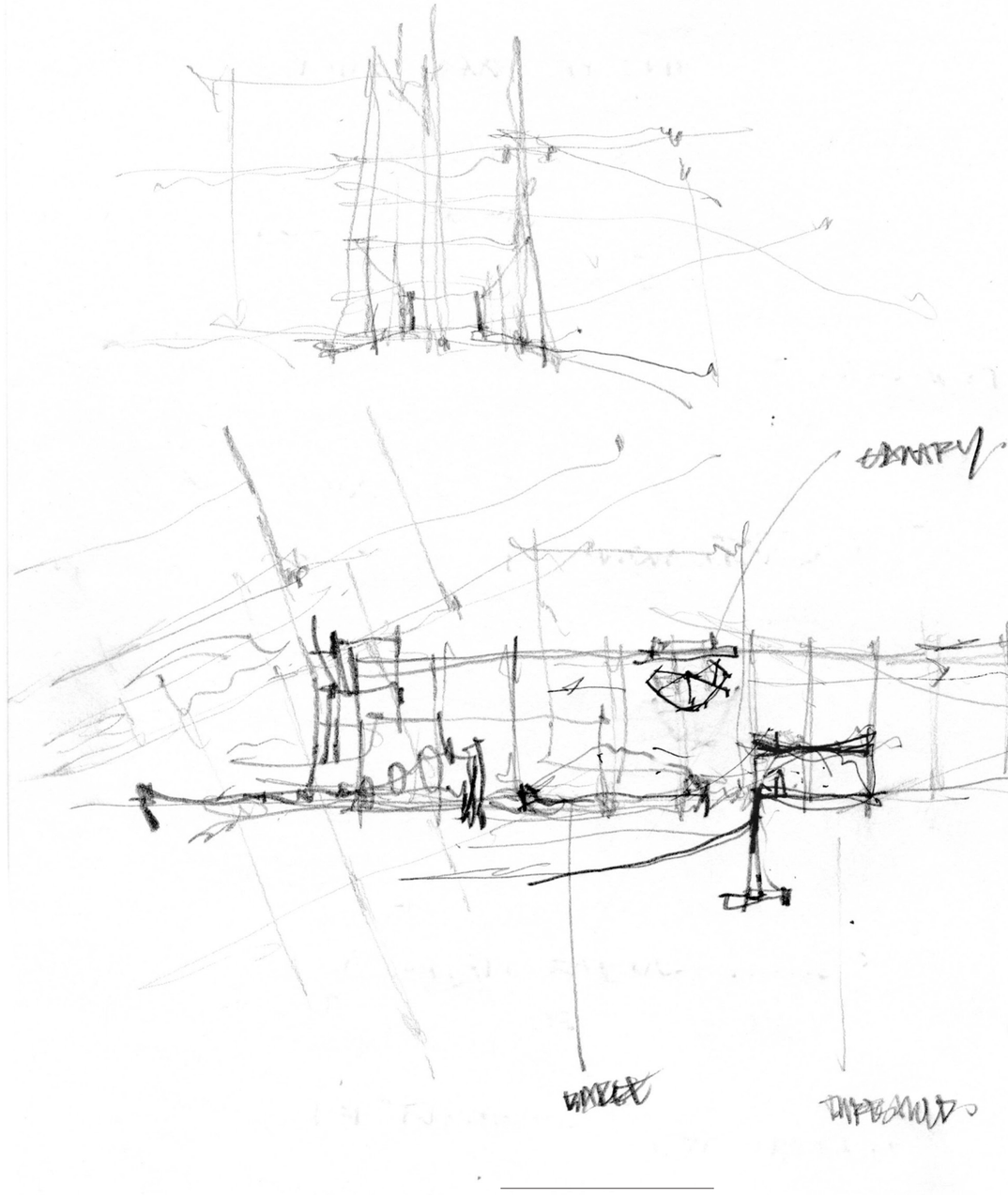


fig. 71 Section of the Industrial Slipyard and Public Threshold

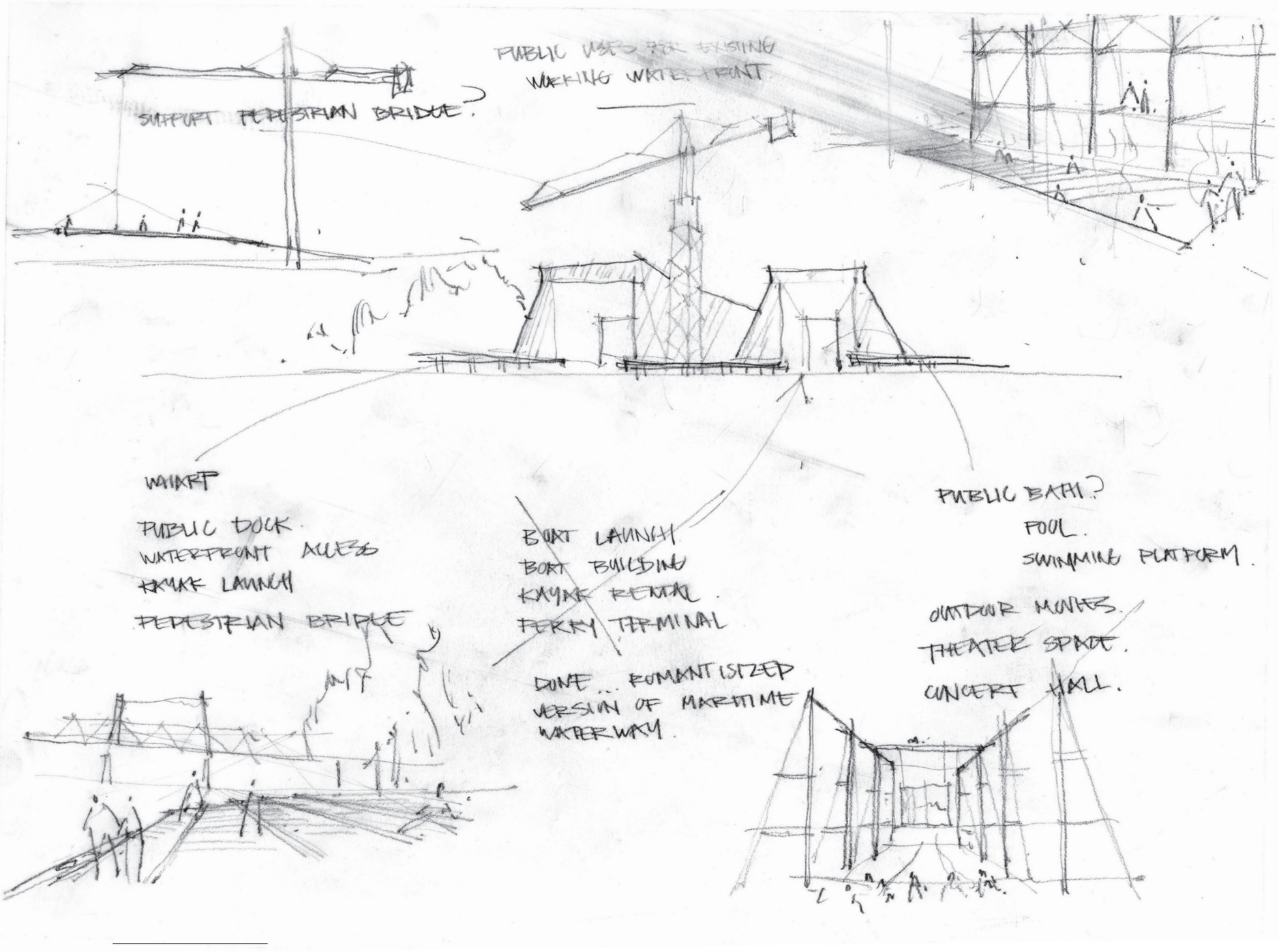


fig. 72 Program Studies for the Reclaimed Industrial Slipyards

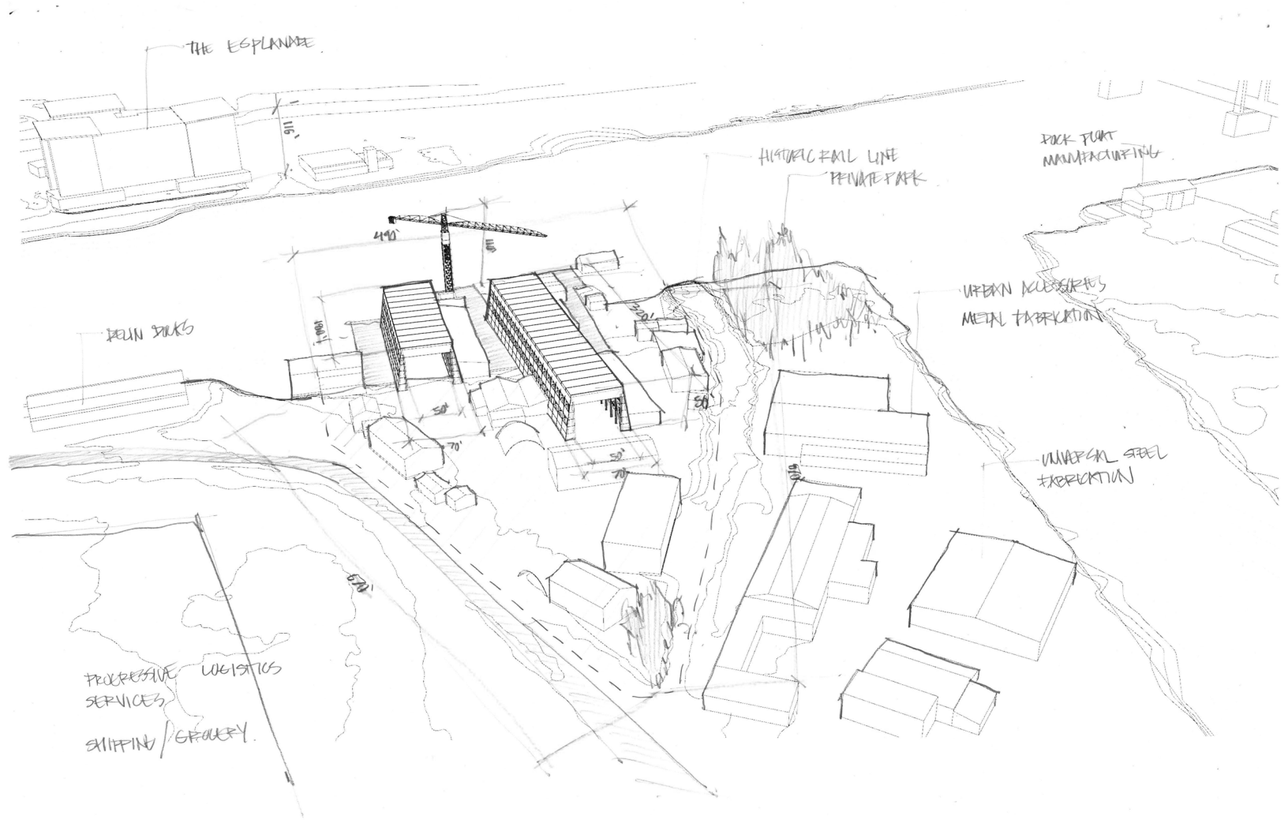
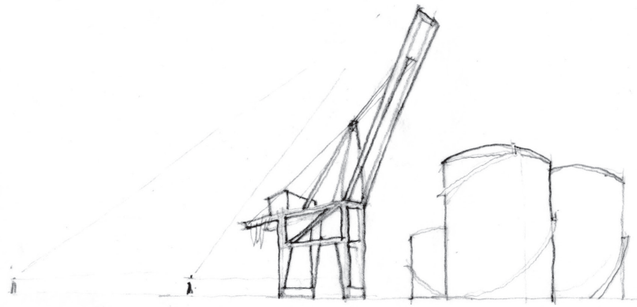


fig. 73 Site Analysis Sketch

DIAGRAM THE PUBLIC'S RELATIONSHIP TO INDUSTRY



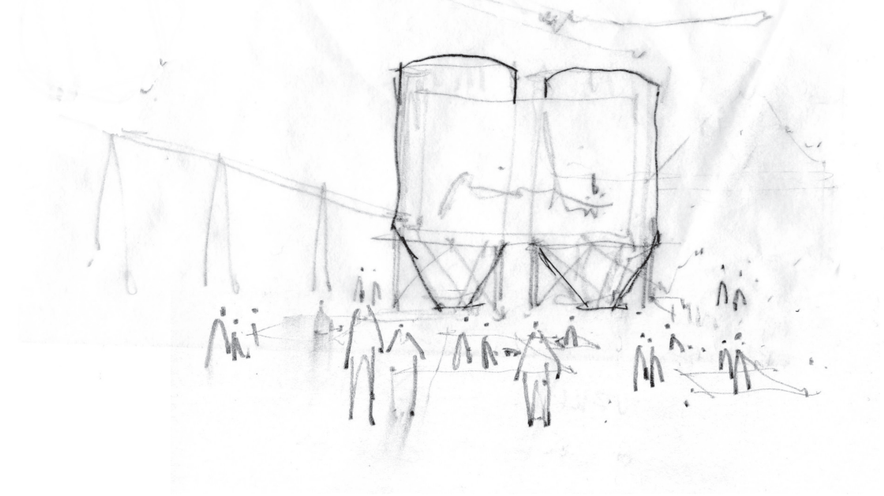


fig. 74 Scale Comparison of Industrial Infrastructure
fig. 75 Storage Silos as a Stage Set for Public Performances and Film

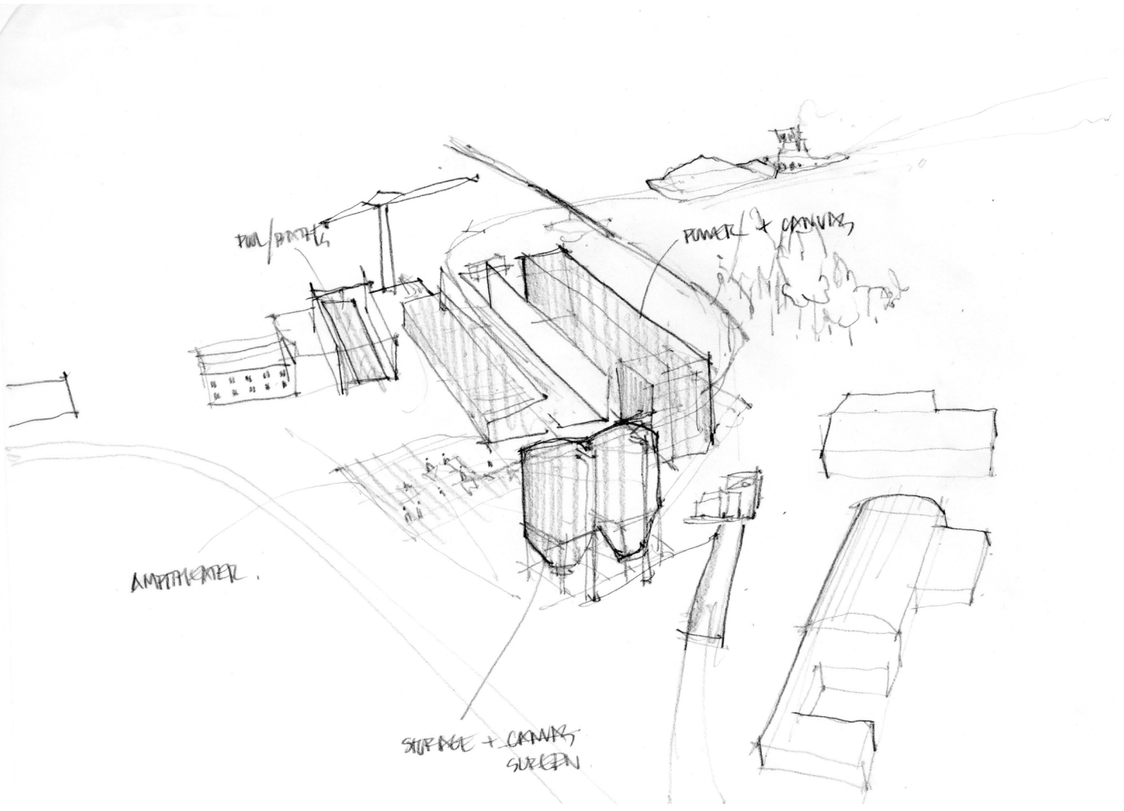
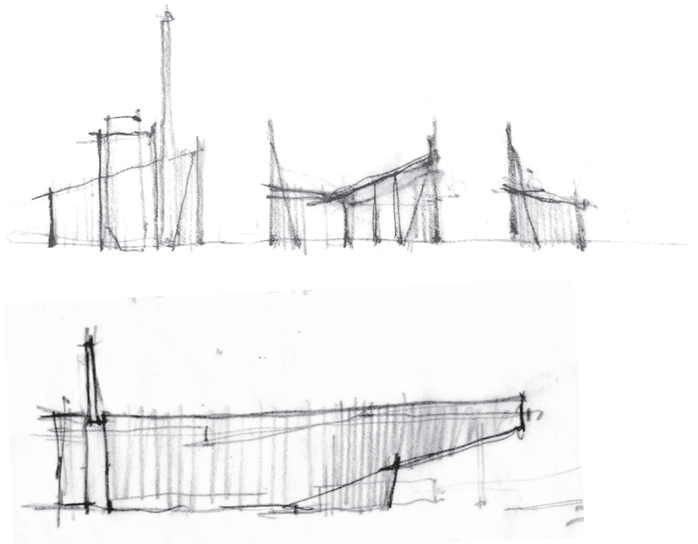


fig. 76 Preliminary Sketch of Massing and Program



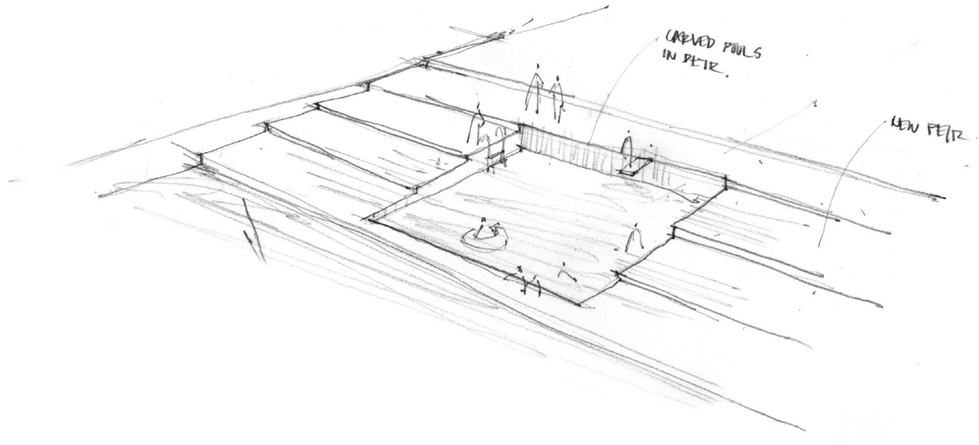


fig. 77 Elevation Studies of Solid and Void

fig. 78 Public Boardwalk with Integrated Harbor Baths

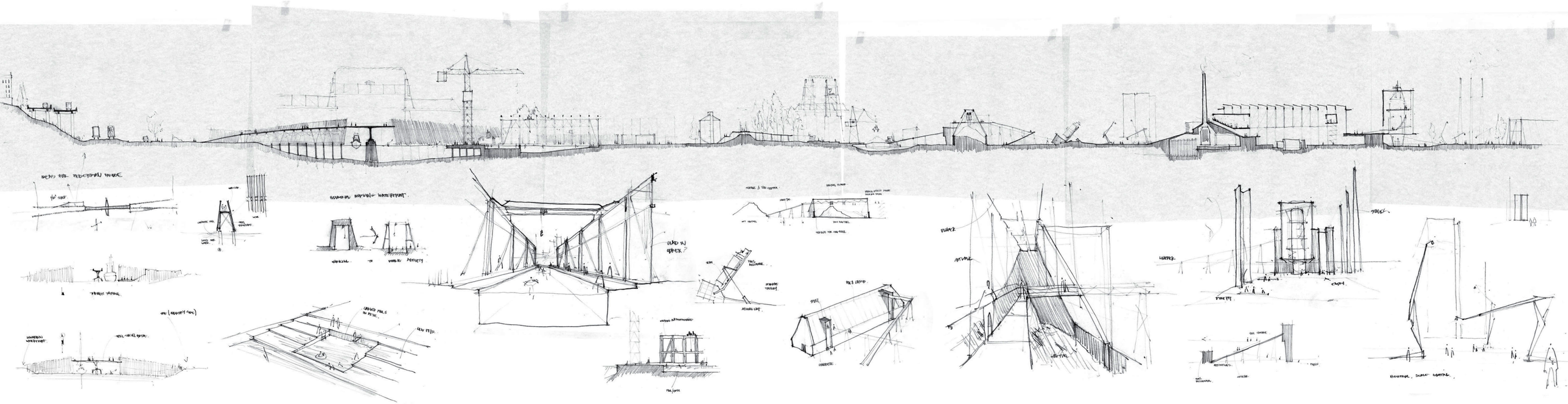


fig. 79 8′ Long Site Section + Thesis Musings

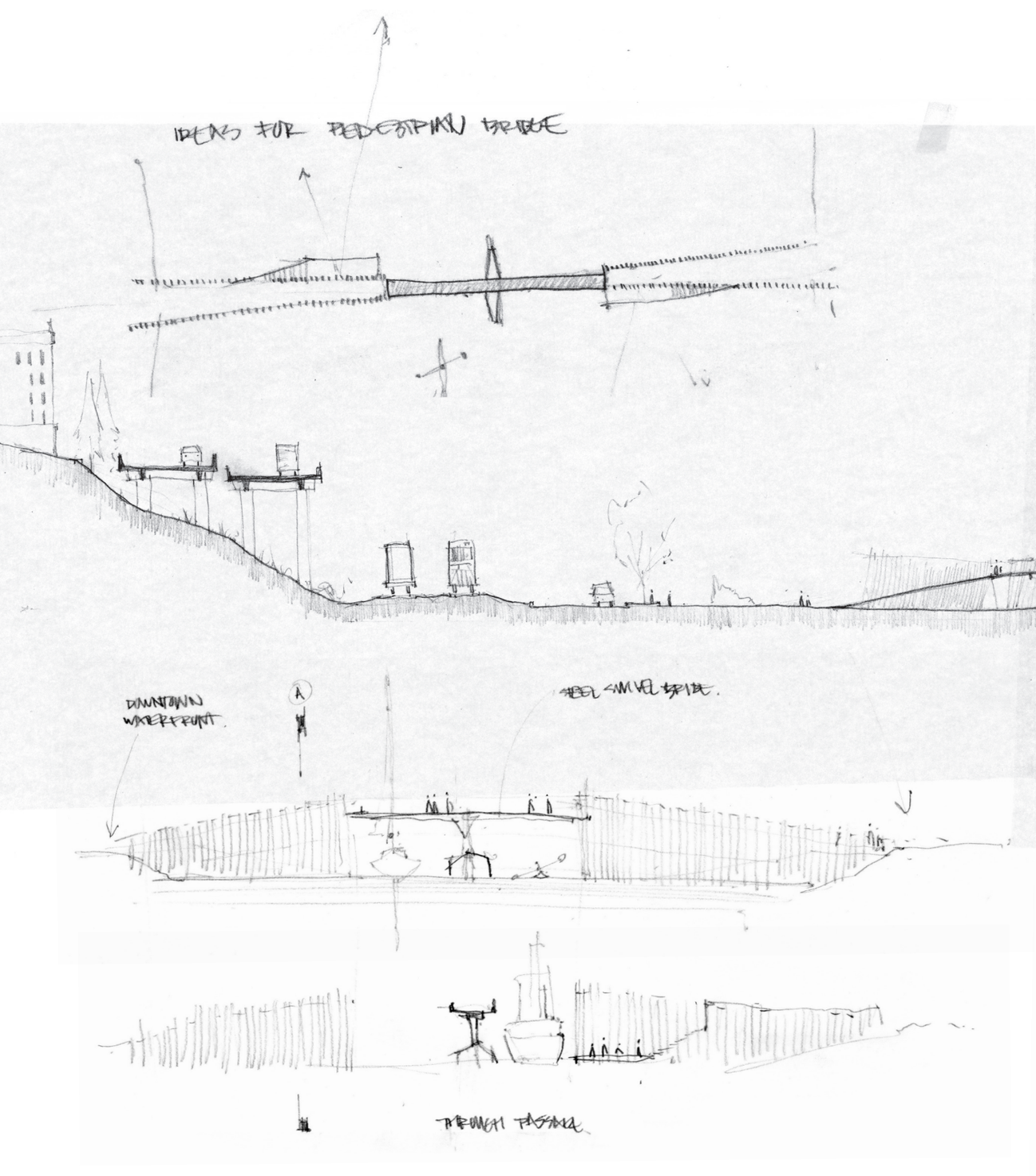


fig. 80 Pedestrian Bridge Plan Sketch
fig. 81 Site Section - Pedestrian Bridge
fig. 82 Swivel Bridge Function for Vessel Passage

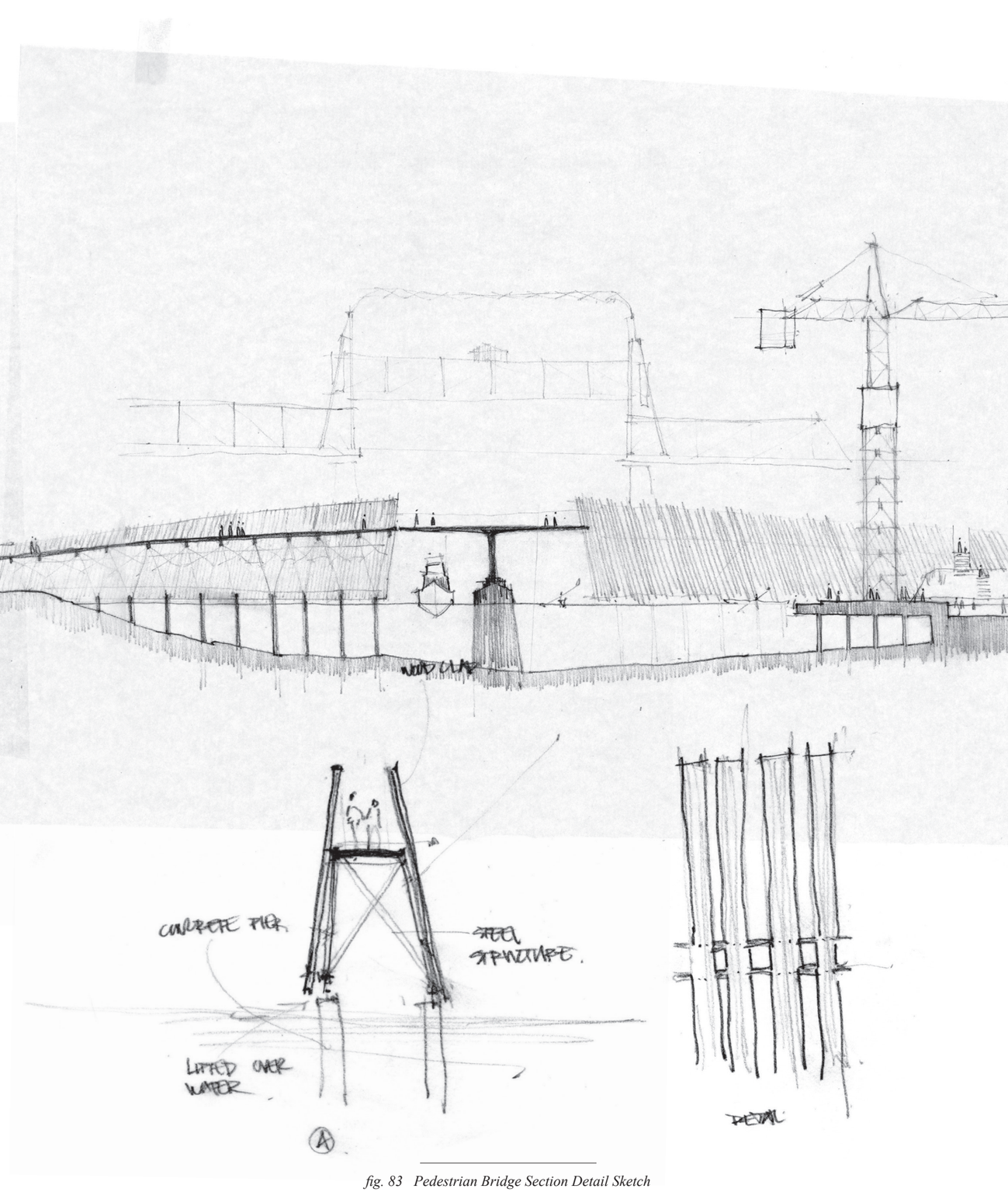


fig. 83 Pedestrian Bridge Section Detail Sketch
fig. 84 Pedestrian Bridge Wood Siding Detail Sketch

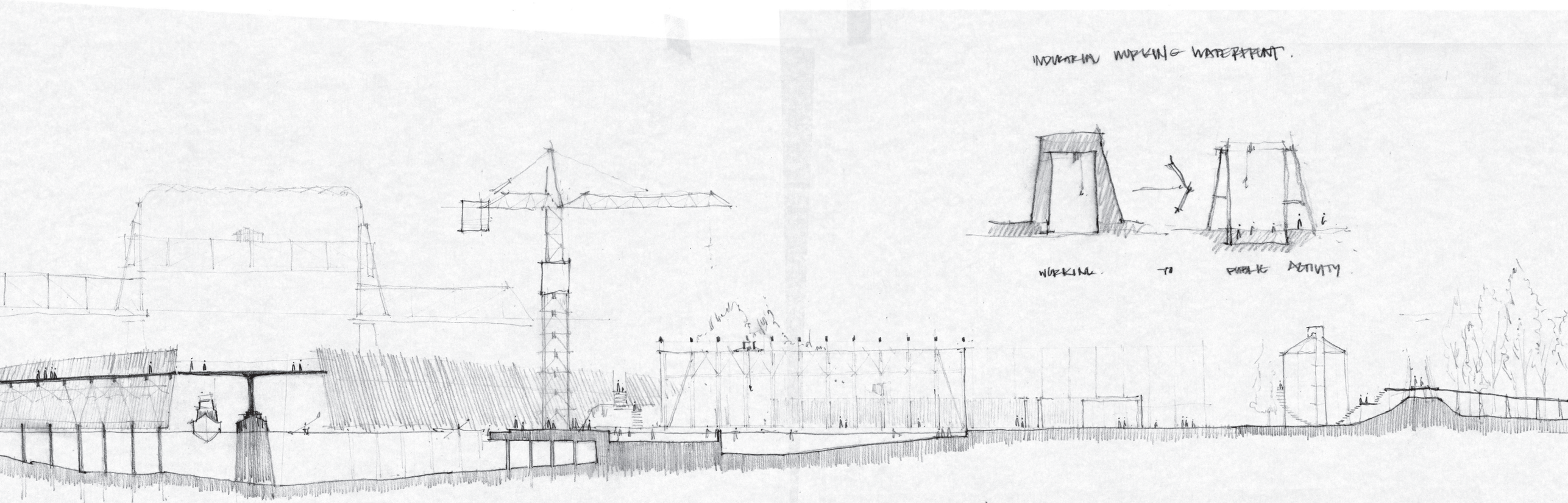
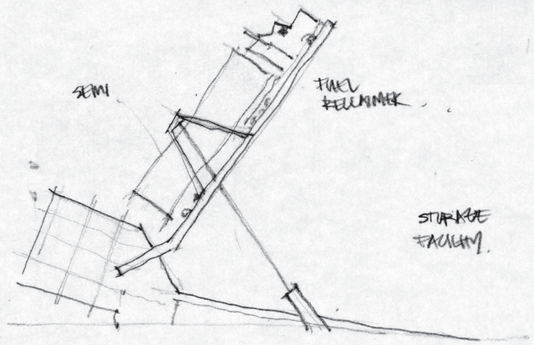
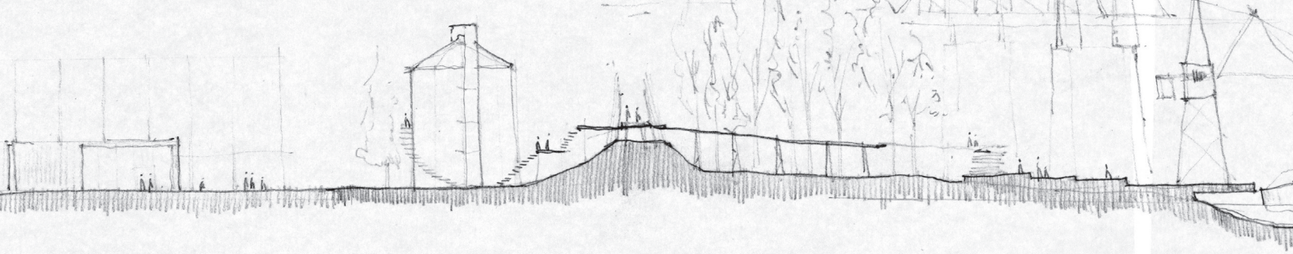


fig. 85 Site Section - Public Harbor Bath
fig. 86 Public Harbor Bath Detail Section

fig. 87 Industrial Infrastructure Turned Public Amenity Diagram Sketch
fig. 88 Public Harbor Bath Section Perspective Diagram





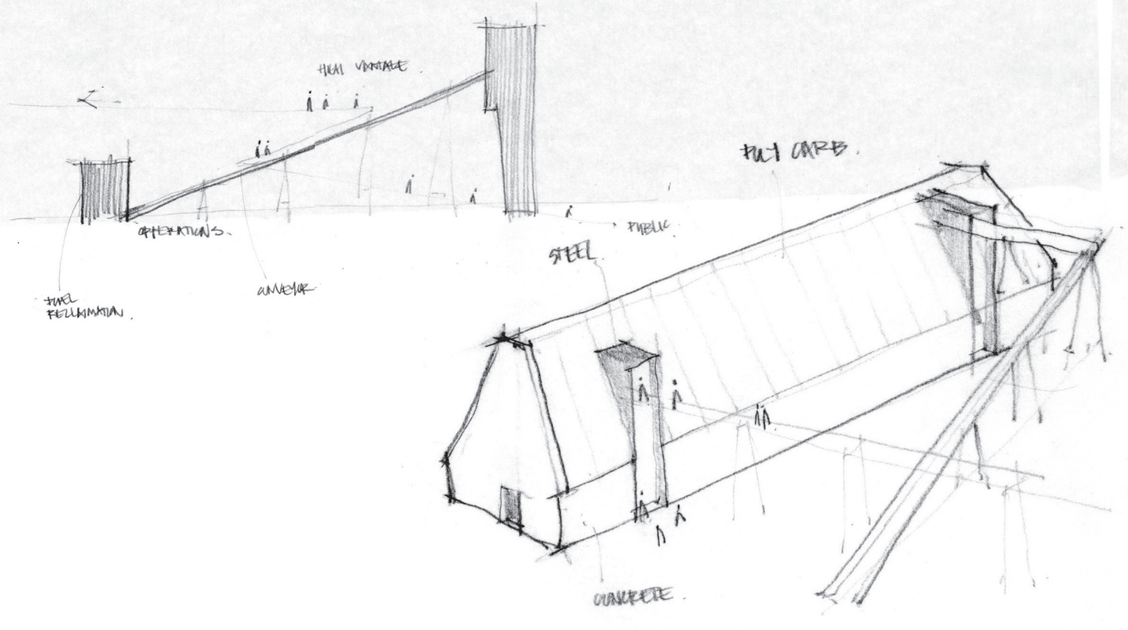
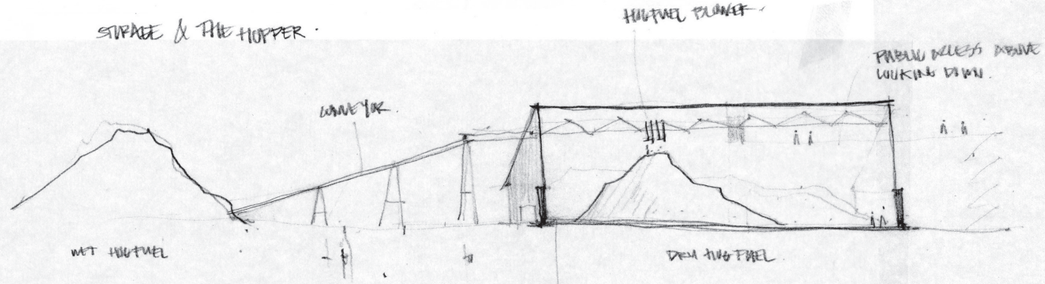


fig. 89 Hydrophilic Lift for Semi Truck Fuel Reclaimer Sketch
fig. 90 Site Section - Hog Fuel Storage Silo
fig. 91 Hog Fuel Storage Silo Axon with Public Access Sketch



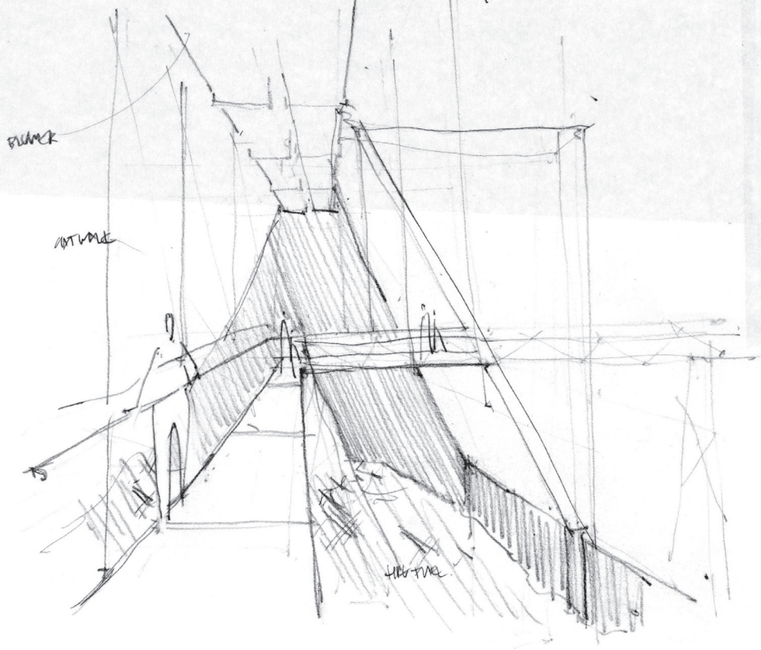
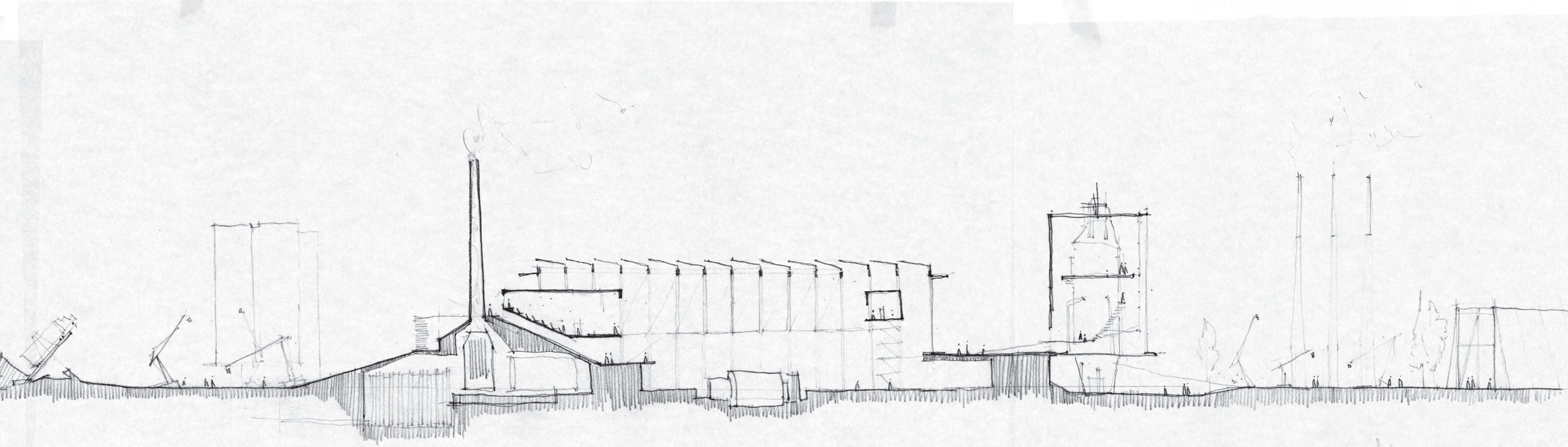


fig. 92 Hog Fuel Storage Silo and Conveyor Section Diagram
fig. 93 Hog Fuel Storage Silo with Public Access Perspective



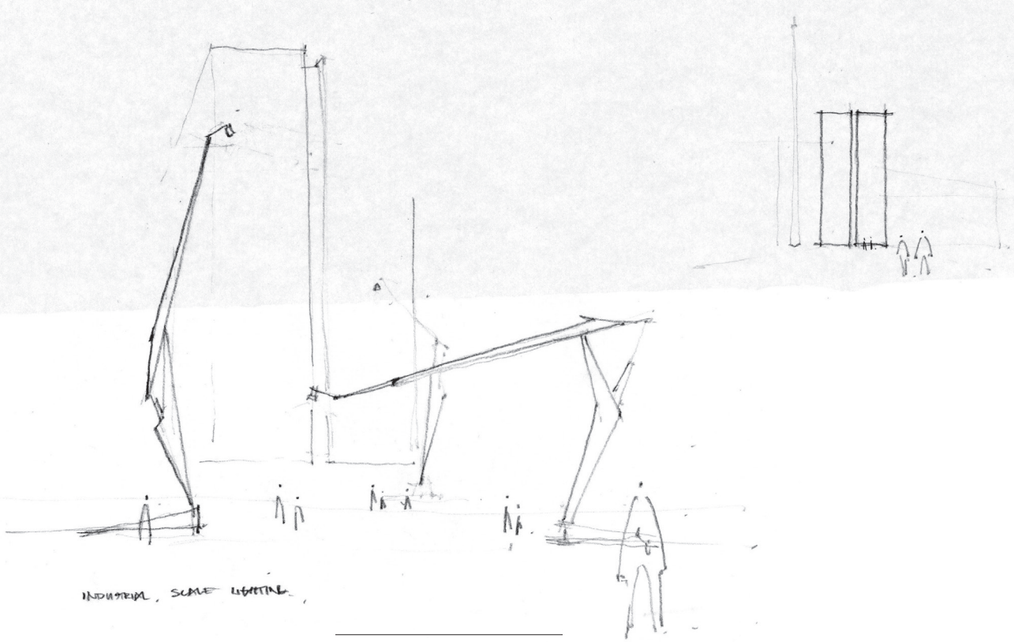


fig. 94 Site Section - Biomass Power Plant

fig. 95 Open Industrial Public Space with Operable Street Lights

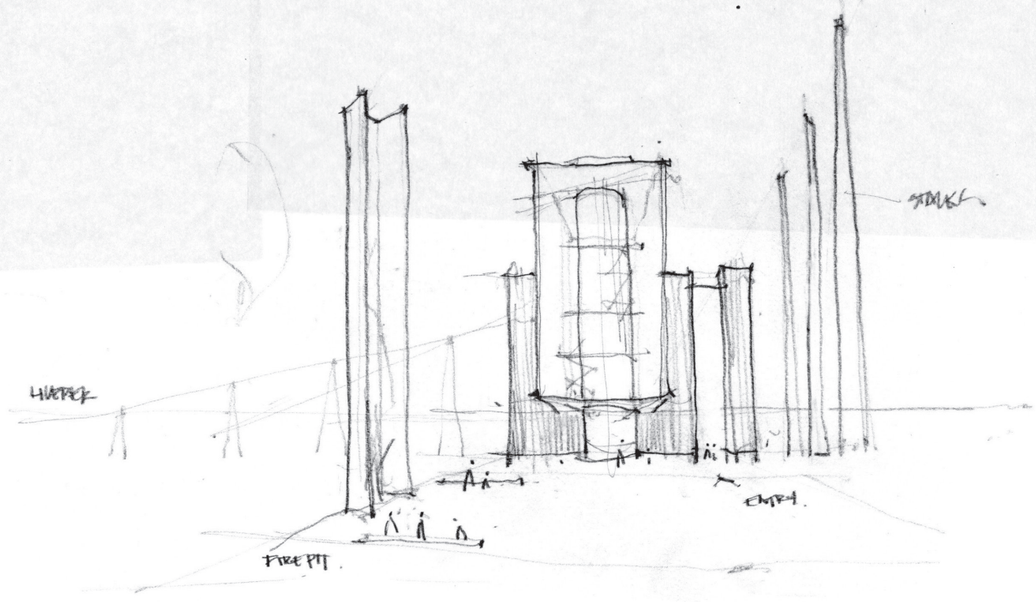


fig. 96 Open Industrial Public Space Centered Around the Power Plant Lantern