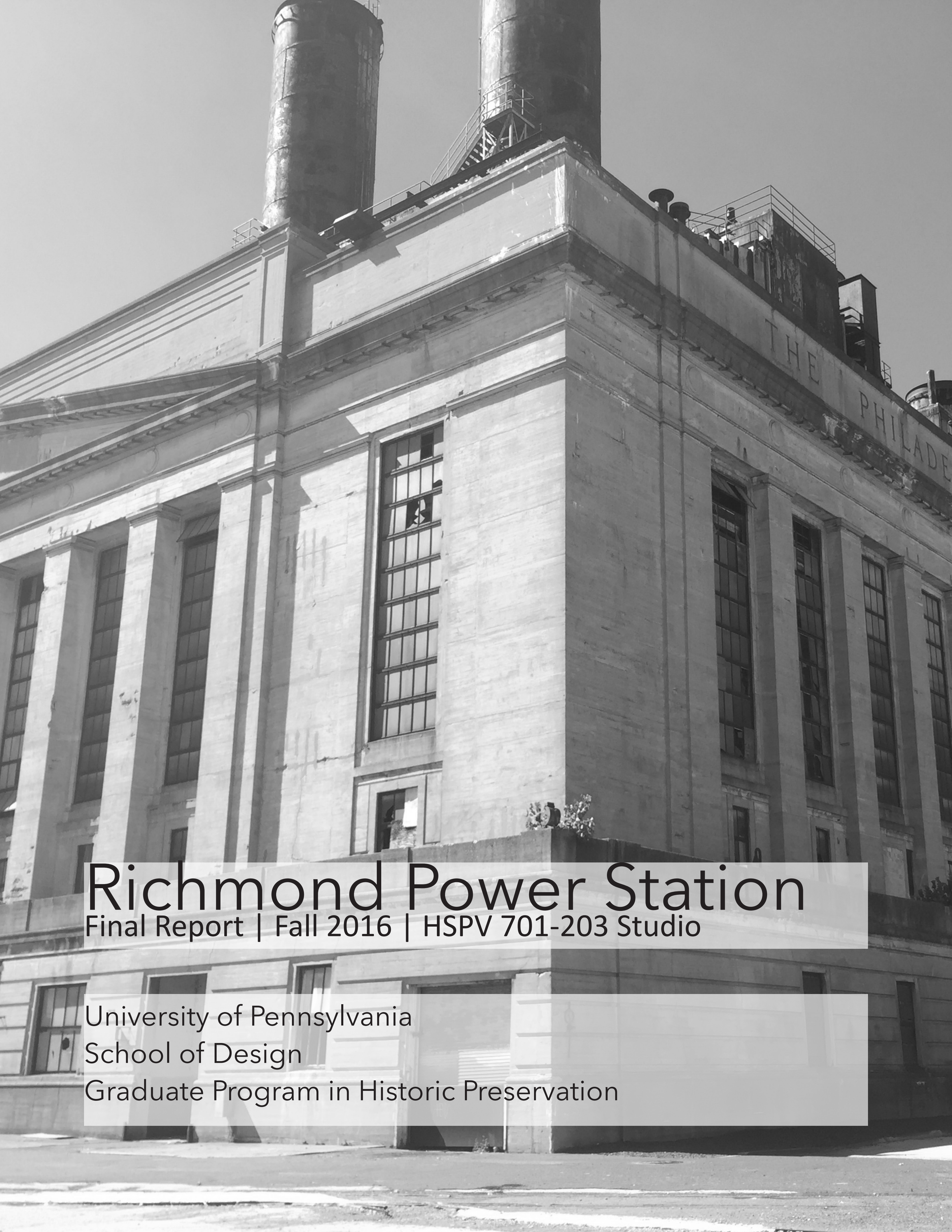

Richmond Power Station

Final Report | Fall 2016 | HSPV 701-203 Studio

University of Pennsylvania
School of Design
Graduate Program in Historic Preservation


LPHIA ELECTRIC

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1.0 Current Site Description

1.0 Current Site Description

Image 1.1 - K. George, Site Visit (2016)

Richmond Power Station sits on a 32-acre plot of land owned and operated by Exelon, formerly the Philadelphia Electric Company (PECO). The property contains several buildings and uses, some of which are currently in operation and some, like the power station, have been decommissioned. The site is located in the Port Richmond neighborhood in northeast Philadelphia, and bounded by the Delair Railroad Bridge and Frankford Creek to the northeast, the Port Richmond Sanitation Center across Delaware Ave. to the northwest, the Tioga Marine Terminal to the southwest, and the Delaware River to the southeast. All of the adjacent land use is zoned for heavy industrial development.

The site is accessed by road from Delaware Ave. from two entrances, one for access directly to an administration building and one that has been used primarily for shipping. The border of the property features a tall chain link fence with razor wire at the top. In certain locations, such as near the river on the north side of the site, several cuts have been made by trespassers and subsequently patched with metal sheeting.

Original plans made by PECO called for three identical power stations placed next to each other. Due to this, it was deemed necessary to buy a large amount of land at one time.[1] While this plan did not come to fruition, the land was retained by PECO and put to alternate use. This includes a large substation on the west of the property facing Delaware Avenue that covers roughly a quarter of the site. It is still in operation and produces a buzzing sound across much of the property.

Nearby is a five million gallon tank of fuel oil for interim emergency use. This, along with the substation, is enclosed by an interior fence that runs down the middle of the property, separating it from the decommissioned power station. The site is also visually divided by small-gauge railroad tracks that were used to transport refuse and, later in the station's operation, coal for firing. Previous to train-delivered coal, the fuel for the station was delivered by boat to the coal tower located on the pier.

The building layout of the power station is defined by the path taken by coal fuel as it moves from its raw form to boilers, which spins turbines and finally becomes energy ready to be transmitted. It is spatially designed to maximize efficiency and prevent loss of material in the process, and it also utilizes the Delaware River as a water source for the boilers.

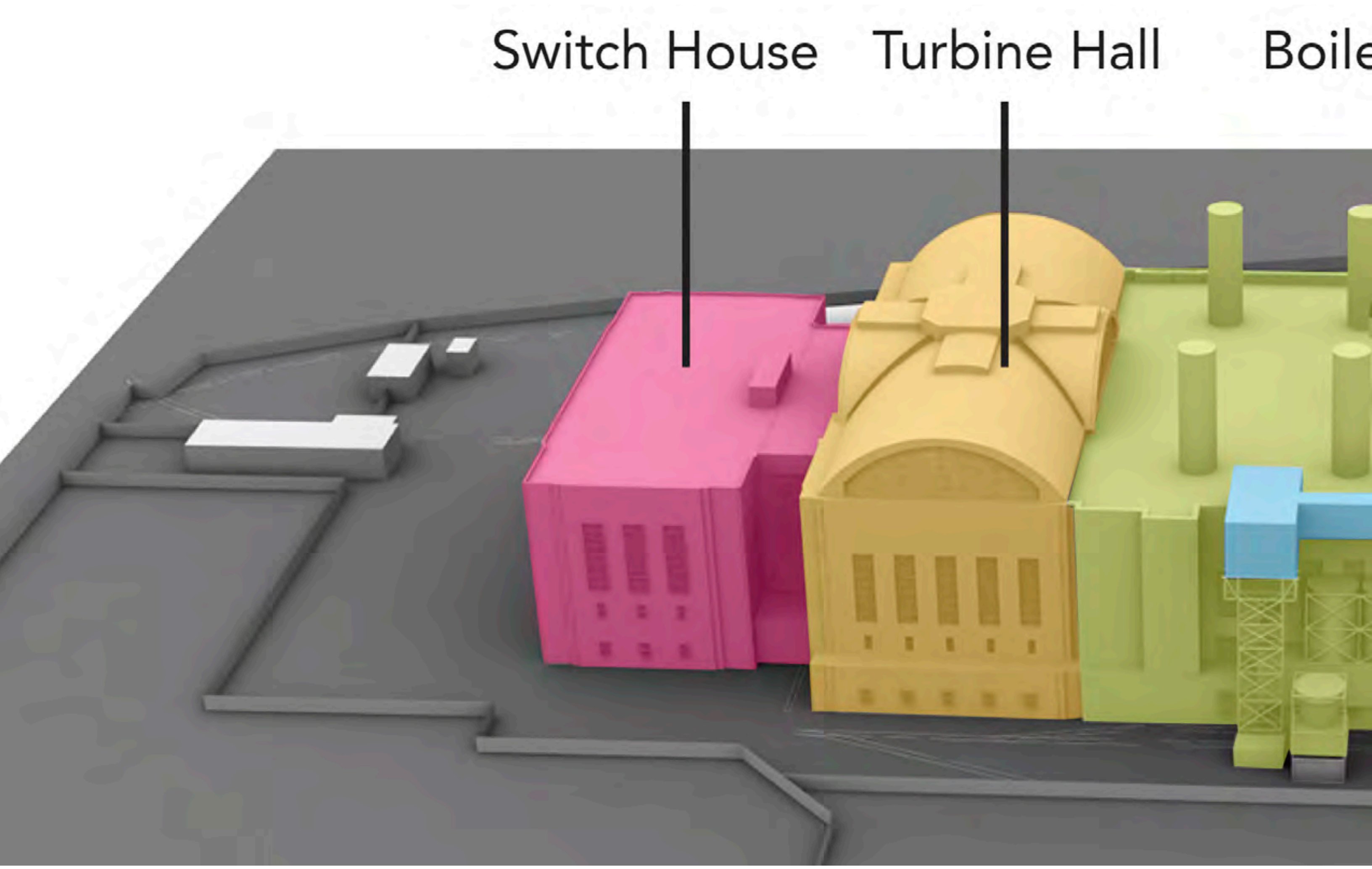
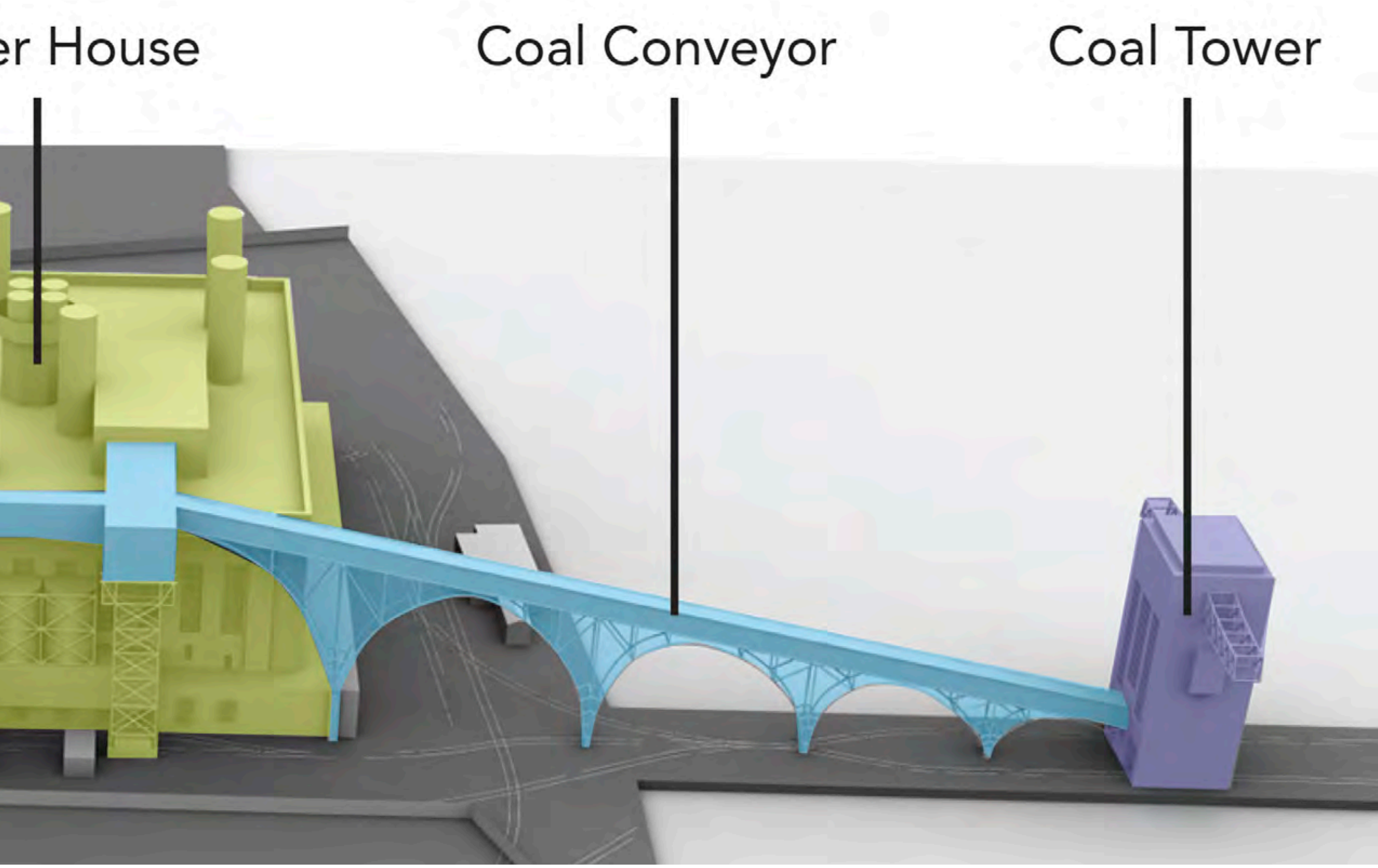


Figure 1.1 - Five structures of historic core, looking north

Five distinct architectural elements are apparent in the power station relating to the process of energy production. These are, from the start of the process to the end, the coal tower, the conveyor ramp, the boiler house, the turbine hall, and the switch house. The following will describe the form, condition, and purpose of each of these and how they relate to each other in the property as a whole.

Located on the edge of the Delaware River pier, the coal tower stands on a 64 by 46 feet plot of land and 130 feet tall. Two cranes extend out the sides next to hoppers to help unload coal ships onto the conveyor belt. The ground story has two roll up doors on the east and west facades large enough to accommodate a train car. There are three bays of windows that provide light for the five floors above the ground story. These spaces were used for storage and some maintenance equipment.[2]

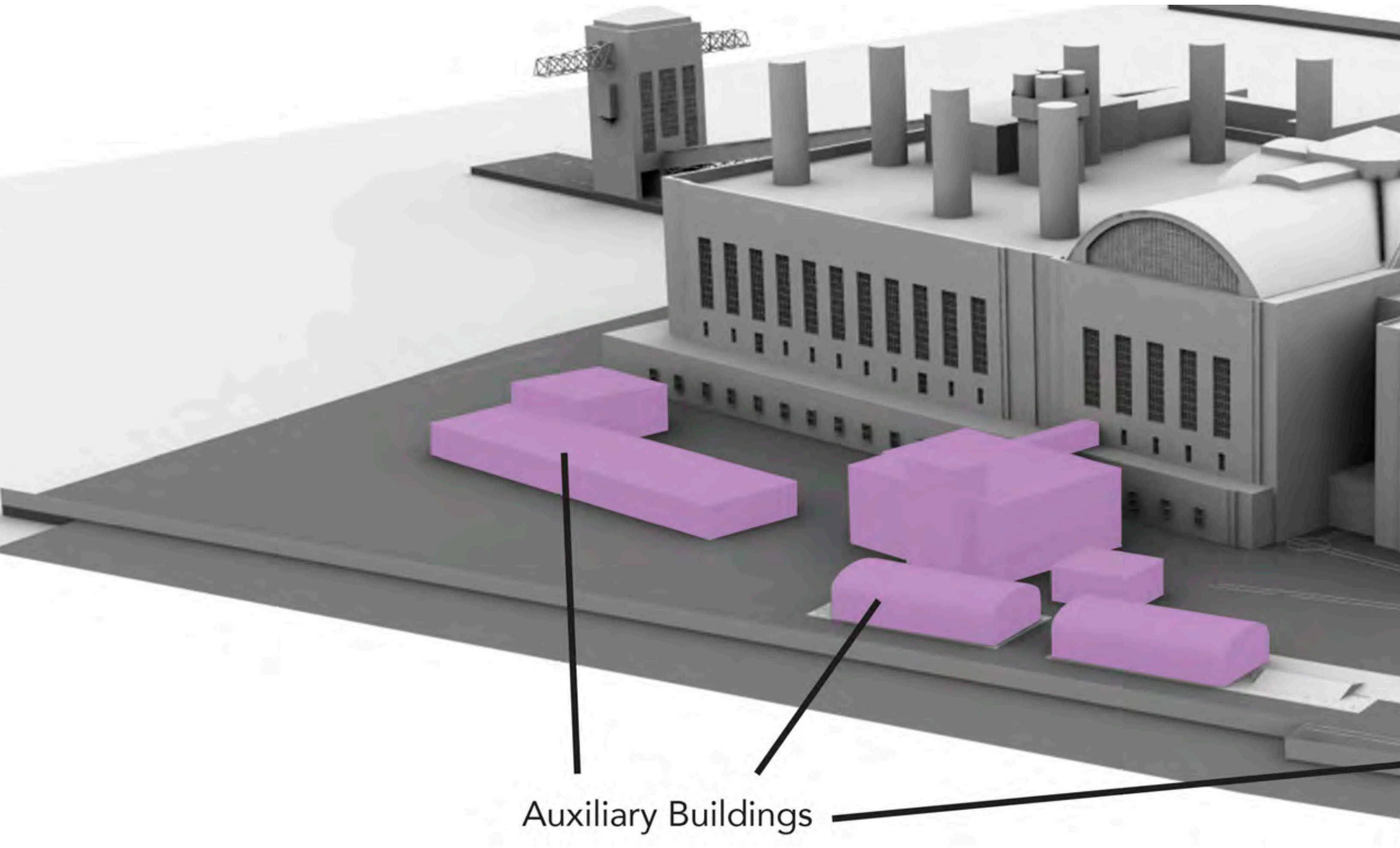
There are several areas of concern with material at the coal tower. Much of the concrete on the river-facing side has spalled due to corroded rebar. Most of the thick windows have been broken as well. The pier itself has overgrown with plant life and is covered with debris. The upper floors of the tower are inaccessible at this time to prevent trespassing.



After the coal was removed from boats in the river, it was loaded onto a conveyor belt to be raised to the top of the boiler house, where it would be gravity fed through machines to crush it into small pieces. When constructed, the over 600-foot belt started at the base of the coal tower and extended to the top of the southernmost corner of the boiler house. It was covered to shield the coal from rainfall and wind. The weight of the conveyor, as well as all the coal traveling on it, is supported by a steel arch structure, which increases in size and span as the conveyor rises.

The material problems found at the conveyor are similar to the coal tower. However, the problems with corroded metal are more serious at the bases of the arched supports, which are steel cores with concrete surrounding it. The concrete has seriously failed and does not function as it once did because of massive cracks that have resulted from the iron in the steel corroding.

Once the coal has reached the end of the conveyor, it is now in the main envelope of the power station. The entirety of the station, which includes the turbine hall, switch house, and boiler house, covers a square footage of just over 320,000



square feet. Not only a large footprint, the building is also very tall. The turbine hall has an average height of 125 feet. It Is useful to examine each of these three components of Richmond Plant separately due to their unique functions, spatial layouts, and levels of decay.

By square footage, the boiler house is the largest portion of Richmond Power Station.[3] However, the amount of equipment, along with the many dark twists and turns give a labyrinth type feeling to the space. The boiler house contains 16 large boilers that are fed by coal, installed in several phases as the plant grew in capacity. Because none of the metals are valuable for scrap, the issue of space and past/future use is one that will need to be interpreted if any preservation work is undertaken. The demolition or removal costs are very high, but removal will likely need to occur for any meaningful use of the space.

Like the other sections, the boiler house is over 100 feet tall. If the turbine hall can be considered one monumental open space and the switch house several compartmentalized floors, the boiler house is a hybrid of the two. It is one large space to fit the equipment, but with several floors of metal stairs to service it. There are also a few small control rooms that fit well with the tight spaces throughout.

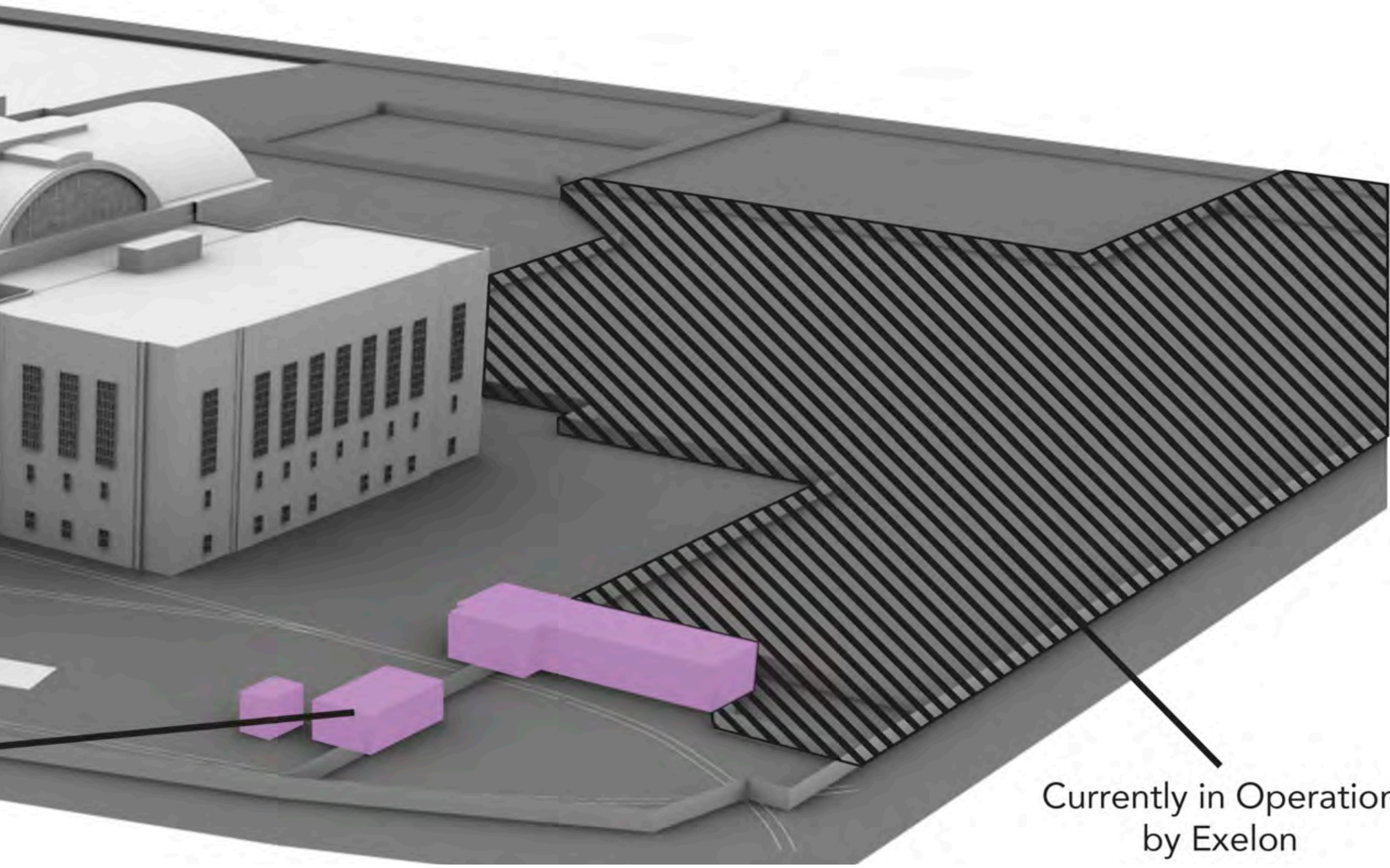


Figure 1.2 - Property uses, looking southeast

The turbine hall is the single largest space in the building, with a footprint of approximately 315 x 123 ft.[4] The structure was built very tall for several reasons. The public or civic architecture that was common for power power facilities in the late 19th century is apparent at Richmond Station. In addition to aesthetic value, the practical needs of the turbines, such as heat, needed to be considered. The enclosed space around four steam-powered turbines would be a safety concern for anyone working inside it, so increasing the volume of the space also increased the heating load that the space could handle. It also provided for large window-walls on the east and west facades to maximize ventilation and light. A crane that also necessitated a large open space provided maintenance and removal of the turbines.

125 feet above the turbine hall floor is the arched roof enclosure, which is currently in a state of disrepair. The structure of this vault is a series of steel beams, and the skin is made up of reinforced concrete and plaster panels, almost all of which have been compromised. The roof has changed dramatically since HABS documentation in 2001, the tiles are unstable and fall down at random. It is currently dangerous and inadvisable to walk under any portion of the vaulted ceiling because of these falling hazards.

Graffiti and tagging is an issue in the turbine hall as well, especially at hard to reach locations. There is frequently new graffiti that appears, which highlights the issues Exelon staff have with preventing trespassers from accessing the property. These trespassers may also be responsible for disturbing the existing material, which can be dangerous in the case of the friable asbestos paneling on many of the walls. Like the switch house, anything in the turbine hall that may contain copper or other expensive metals have been stripped, and the remaining damage (for example on one of the turbines, where the thick metal has been pulled back to access the mechanical work inside) is clearly visible and could prove to be a safety hazard.

Several films have used the turbine hall for filming, most notably 12 Monkeys and Transformers 2: Revenge of the Fallen. While 12 Monkeys was not the most invasive to the site material, the Transformers movie removed site material and destroyed the former administration office on the southeastern side of the turbine hall. The glass and metal enclosure is now unusable and, while it does not affect the overall structural integrity of the building, it no longer conveys past use of the material.

The switch house is the section of Richmond Plant furthest from the Delaware River, and it houses the former office space and control room for Richmond covering four stories. Each floor has very high ceilings, up to 16 feet each. All floor plans are roughly the same, with the front room serving the turbine hall and the rear rooms housing reactors. There is also a first floor breezeway below the control room that is called the Transformer Court. This area housed various power transformers and currently is used as a storage area by Exelon.

While the structure of the switch house is generally intact, especially compared to the turbine hall, the degradation and decay is due mostly to human, rather than environmental factors.[5] One of the office rooms is currently filled with broken glass insulators, from which vandals took the copper in the middle. This type of vandalism is visible throughout the whole site, but a lot of material was discarded in the switch house rooms.

The control room is on the fourth floor and contains several large computers from when the plant was operational, all in a hemispherical layout. The computers face a window wall overlooking the turbine hall below, and this window provides a wonderful view. There is also a great deal of tagging and graffiti in this room, along with various trash piles, indicating that this is a popular site for trespassers to visit.

Certain rooms at the rear of the switch house are inaccessible today due to asbestos hazards within. There has been some remediation for asbestos and other health hazards such as lead, but these efforts have been focused more on the turbine hall and boiler house. As such, the current condition could not be determined, but it is certain that remediation would need to be done before this area could be used.

The Richmond Power Station is located in the Port Richmond neighborhood of Northeast Philadelphia, a historically working-class Polish community. The areas zoned residential are not adjacent to Richmond Station, but are rather located slightly over half a mile away from each other at the nearest point. In addition, a physical boundary in the form of I-95 demarcates the southern edge of residential development. South of the highway to the river is zoned for heavy industrial, including Richmond Power Station.

North of the station is another neighborhood, Bridesburg. Similar to Port Richmond, this maintains a strong Polish influence to this day. It also has barriers that prevent easy access to Richmond Power Station, specifically Highway 90 and Frankford Creek which limit site access to Delaware Ave. and Richmond St.

1.1 Historic Register Nomination

In 2001, a nomination was prepared to list Richmond Power Station on the Philadelphia Register of Historic Places. Proposed by the Philadelphia City Planning Commission, this nomination was supposed to be the first of many nominations of important industrial sites and districts within Philadelphia. Because of its historical connections to the development of the city and its neoclassical features, it was strongly believed that the nomination would be passed by the Philadelphia Historical Commission without any issues. Unknown by the Planning Commission, the site owner, the Exelon Corporation reached out to the mayor's office in order to stop the nomination. With the combined factors of higher-ranking

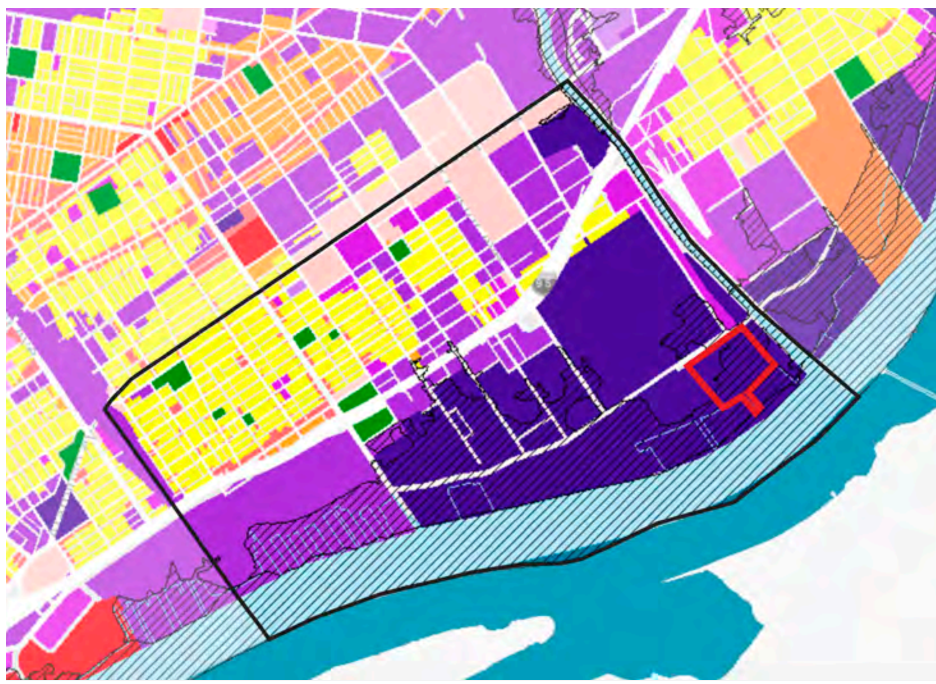


Image 1.2 - Turbine Hall interior - K. George, site visit (2016)

Figure 1.3 - Zoning map of Port Richmond neighborhood, with Richmond Power Station outlined

political influences and the Philadelphia Historical Commission's thought that there were no believable adaptive reuse options for the site, the nomination for the Richmond Power Station was set aside.[6] It is important to note that the nomination was defered, not rejected.

With fifteen years between the previous nomination and today, as well as different political leadership, now is the time to make another attempt at listing the Richmond Power Station on the Philadelphia Register of Historic Places. Since 2001, the sister stations of Richmond Power Station, both Delaware Station and Chester Station, have been listed on the National Register of Historic Places for access to historic tax credits. Only Delaware Station has been listed on the Philadelphia Register of Historic Places. This will hopefully set a precedent for a further nomination for the Richmond Power Station.

We believe that for the longevity of the site, listing the Richmond Power Station on both the Philadelphia and National Register will be beneficial for the future of both the historic fabric and economic factors of the site. Listing the property on the Philadelphia Register of Historic Places will prevent future demolition, though the owners could claim economic hardship. Listing the site can bring greater publicity, and could increase the value placed on the site in future plans for the

Image 1.2 - Turbine Hall exterior - E. Gruendel, site visit (2016)

city of Philadelphia and other regional partners.

Nominating the Richmond Power Station on the National Register of Historic Places would give the Exelon Group access to historic tax credits when attempting to move forward with the preservation of the historically significant structures on the site. A 20% income tax credit is available for certified historic structures for rehabilitation.[7] The work will have to be reviewed by the Pennsylvania State Historic Preservation Offices and the National Park Service to determine if it complies with the Secretary of the Interior's Standards for Rehabilitation.

Nominating historic sites on the Philadelphia Register of Historic Places does not require owner's consent. We believe that this is a necessary step in preserving the Richmond Power Station because of the unknowns that exist for the Exelon Group's future plans for the site. Listing a property on the National Register of Historic Places can be a more lengthy process, and will require owner consent.

1. Philadelphia Electric Company. Richmond Station. Philadelphia: The Philadelphia Electric Company System, 1926. 6.
2. Masny, Walt. Operational History of Richmond Station. Private Correspondence. Received by Email September 2016. 173.
3. Masny 160.
4. Tidwell, Marshall, and Haley Van Wagenen. Richmond Station. University of Pennsylvania, 2011.
5. Tidwell, 16.
6. Information from a phone conversation with Laura Spina, the author of the Philadelphia Register of Historic Places nomination, as well as the Planning Division Director for the Philadelphia City Planning Commission.
7. "Tax Incentives for Preserving Historic Properties: 20% Tax Credit," https://www.nps.gov/tps/tax-incentives.htm.

2.0 Site History and Integrity

In the early twentieth century, the Philadelphia Electric Company began a campaign to build large-scale generating stations on the outskirts of Philadelphia to service the growing city. Built in 1925, the Richmond Power Station was the third station built in the Neoclassical style by the dynamic collaboration of architect John Windrim and engineer William Eglin.

Image 2.1 - View of the Turbine Hall shortly after opening in 1925 (PECO Archives).

2.1 Brief Historical Narrative

The Richmond Power Station site exists to the direct east of present-day Port Richmond, along the Delaware River. Earliest documentation of the subject site found from 1808 shows site was a coastline meadow, presumably functioning as agricultural/grazing land for nearby country estate "Hop Hall," listed on an 1808 Hills Map.[1] Canals were proposed for the site in 1862 and built by 1895, which served a Gas Works, pointing towards the historic industrial nature of this area from the Victorian-era onwards.[2] The present Frankford creek, which historically wrapped around nearby Bridesburg to its north, was relocated parallel to the New Jersey/Pennsylvania Railroad sometime between 1938 and 1962.[3]

Architect John Torrey Windrim (1866-1934) and engineer William C.L. Eglin (1870-1928) designed many electric plants for the Philadelphia Electric Company, Port Richmond being its largest building despite an unrealized design for it to be an even larger complex of three identical plants. Construction began in 1924 and took less two years to build under the supervision of contract engineers and builders Stone & Webster.

Richmond Station was the third power station built between in the PECO campaign to consolidate the Philadelphia power generating stations and move them to the periphery of the city. First was the Chester Waterside Station, built in 1916; second was the Delaware Power Station built in 1917. The choice of the Ecole des Beaux-Arts Neoclassical design was a deliberate one: PECO sought to create for its private company an image of the people by using an style associated with civic architecture for its new constructions.[4] It was the progressive era--a time when big companies were not looked favorly upon by the public and the threat of union strikes were always of concern. These power stations not only provided Philadelphia with the necessary energy for a growing city, but also served a specific public relations purpose for PECO.

Richmond generating facility was a monument to technology and innovation. The original design was to house sixteen boilers serving four turbines, only

1880 · 1900 · 1920 · 1940 · 1960

1903
Schuylkill Power Plant Online

1910
Philadelphia General Strike

1916
Chester Power Plant Online

1917
Delaware Power Plant Online

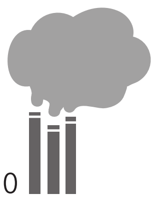
1925
After only 2 years of construction Richmond Power Station opens in 1925 to plans designed by Architect Windrim and Engineer Eglin. Contract engineers Stone & Webster executed the work. Sixteen boilers serving four turbines supply 100MW.

1932
Construction of GE Rotary Frequency Converter converting 60hz to 25hz for rail transportation.

1935
One Westinghouse steam turbine, 165 MW, installed only needing two down-fired pulverized coal firing boilers.

1950
GE Steam Turbine installed, supported by two tangentially-fired boilers.

1951-1955
Boilers #49-52 & #57-60 were converted to heavy fuel oil. Tank and pump house installed.



1970
Coal Burning banned in Philadelphia: Remaining boilers converted to burning oil after legislation banned the use of coal.

1994
"12 Monkeys" Filmed on Site

2016
America Ninja Warrior Finals Held Onsite

1980 2000 2020 2040

1985
Richmond Power Plant Retired

1984
Chester & Delaware Power Plants are Retired

2001
Historic Register Nomination deferred

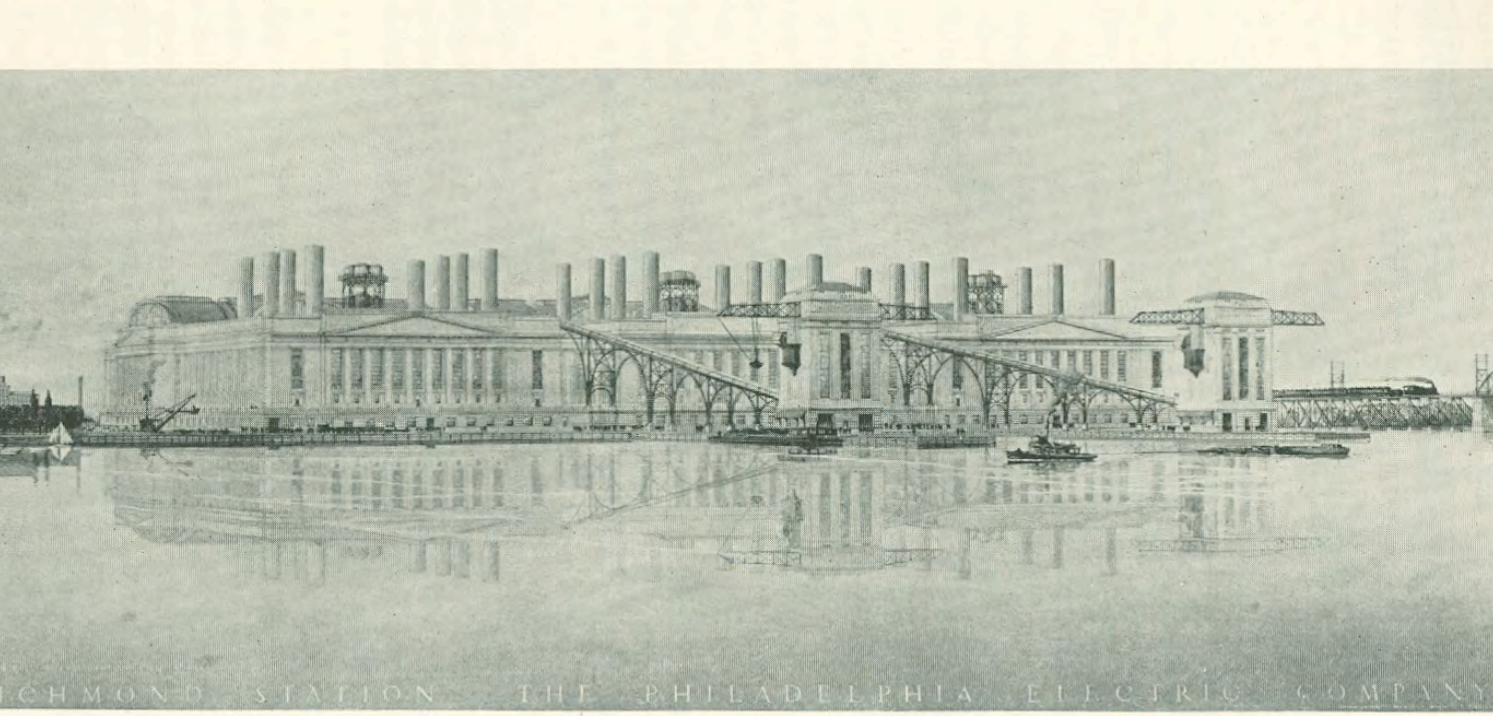
2015
Exelon's Official Programmatic Approach to "Retired Assets" as: Hold, Demolish & Hold, Demolish & Sell, Sell As-Is, or Redevelopment.

Exelon

twelve boilers were installed and two turbines were installed by 1926, providing a general 100MW with a potential for 120MW. In 1932 a General Electric Rotary Frequency Converter (RFC) was installed to convert 60hz energy to 25hz to service rail transportation.[5] Technology advanced quickly enough that in 1935, a Westinghouse designed 165MW turbine was installed that could be powered by only two coal fired boilers. In 1950, a 185MW turbine was installed, also powered by two coal fired boilers, but this time tangentially pulverized coal fed rather than gravity fed. From 1951-1954 eight of the sixteen boilers were converted to oil-firing from coal. In 1970 four boilers were decommissioned and, the remaining four coal burning boilers were converted to oil burning after Philadelphia passed legislation banning the use of bituminous coal. In 1985, Richmond power plant is retired, although in the wider curtilage of the historic plant generators have been variously and installed, including two emergency electrical service backup jet engine turbines.[6]

Port Richmond Generation Plant's history is embedded in the story of the companies that developed its product and offered its service. Beginning with the Brush Electric Light company, formed in 1881, joined with the United States Lighting Company to become the Electric Trust. The Electric Trust went on to to purchase and control many others, ultimately becoming the Philadelphia Electric Company, incorporated in 1902.[7] In this era, the Philadelphia Electric Company used DC, based off the work of Thomas Edison. In 1880, Philadelphia's population

Image 2.2 - "River View of Richmond Station as It Will Appear When Completed," *Current News* 22, no.7 (January 1, 1926).



Architect's Perspective of the Richmond Station of The Philadelphia Electric Company. John T. Windrim, Architect
The initial capacity of the building is 200,000 kilowatts, of which 100,000 kilowatts is being installed at present
The ultimate development will be 600,000 kilowatts

was second in America to New York City, numbering 847,542, this number was to grow to 1,951,000 by 1930.[8] With the advent of new technologies and an increasing population the demand for electricity demand grew in the early 20th century spurring a flurry of building activity by PECO.[9]

In 1923, connection was established with New Jersey, in 1928 with Pennsylvania Power & Light, in 1931 with Public Service, and in 1956 PJM (shorthand for Pennsylvania- New Jersey- Maryland), the world's largest energy provider until the EU surpassed them in the 2000's.[10] In 1997 the electric utility industry is deregulated, leading to a PECO and Unicom Corporation merger in 2000, forming Exelon Corporation. A National Historic Landmark Register nomination for Richmond was submitted in 2001 but was not heard by the City of Philadelphia's Historical Commission, largely because Exelon opposed it.

Image 2.3 - Richmond Station floodlit, 1926, PECO Archives.
Image 2.4 - Richmond Station Coal Tower, 1924.

2.2 Site Morphology

Through historic map research, changes in the water's edge are visible, which coincide with the construction of Richmond Generating Station in 1925. The 1910 Bromley Atlas map shows a natural edge, while the 1925 Bromley Atlas map shows the intervention. This pier that extends beyond the natural water's edge was part of the original plan of the station's construction, bringing the edge of the "land" into deeper water to allow for closer access to ships transporting coal.

From 1910, prior to the station's construction and onward to 1942 (1942 Works Progress Admin. Land Use Map), we see increased occupation of the area surrounding the site, with large industrial developments, as well as residential, and commercial, particularly to the west and north. By 1962, Frankford Creek was relocated to continue south next to the site instead of going east to meet the Delaware River.

Historic photo research and interviews with Walt Masny offer data to construct a site morphology: in 1925, the original buildings, the main station and the few outbuildings were constructed; in 1932, the southwest outbuildings removed, and fly ash tanks were added to the west and two converter substations to the east; the 1950s brought a utility/locker room building built, as well as an ignition oil tank; in the 1970s, a fuel oil tank and a crude oil tank were built, in addition to the installation of fourteen combustion units; prior to 1998, eleven combustion units were removed, the ignition tank and the crude oil tank were removed, and in 1998, a storage building was constructed; today, 2016, two of the three remaining combustion units, the remaining fuel oil tank, and the administrative buildings at the entrance to the site are still in use as well as the recently built storage building.

Image 2.5 - 1925 Bromley Map, Phila Geo History.

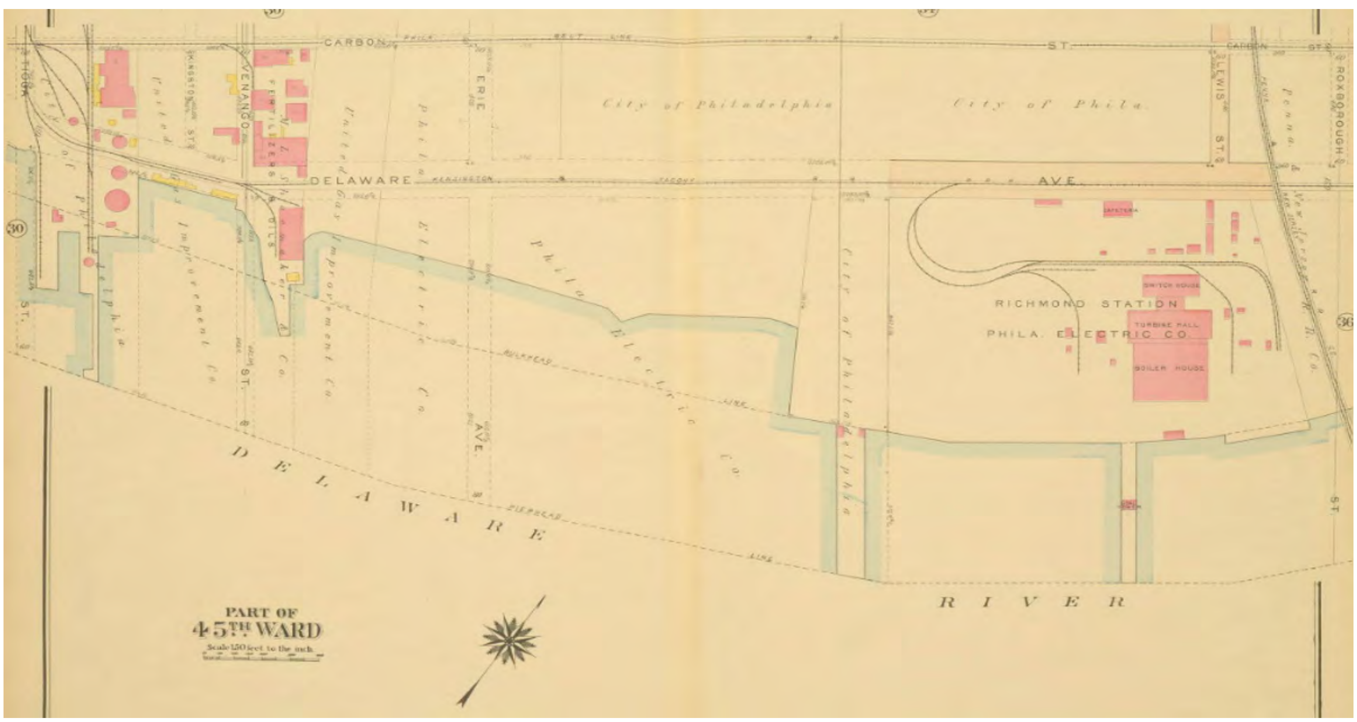


Image 2.6 - Buildings on site by date.
Image 2.7 - Richmond Station aerial view, PECO Archives.

2.3 Site Integrity

Despite its history and current appearance, the Richmond Power Station maintains a high degree of integrity. The National Register Bulletin encompasses an historic site's integrity through its location, design, workmanship, materials, association, feeling and setting.[11] It is defined as "the authenticity of a property's historic identity, evidenced by the survival of physical characteristics that existed during the property's historic period."[12] This study has shown that the Richmond Power Station still retains significant features for all aspects of integrity as defined by NPS.

Location

The location of the Richmond Power Station has not changed since the time of its construction. The parcel that the structure sits on is still covers the same area of land, with slight growth from what was the original historic core. Along with the same physical location, the parcel is still zoned industrial.

Image 2.8 - Detail of poured-in-place concrete, D. Pape, 2016.

Design

While numerous other structures now surround the historic core, the design created by engineer W.C.L. Eglin and architect John Torrey Windrim is still conveyed to the viewer. Minimal changes beyond covering windows have been made to the exterior of the Boiler House, Turbine Hall, Switch House and Coal Tower, communicating the neoclassical architectural elements and monumentality of the City Beautiful Movement, as well as the importance placed on signage by the Philadelphia Electric company. Because the changes to the interior design of the building have occurred due to advancing technologies, they have their own significance. Despite the Richmond Power Station's decade of abandonment and continued minimal access, almost all of the machinery still exists within the various structures, giving a timeline of industrial advancement.

Workmanship and Materials

One aspect of the historic significance of the Richmond Power Station is the use of the latest technology in the construction of the site's original buildings. At the time of construction, poured in place, reinforced concrete structures were reaching the scope and size needed for the station. This developing technology was also evolving into use for monumental public architecture, especially under the scope of the City Beautiful Movement. The issues associated with this type of construction are present at the site, with spalling concrete revealing the interior rebar reinforcements. While not necessarily seen by the public, the imprint of the wooden formwork used to pour the concrete in place is still visible in numerous locations on the interior and exterior of the structures. Due to the inherent properties of the materials used at the time of the original construction, as well as the lack of maintenance, the historic buildings are in a state of disrepair, with deteriorated ceiling tiles in the Turbine Hall and vandalism to the mechanical systems because of material theft. Despite a lack of maintenance, the majority of the historic fabric remains with mainly cosmetic repairs needed to bring the site back to a stabilized condition.

Association

Another feature of the historic significance of the Richmond Power Station is its connection to the evolution of the Philadelphia Electric Company and to the development of electricity within the city. Richmond Power Station still stands as the last generating station that was built in the neoclassical style by the Philadelphia Electric Company, as well as the northernmost generating station built along the Delaware River following the expansion of industrial production to the northeastern neighborhoods. While the historic core of the station no longer functions, the majority of the site is still used by Exelon as an electricity transfer station, continuing the site's utility. The Exelon Group plans to continue this use, along with developing the use of other electric generating capabilities.

Setting

The area surrounding of the Richmond Power Station has changed little over time. An industrial landscape still exists, and is likely to persevere despite the movement of industry away from the core of Philadelphia. With institutions like the Port of Philadelphia, the Philadelphia Gas Works and a water treatment facility surrounding the station, their defining characteristics lead to the conclusion of permanence. The industrial area along the Delaware River in the Port Richmond neighborhood is clearly defined as ranging from the waterfront to I-95, and from the border of Kensington to the south to the Betsy Ross Bridge. Research on the surrounding area through the study of historic maps, this industrial core has existed since the development of the Richmond Power Station, and will continue to be zoned as industrial.

Feeling

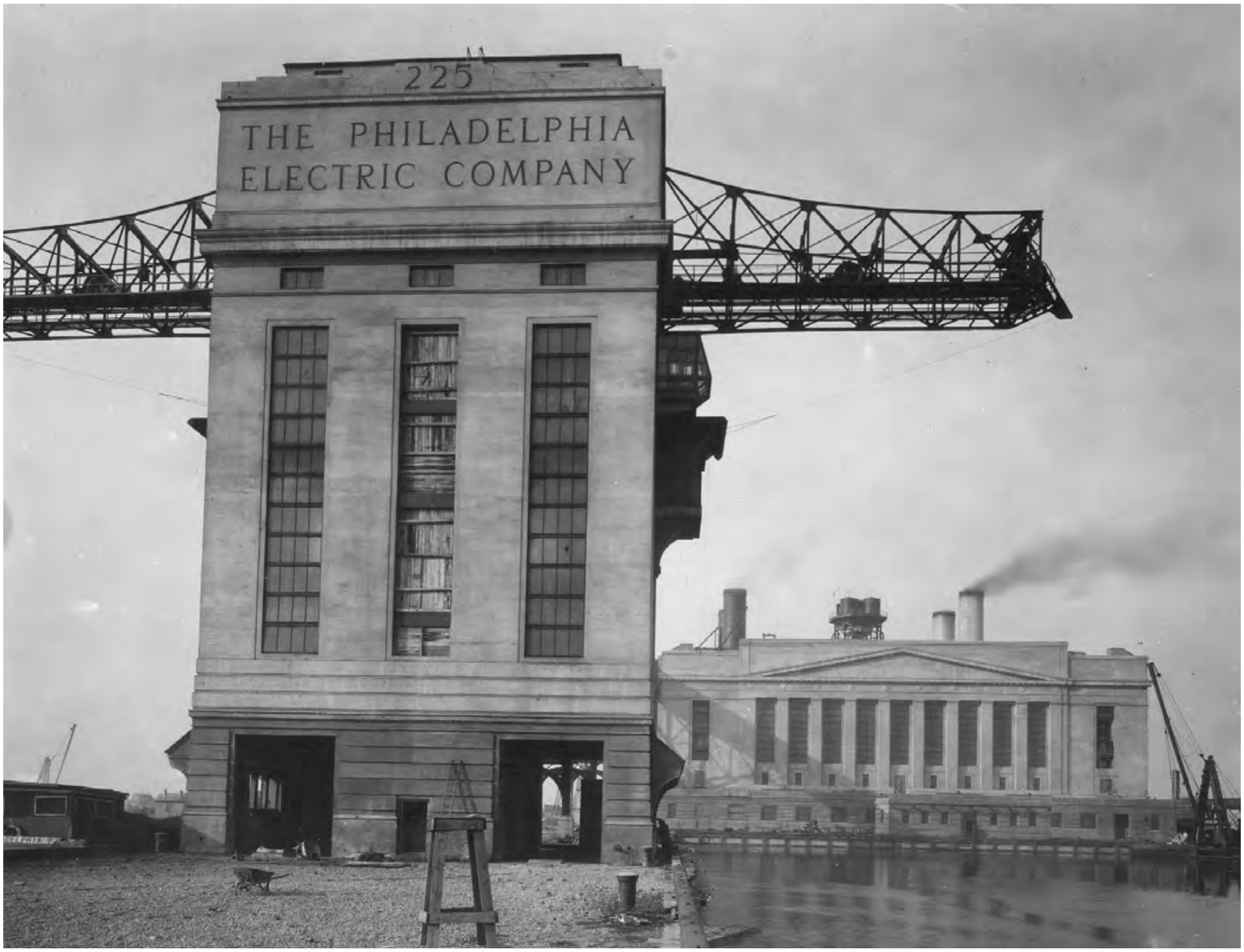
While the feeling of the Richmond Power Station has changed little over time, small changes have corresponded to significant shifts in the use of the site. The generating station was originally a hub of activity, with coal arriving to the site by barge and train, and the sounds and atmosphere of the boilers and turbines consistently running. The decade of nonuse has left its mark on the structure, leaving the impression of a ruin to the viewer, no longer communicating the power and permanence that is typical of the City Beautiful Movement. The building now stands as a romanticized aesthetic of an older industrial age; continuing to draw viewers to the site through its ruinous nature.

Shortly after the plant opened (c. 1927)

While a portion of the significance of the Richmond Power Station now comes from its ruinous nature, the site and its numerous historic structures still hold integrity in communicating the history of its construction and materiality. The Richmond Power Station still stands as an important landmark in the development of the culture of electric use in the city of Philadelphia.

The following pages show comparisons between historic images of the Richmond Power Station and from our site visit in the fall of 2016. They convey the high level of integrity that the site holds, but also the increased rate of deterioration seen at the site over the past fifteen years.

Google Earth (2016)



John T. Windrim
Collection (c. 1927)

D. Pape, Site Visit
(2016)

John T. Windrim
Collection (c. 1926)

E. Oxland, Site Visit
(2016)

Electrical World (1930)

Joe Elliot, HABS (2000)

M. Tidwell (2011)

Shortly after the plant opened (c. 1927)

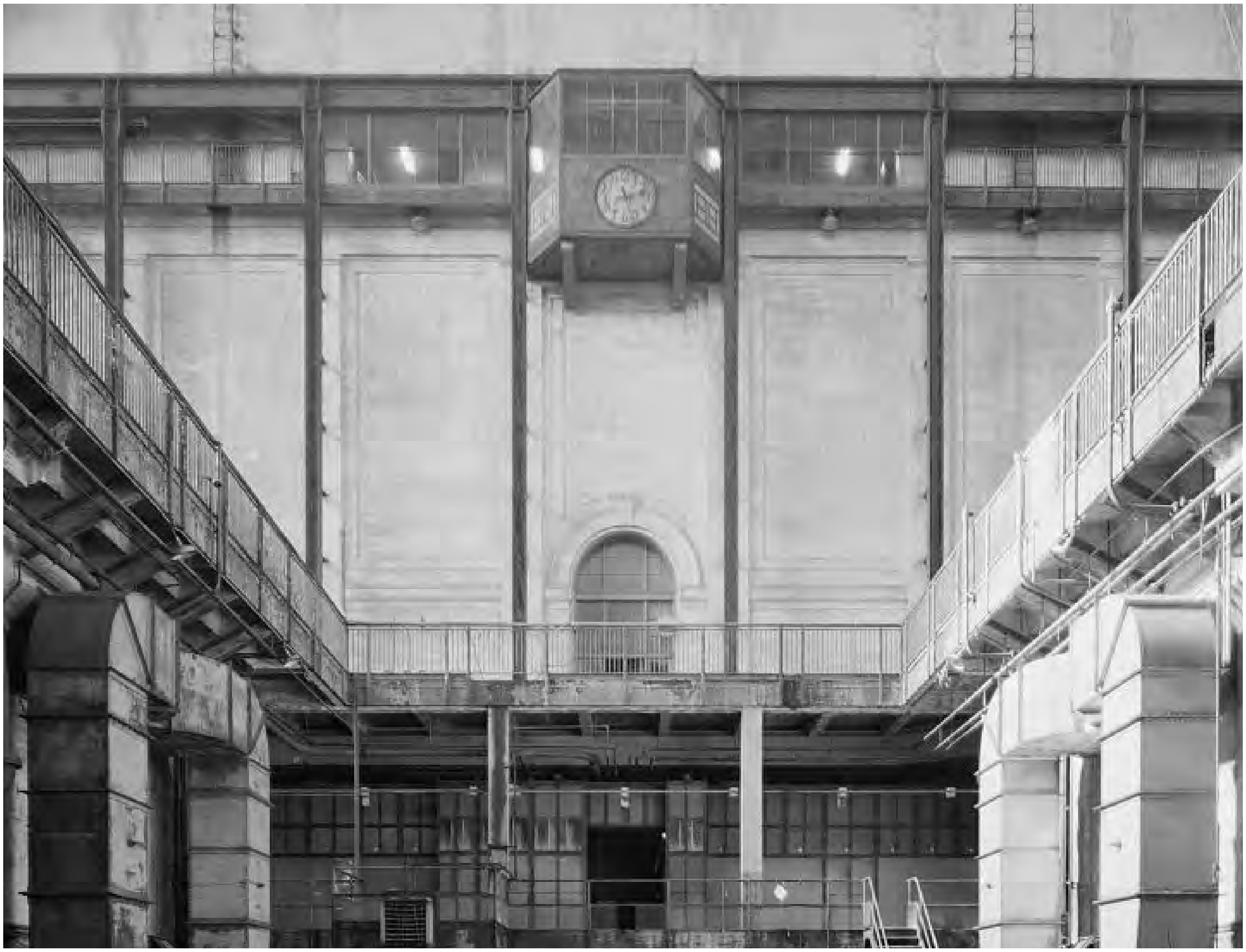
Joe Elliot, HABS (2000)

K. George, Site Visit
(2016)

Shortly after the plant opened (c. 1927)

Joe Elliot, HABS (2000)

K. George, Site Visit
(2016)



Joe Elliot, HABS
(2000)

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2. Smedley, Samuel. 1862. Philadelphia Atlas. Greater Philadelphia Geo History Network. Accessed Online 23 September 2016 at: www.philageohistory.org; Bromley 1895.
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The 35,000 KW. Turbo-Generator

ELECTRICITY—

THE POWER THAT MAKES PHILADELPHIA THE WORKSHOP OF THE WORLD

EFFICIENT, Reliable and Adequate Electric Power Supply is essential in order that a community may take its place in the front rank from the standpoint of industrial activity. That is one of the reasons why Philadelphia is recognized as "The Workshop of the World."

Its rail and water facilities, in combination with Central Station Electric Power Service supplied at economical rates, give Philadelphia an industrial advantage second to no city in the country.

The largest turbo-generators in the world now in operation are installed in the new Schuylkill Waterside Station of The Philadelphia Electric Company. The generating capacity of 275,000 horse power now installed will shortly be augmented by two or three times this capacity. That Philadelphia Electric Service is Reliable and Economical is evidenced by the fact that such internationally known concerns as the Baldwin Locomotive Works, the American Viscose Company, Wm. Cramp & Sons Ship and Engine Building Company, Midvale Steel & Ordnance Company, the Pennsylvania Railroad Company, the Bell Telephone Company and the Philadelphia Rapid Transit Company, to mention but a few, are employing that Service.

Before locating elsewhere manufacturing establishments should investigate the advantages of Philadelphia's Electric Power Supply. Inquiry solicited.

***The* PHILADELPHIA ELECTRIC COMPANY**

3.0 Statement of Significance

Image 31 - PECO Archive

Lauded as "The Most Handsome Station in America," Richmond's monumental form recalls the heroic vaulted spaces of Ancient Roman baths, and its classical entablature associates technological innovation with notions of permanence and tradition.[1] Port Richmond is architecturally significant as the largest of the many electric generation stations designed by architect John Torrey Windrim (1866-1934) and engineer William C.L. Eglin (1870-1928) for the Philadelphia Electric Company. In 1927 Warren Lutz of PECO described Richmond Power Generation Plant as a "monument to progress, dressed in outward garments of refinement symbolic of its strength and power – creating the impression of beauty and dependability and strength."[2]

Richmond Power Generation Plant has historic significance for its role in Philadelphia's growth during the early 20th century, providing electricity to the industries that earned the city the title of, "The Workshop of the World."[3] It was celebrated as a key component whereby, "Philadelphia Electric Preparedness Spells Industrial Supremacy for Philadelphia."[4] Richmond Power Generating Station was a key part of the early 20th century PECO power generation facilities in the metropolitan Philadelphia, including Chester and Delaware, both of which have been or are in process of reuse. Retired since 1985, the site has extraordinary value as a beautiful building with intact machinery, picturesquely sited on the shores of the Delaware River in an industrial landscape. In recent years it has gained new value drawing urban explorers to seek out its magnificent space.

The Richmond Generating Station was the final stage of Philadelphia Electric Company expansion concurrent with post-World War I associated industrial and residential boom. As one of the largest electrical power plants in the world at the time, its design, classicist details, materiality, and craftsmanship embraced the most significant technological innovations of its time. The collaboration of Philadelphian architect John Torrey Windrim and engineer William C. L. Eglin made it a work that strove to balance the aesthetic with the productive. The structure's connection to City Beautiful notions as seen in its beaux-arts architecture communicates the desire to express the stability, permanence and civic responsibility of the company at a time when faced with public doubt.

By 1902, Philadelphia's City Council passed an ordinance recognizing the "Philadelphia Electric Company," giving the company the power to "own and operate a unified electrical system throughout the city. The newly reorganized company now served 12,090 customers, powering 17,188 arch lights, 440,698 incandescent lights and motors using 11,868 horsepower.

3.0 Statement of Significance

To standardized the electrical systems in place throughout the city, the Philadelphia Electric Company introduced the George Westinghouse standardized system of "two-phase, three-wire alternating current at 60 cycles."[5] The company's Callowhill Station, along the Schuylkill River, met the needs of the City until the start of World War I, when the rise of industry demanded the need for expansion. Of the three stations constructed post-World War I, Richmond Generating Station has the most pronounced connections with neoclassicism. As an "automated, neoclassical giant," Richmond Generating Station can be seen as a reflection of the major engineering trends of its era as these efforts were intertwined with discourse on civic pride and industrial and urban necessity.[6]

Richmond Generating Station currently can be seen as significant as part of the collection of electric generating stations along the Delaware River, and for its separate evolution from Chester and Delaware Stations into what they are today. In 1970, the remaining coal furnaces in the boiler house were converted to burning oil after legislation banned the use of coal within city limits. This situation, along with the expansion of the Conowingo Hydroelectric Station and the Peach Bottom Nuclear Generating station, lead to the closure of Richard Generating Station in 1985, a year after the closure of Delaware and Chester Stations.

The site continued to function as an electrical transformer, but the main building has been in a general state of disuse over three decades. This decade of abandonment transformed a monument to Neoclassicism and state-of-the-art electrical machinery into a "distressed asset." It is now visited by urban explorers, who are attracted to the ruinous nature of the building and its site. Players in the Movie-Makers Movement are attracted by these same qualities, using the rusted machinery and vast space as a backdrop for movies including "12 Monkeys" and "American Ninja Warrior." While Exelon, the current owner of the Richmond Generating Station, promotes the use of the site as a movie backdrop as a way to increase the public perception of the site, there is a high rate of vandalism by people who want to experience the interior of the boiler house, turbine hall and switch house.

Urban Explorers, including spelunkers, photographers and artists, find their way into the site illegally, all with the purpose of experiencing the aesthetic aspects of the building. There has been a cycle of illegal entries and newly blockaded entranceways. Photographs of the site continuously pop-online, with new campaigns of graffiti on the exterior and interior of the building. These movements are in opposition with how Exelon currently views how the building should be used, with concerns over visitor safety because of the deteriorated condition of the roofing panels. In a roundabout way, the vandals exploiting the Richmond Generating Station for its distressed assets give additional significance to the aesthetic values of the site by attracting the attention of people around the world. As the last of the three original Delaware River generating stations to be built, Richmond Generating Station stands in the unique position of being under ownership by Exelon with current electric generating capacity.

Both Chester Generating Station and Delaware Station are now privately owned, with Chester Station converted into conference space and a recent plan for the adaptation of Delaware Station. Richmond has a particularly high level of significance because of its integrity. It has a complete set of machinery and buildings that is representative of both the originally intended method of energy production but also its evolved adaptation as technology and legislation changed. This set of industrial processes is comprehensible in its current form, something all these other PECO giants no longer have, giving this site even more significance in terms of rarity as a complete set.

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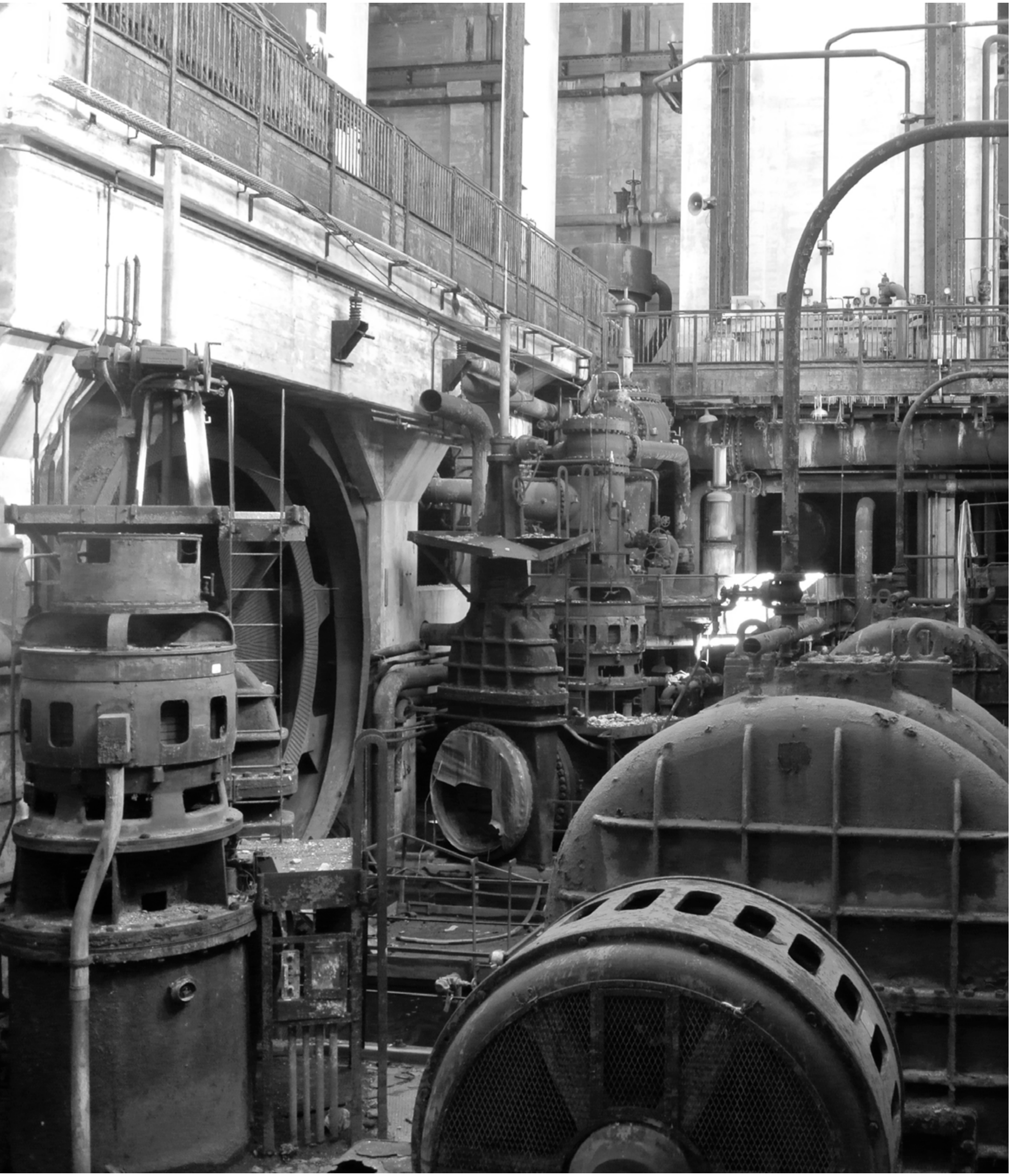


4.0 Site Values

D. Pape, Site Visit (2016)

Richmond Power Station has a wide range of significant features that give the site value. Based on an analysis of the various stakeholders, historical research and time spent at the site, the main values that give the site significance can be divided into six main categories (fig. 4.1). The included diagrams show the process of how we defined the site's significance through the varying interconnected values.

After identifying the values that give Richmond Power Station significance, we identified concrete factors or aspects of the site that fit under the various values. We considered historic, contemporary and potential future factors of the site; looking at aspects like Philadelphia's history as the "Workshop of the World," the site's current romanticized ruinous aesthetic, and the potential for employment if the site is reused. Figure 4.2 shows the factors that we considered, ranking them under their assigned value from most to least important moving forward. We took this ranking into consideration when looking at which values were the most important to preserve in our later Preservation Plan for the site.

4.1 Historic Value

Historically, Richmond Generating Station is significant because of its connection to the technological advancements in electrical production that were used at the site throughout its history. Along with electric production, the Philadelphia Electric Company worked to mechanize labor, which is exhibited through the technical process. It is this connection with the Philadelphia Company that gives the Richmond Generating Station a greater historical value.

The Philadelphia Electric Company was responsible, in part, for the development of electric production in Philadelphia. Richmond Generating Station was the last of the great neoclassical stations built in the early 1900s by architect John T. Windrim and engineer W.C.L. Eglin - two figures prominent in Philadelphia's history. It was at this time that Philadelphia was considered to be the "Workshop of the World;" a city with growing industrial prowess.

4.2 Architectural Value

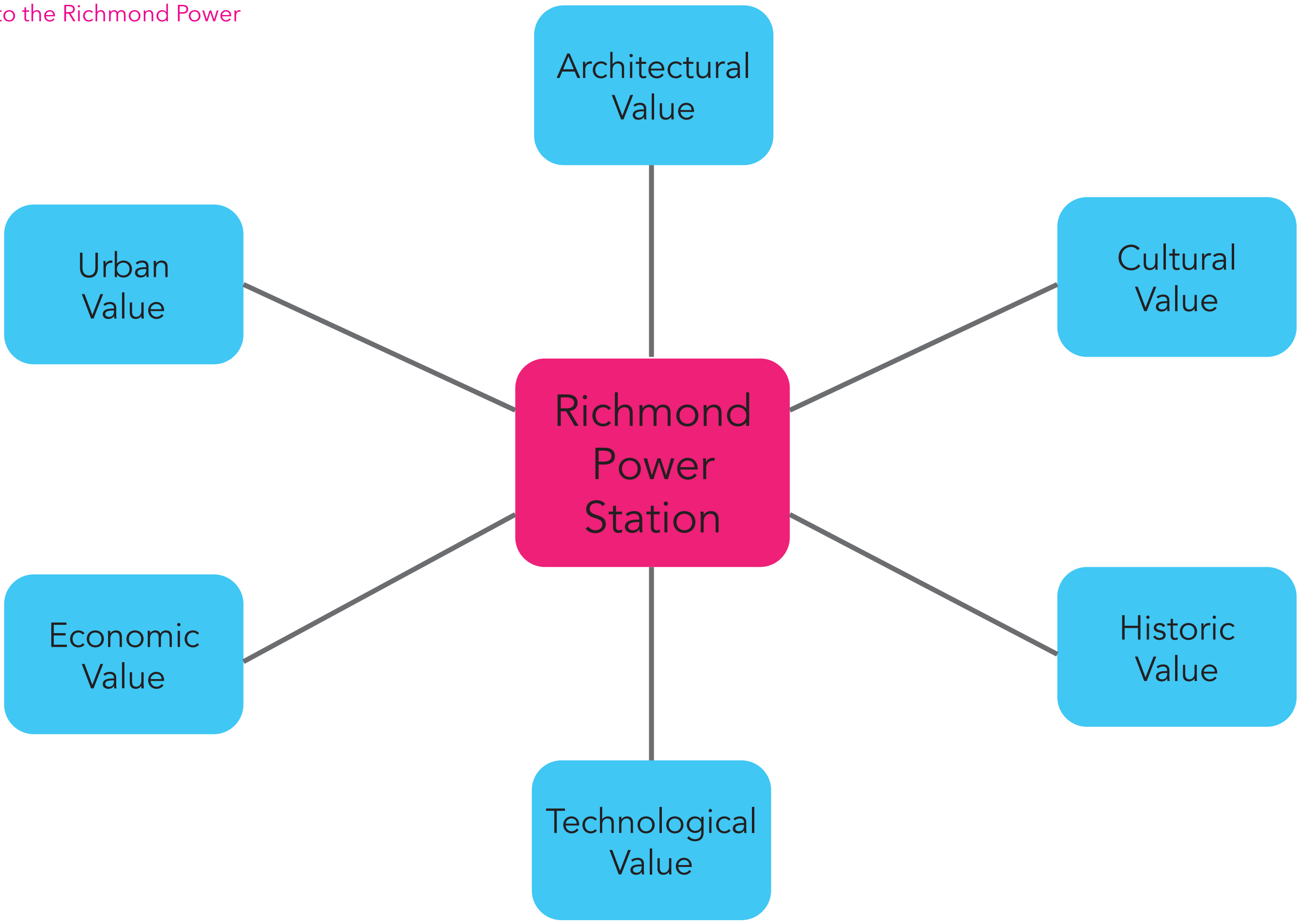
It is Windrim's neoclassical design under the City Beautiful architectural movement that creates another significant value for the Richmond Generating Station. The grand size and scope of the main historic core of the site made the Richmond Generating Station a "Palazzo of Power;" drawing on the power and prestige of the neoclassical style in relation to the reputation of the company. Originally, the generating station was seen as architecture in the landscape because of its scale compared to the surrounding area. Its architectural features also made the site a landmark to travelers.

Currently, the Richmond Generating Station has significance through its ruinous nature. It has been used by the Movies Makers Movement, Urban Explorers and as a canvas for graffiti because of these characteristics. We are characterizing the ruin value of Richmond Generating Station as a romanticized view of an earlier industrial aesthetic that is slowly disappearing.

4.3 Cultural Value

The Richmond Power Station has a strong cultural and social history due to its connections to the neighborhood of Port Richmond, and the cultural heritage of the city of Philadelphia as a whole. Historically, the employees of the Richmond Power Station would have lived in Port Richmond, making the short commute between the residential portion of the neighborhood to the industrial cluster along the Delaware River. This is no longer the case, mainly due to the buffer created by the construction of I-95, which created a greater divide between the residential and industrial land in Port Richmond.

Figure 4.1 - The values that give significance to the Richmond Power



The construction of the Richmond Generating Station in Port Richmond in the early 1920s follows the major themes of Philadelphia's industrial heritage; a major point of the development of electrical production sites on the outskirts of what was a growing city.

4.4 Urban Value

Another aspect of Richmond Generating Station's significance is through its urban value. The site's location fits within the wider narrative of Philadelphia's industrial history, and its continued industrial usage provides integral services to the city. The Port Richmond industrial core provides goods and services that include: utilities, gas, water and sewage treatment. This area has developed as an industrial core; responding to the expansion of industrial sites in the city.

4.5 Economic Value

Because the site has continued to be used for electrical production, Richmond Generating Station has continued to have economic value due to partial use. As industrial zoned land, which is diminishing in the city, the station is still as capital asset. The site has municipal gains from land and income generating activities.

Richmond Generating Station has lost economic value from the non-use of the historic portion of the site, which accounts for close to 50 percent of the land area. The potential re-use of the site will increase the economic value of Richmond Generating Station, from both income generating activities and potential job opportunities. The station has a history of employment for the neighborhood when the historic equipment was operational, giving it both historical and potential employment value.

4.6 Technological Value

Richmond Generating Station has a high level of significance from its industrial archaeological value. This is because of the rarity of the industrial equipment that remains on the site. In the electrical production stations that were built in this time period, the equipment is integral to the structure; at Richmond Generating Station the equipment remains because it would be too expensive to be removed. Because the machinery was never removed, the equipment the remains is an example of the evolution of the machinery used in electrical production from 1925 to the present.

Beyond the value of the electrical machinery, Richmond Generating Station holds symbolic value of the rise and decline of municipal utilities within the city of Philadelphia. The site's technological evolution is valuable in terms of its interpretation to the public. This evolution and growth of the site follows the path of technological innovation and industrial growth of Philadelphia.

The interconnectedness of the aspects under each of the five main values creates an even more complicated web when stakeholder's values and views on the preservation of the site are added. From this study, we identified the main stakeholders of Richmond Generating Station as Exelon, the surrounding community of Port Richmond, and the city of Philadelphia. The city of Philadelphia

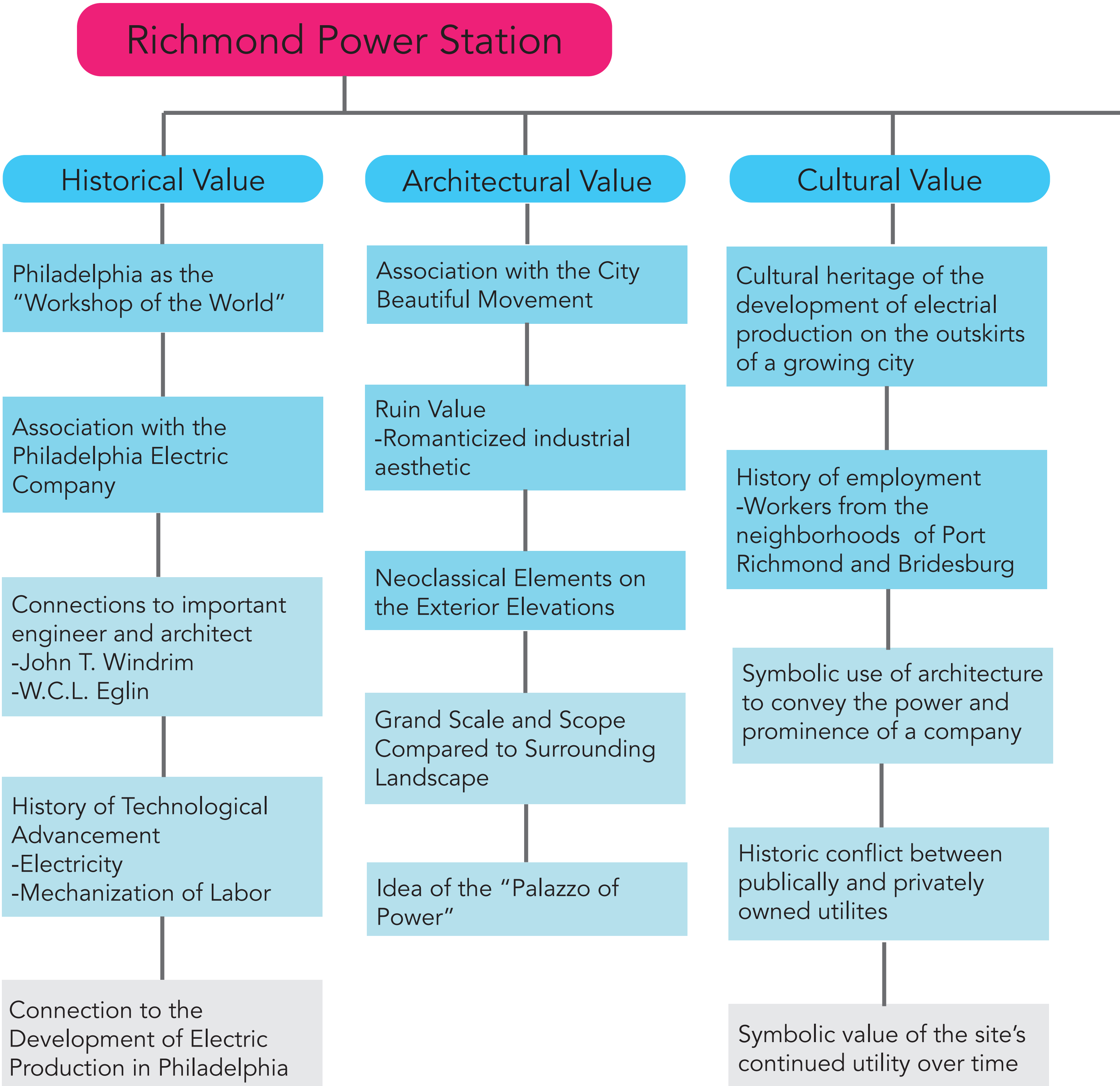


Figure 4.2 - The various important values of the Richmond Generating Station, along the significant features that are shown hierarchically.

Economic Value

Continued Partial Use On-Stie
-Continued energy production

Employment Value
-Potential job opportunities
-History of employment when the station was operational

Property Value
-Capital asset

Tax Value
-Municipal gains from income generating activities

Lost Economic Value
-Non-use of historic portion of the site

Technological Value

Example of the evoltuion of machinery used in electrical production since 1925

Rarity of the industrial equipment that remains on the site

Example of the Rise and Decline of Municipal Utilities

Industrial Archaeological Value

Urban Value

Contemporary Planning
-Connections to the Waterfront Trail
-Connections to future planning efforts

Integral Services
-Services that the site and surrounding industrial area provides

Relationship to the Growth of Philadelphia
-Expansion of industry

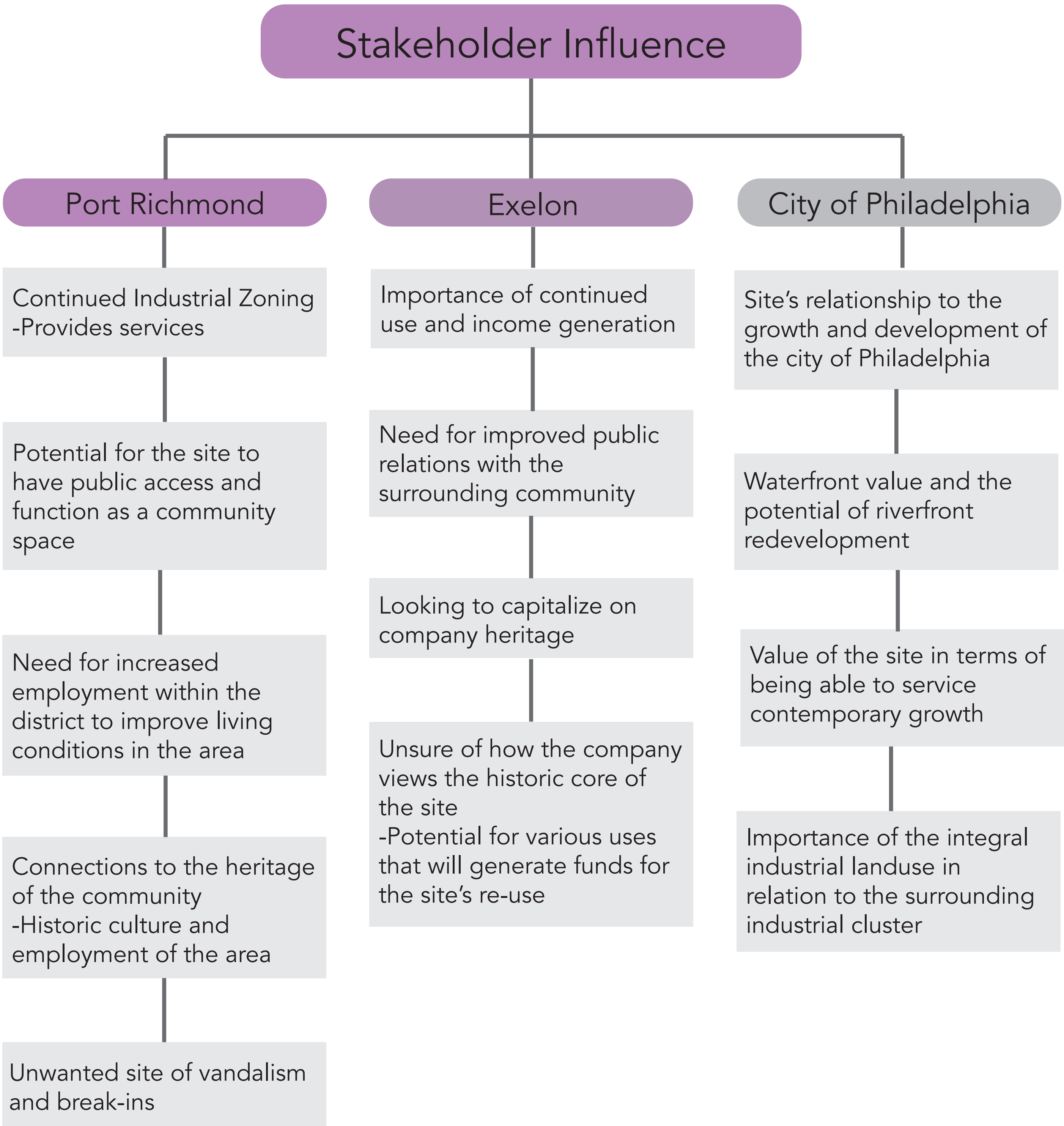


Figure 4.3 - The varying features of the Richmond Power Station that the site stakeholders find significant.

encompasses many different interests, including preservationists, industrialists and city planners. Figure 4.3 shows the various interests that each of these stakeholders find valuable about the site.

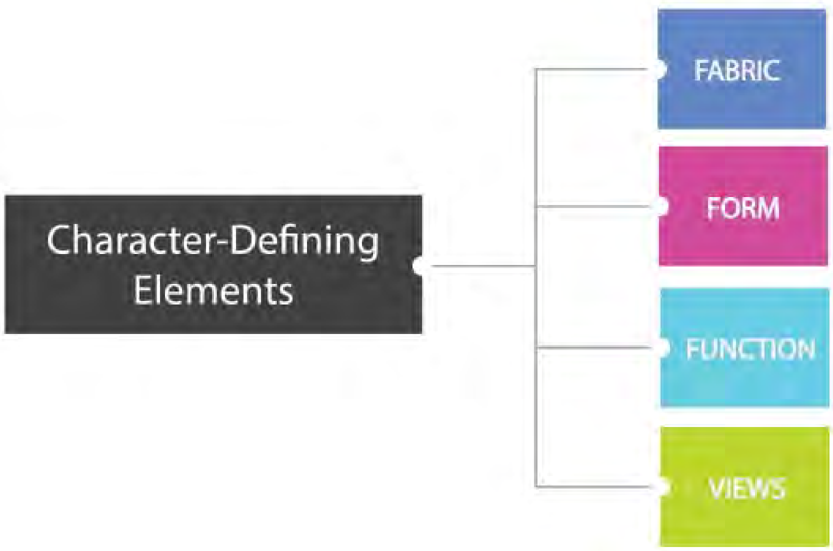
When these interests are compared to the significant features of the site's heritage and current usage, a interconnected web of the site's values is created. This is mainly due to the features of the site having significance for numerous stakeholders and under different forms of what is "valuable." From this web, six significant features of the site's aesthetics and use were identified to help inform the preservation plan. They include the site's current romanticized industrial aesthetic of the ruin, which should be capitalized on because it is already drawing people to the site who want to see the interior. Another important feature of the site's aesthetics is the exterior neoclassical features that are associated with its construction during the City Beautiful Movement, when utility companies attempted to show the power and longevity of their company through their buildings. The symbolic value of Richmond Power Station's utility is shown through its continued use as a site of electrical production - even if it is not concentrated within the historic core of the site. This is a feature that should be explored in terms of bringing electrical production back to the historic core in the preservation plan. Because of various stakeholders within the city of Philadelphia and in the Port Richmond community, there is a need to keep the site's integral industrial land-use in relation to the surrounding industrial cluster along the Delaware River. Another valuable aspect of the Richmond Power Station is its relationship to the development of electric production in Philadelphia, which potentially is a value that should be interpreted through the preservation plan. Moving forward with the reuse of the site, the various Economic-Urban values of the site (Property Value, Future Employment, Contemporary Planning Efforts, and Waterfront Value) should be taken into consideration for sources of funding when developing the preservation plan.

5.0 Illustrated List of Character-Defining Elements

For the character-defining the elements, using the National Park Service guidelines for identifying character defining features (Preservation Brief 17), we applied the three-step process in order to assess systematically and exhaustively the site's features, each of which falls under one or more of the following categories: fabric, form, function, and views.

Image 5.1 - Turbine Hall, studio visit September 2016

"This approach involves first examining the building from afar to understand its overall setting and architectural context; then moving up very close to appreciate its materials and the craftsmanship and surface finishes evident in these materials; and then going into and through the building to perceive those spaces, rooms and details that comprise its interior visual character."[1]



Although the guidelines suggest a piece-by-piece method, we approached the project holistically, as comprehension of the parts is intimately interconnected and explicable only by reference to the whole since the station is an expression of a process. Essentially, each element was compared to the whole and considered character-defining if it would alter the character of the entirety of the space or the site or mechanical process if the element were changed or removed. Generally, we agreed the character is defined by the historically functional fabric as it contributes to understanding the narrative of the process. Furthermore, we rearranged the order of the steps in order to suit this site better. We begin with setting, move to the site and exterior, and finally enter the interiors following the linear process of electricity production.

5.1 Setting

The setting of RIchmond Power Station is defined by the views both to and from the site, as well as its location on the river, which was essential to the process of generating electricity. It provided barge access for delivery of coal in addition to the immense amount of water required for cooling the boilers and creating steam for the turbines. Its proximity to highly trafficked transportation thoroughfares and their unobstructed viewsheds are essential to the station's power and prominence of the untility company as a civic entity.

Waterfront Location

Image 5.3 - View from the Betsy Ross Bridge,Google Street View

Proximity to Highway I-95, Betsy Ross Bridge

Image 5.2 - View from the Delaware, Google Earth

Proximity to Delair Memorial Railroad Drawbridge

Image 5.4 - View from the water's edge, studio visit September 2016

View of Philadelphia Skyline

Image 5.5 - View from the water's edge, studio visit September 2016

5.2 Exterior

If we take a look at the site from a distance, we see the basic volumes and relative scale of the historic core (in color) compared to the auxiliary buildings, demonstrating its monumentality. It is worth mentioning the smokestacks, double barrel vault roof, architectural details, neo-classical style, and poured-in-place concrete.

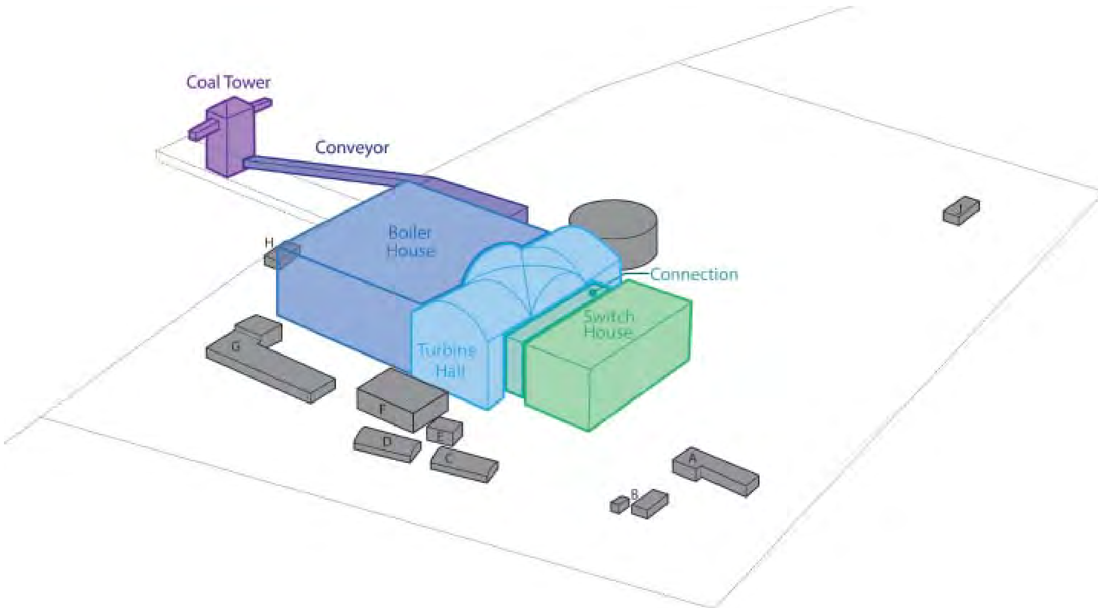


Image 5.6 - Auxilary Buildings
A. Administration
B. Garage
C. Rotary frequency converters
D. Rotary frequency converters
E. Control room
F. Locker room
G. Storage
H. Pump house
J. Substation
K. Fuel oil tank

Neo-classical details

Image 5.7 - South facade, studio visit September 2016

Poured-in-place concrete

Image 5.8 - Wall surface, studio visit September 2016

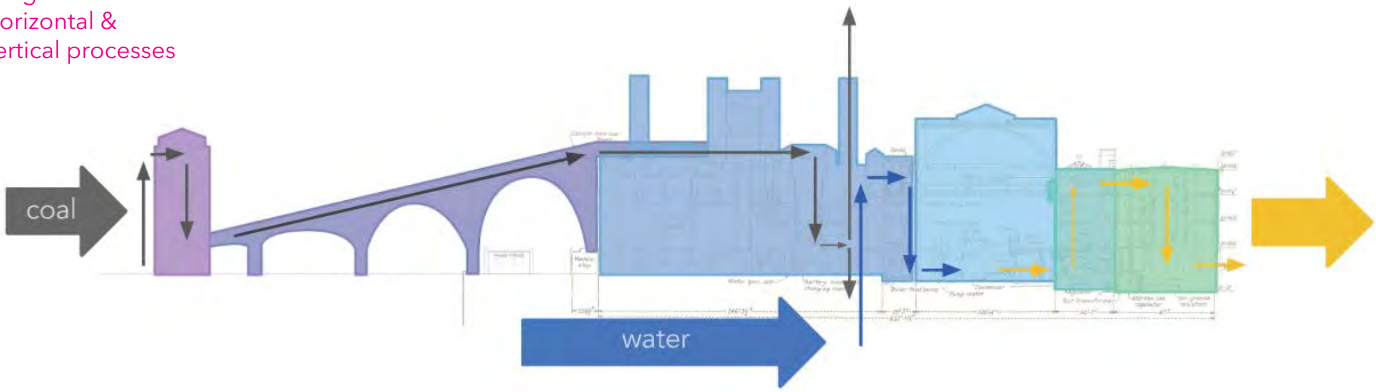
5.0 Illustrated List of Character-Defining Elements

Besides the overall form, materiality, architectural elements, and scale, what is ultimately most significant is the fabric that contributes to the historic function of the station - essentially the things that tell the story of making electricity at Richmond Power Station.

Image 5.9 - Bird's-eye view, Google Earth

The process is a linear sequence left to right, but also vertical undulation in the rising and falling of the raw materials: coal, water, and air, which eventually create electricity.

Image 5.10 - Horizontal & vertical processes



5.4 Interior: Coal Tower & Conveyor

The process that this building represents is illustrated as follows: Coal enters from a barge on the river or train into the coal tower by means of the cranes on either side. It travels down the tower, whose height is significant because of this vertical processing of coal, and it lands at the base of the conveyor ramp, where it moves up toward the boiler house in the main building.

Coal Tower Crane

Image 5.11- Studio visit September 2016

Coal Tower

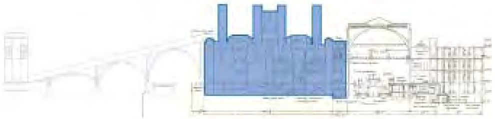
Image 5.12 - Studio visit September 2016

Conveyor

Image 5.13 - Studio visit September 2016

Conveyor interior; skylights

Image 5.14 - Richmond Power Station Folder at the Philadelphia Historical Commission



5.5 Interior: Boiler House

Coal from the bunker deposits into the brick boilers, where it burns and heats filtered river water to create steam. Exhaust is released through the smokestacks, and ash is released into the lower level into ash cars. These items, specifically the boilers contribute to the character of the boiler house.

Boiler door

Image 5.15 - View from the Delaware, Google Earth

Boiler base, steam pipes

Image 5.16 - View from the Betsy Ross Bridge,Google Street View

Firing aisle; skylights

Image 5.17 - View from the water's edge, studio visit September 2016

Ash chute

Image 5.18 - View from the water's edge, studio visit September 2016

5.6 Interior: Turbine Hall

Steam travels to the Turbine Hall and flows at high pressure to turn the turbines, which spin the generator to create electricity. The generous floor-to-ceiling height is significant not only because of its spectacle, but also because it was necessary for installing machinery and regulating temperature. Other essential elements include the four turbines themselves and the roof structure which allows for plenty of natural light and ventilation.

Generous floor-to-ceiling height

Image 5.19 - Marshall Tidwell, April 2011

Roof Structure

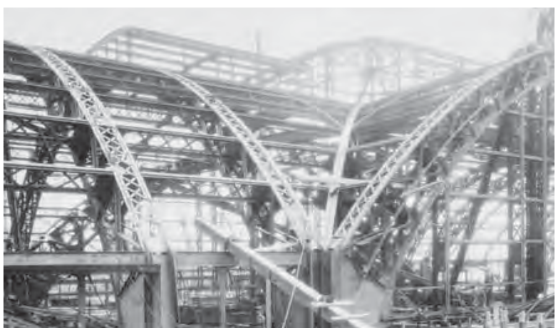


Image 5.20 - Detail, Richmond Power Station Folder at the Philadelphia Historical Commission

Turbine Unit 10

Image 5.21 - Studio visit September 2016

Turbine Unit 11

Image 5.22 - Studio visit September 2016

5.7 Interior: Connecting Volume

The operating room is the "nerve center" of the station. It houses the operating console for managing the entire output and operation of the station and is a space that bridges the turbine hall to the switch house. The operating room looks out over the turbine hall, which is significant, not merely because it is a captivating sight, but because the visual connection was necessary to oversee the operations of the station.

Operating console

Image 5.23 - Studio visit September 2016

Window to turbine hall

Image 5.24 - Studio visit September 2016

View to turbine hall

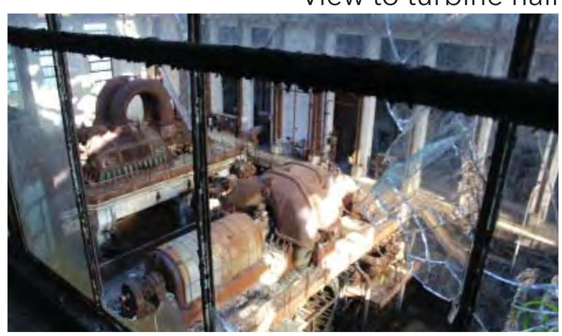


Image 5.25 - Studio visit September 2016

Window to control room

Image 5.26 - Studio visit September 2016

5.8 Interior: Switch House

Each of the three phases of the switch house is isolated on its own floor, descending from top to bottom with the operating mechanism on the ground floor. A substation nearby holds transformers connected to the station by underground cables. The transformers step-up the current to the proper voltage before it leaves the site.

1. United States National Park Service. "Preservation Brief 17: Architectural Character–Identifying the Visual Aspects of Historic Buildings as an Aid to Preserving their Character." U.S. Department of the Interior. Accessed October 2016. https://www.nps.gov/tps/how-to-preserve/briefs/17-architectural-character.htm.

Switch house breaker cabinets

Image 5.27 - Studio visit September 2016

Switch house corridor

Image 5.28 - Studio visit September 2016

Switches detail

Image 5.29 - Studio visit September 2016

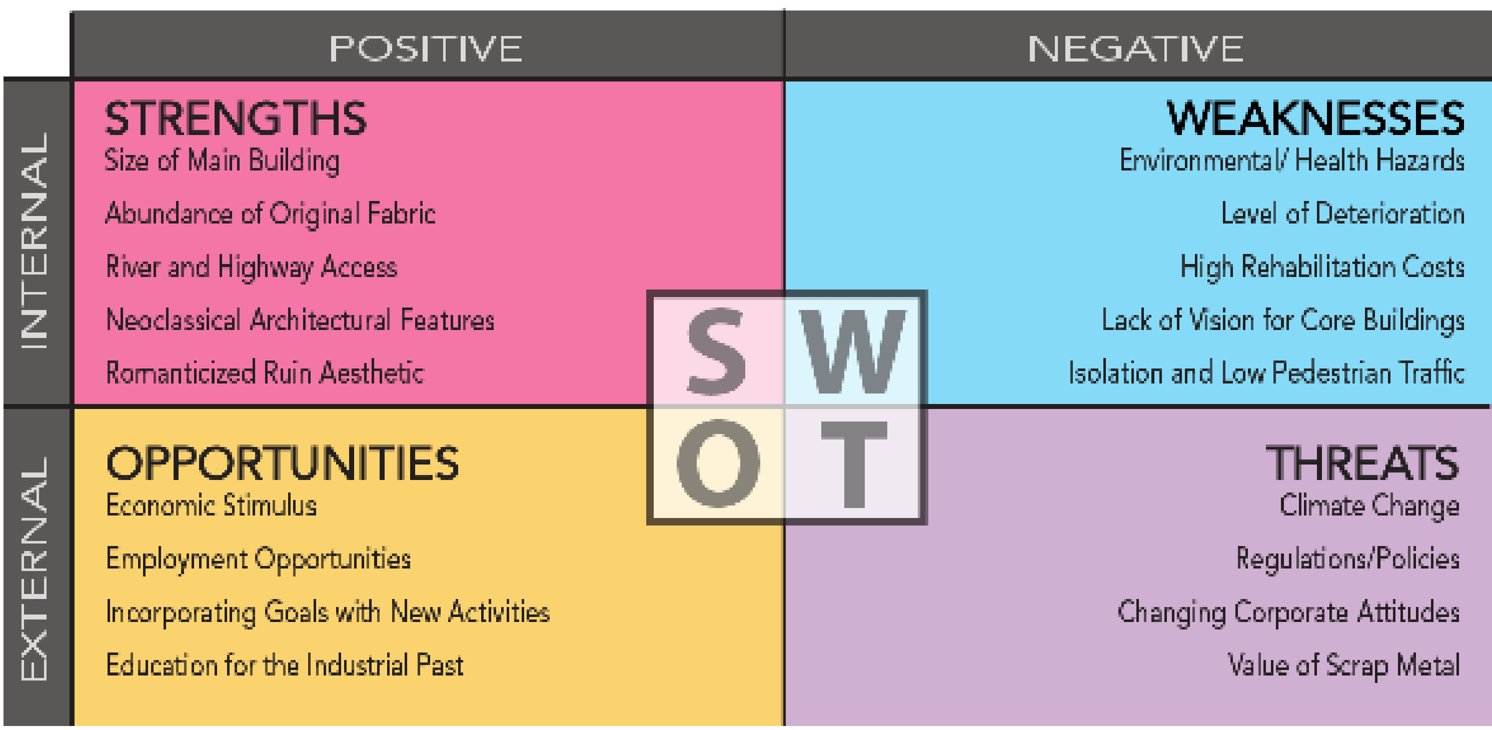
6.0 SWOT Analysis

The vast size and complexity of the Richmond Power Station presents a number of challenges and opportunities. In order to better understand the potential of the station, it was necessary to perform a SWOT analysis- which analyzes the strengths, weaknesses, opportunities, and threats (SWOT) related to the site. This analysis is used to inform interim and long-term planning.

The first two categories (strengths and weakness) refer to factors that are internal to the site. The final categories (opportunities and threats) focus on external factors, which can have a broad range of effects on the site, surrounding community, city, and region. It is important to note that some factors that may appear as a detriment, can also be benefit. For instance, the location can be considered a strength and a weakness. The site is isolated from major commercial and residential areas, giving it a very low walkability rating. Despite this the site is located near major transportation networks, such as the Delaware River, Interstate 95, and the Betsy Ross Bride (State Route 90).

Image 6.1 - Modern Interior View of Turbine Hall

Image 6.2 - SWOT Diagram (A. Prah, 2016)



6.1 Strengths

Size of the Main Building

The size of the Main Building is one of its most appealing aspects. The robust structure contains 262,750 square feet and has footprint equivalent to two football fields. This size not only gives the building a sense of monumentality, but will also allow for multiple programs to be incorporated into the space.

Abundance of Original Fabric

Despite being decommissioned over thirty years ago, much of the architectural fabric and original equipment is still present. There is a great amount of embodied energy stored within this structure. Not only is this an environmental benefit but this also provides an unique view into the operations of early 20th century electrical power plants.

River and Highway Access

The Delaware River was important for the station's electrical production, and can be an asset for future use. Development plans by the city and local organizations have put an emphasis on reestablishing the city's connection the River. The Richmond Power Station's location along the Delaware River and its proximity to Interstate 95 and the Betsy Ross Bridge are great assets.

Neoclassical Architectural Features

Many of the neoclassical motifs are still intact, such as simple geometric volumes, pediments, pilasters, dentils, and clean lines. In addition to its classical style in a "modern" material (concrete), features such as the Turbine Hall's roof expresses the civic responsibility felt by the original stakeholders. Furthermore, architectural features such as the large windows on the facades are not only aesthetic, but also have environmental benefits-providing ventilation and natural daylight.

Romanticized Ruin Aesthetic

According to a poll by Curb Philadelphia, the Richmond Station ranks fifth in the Coolest Abandoned places in Philadelphia. The allure of industrial ruins remains prominent in tourism and popular culture. For instance, attractions such as Eastern State Penitentiary attract over 200,000 visitors a year. Individuals are attracted to these sites because they break from traditional ideals of how buildings should appear and provide a different experience.

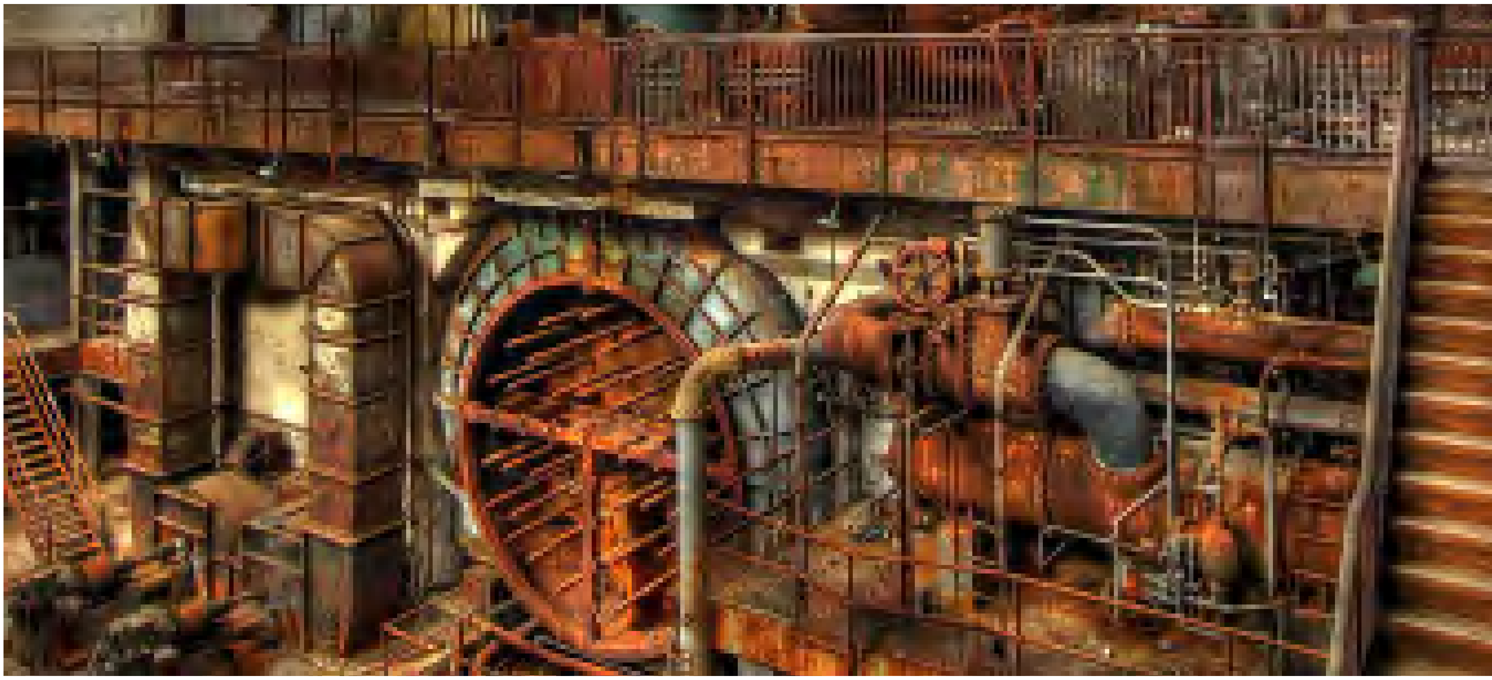


Image 6.3 - View of Richmond Power Station from the southeast (Author Unknown)

Image 6.4 - Interior of Turbine Hall (Supercar, 2014)

6.2 Weaknesses

Environmental/Health Hazards

There are contaminants present on site from the electric generation process and from the materials used to construct the buildings (see Section 10.3 for more details). These hazards will need to be addressed in order for the site to be occupiable.

Level of Deterioration

Due to a lack of maintenance, water infiltration, and the fact that many of the materials have reached the end of their service life, the buildings are in an advance state of deterioration. This results in loss of fabric and a safety risk.

High Rehabilitation Costs

Stabilization and remediation costs may be high. Also, new systems will be needed to make the buildings operational. In the case of the Main Building, the structure was designed to dissipate heat, so a heating system was not integrated into the original design. A HVAC system will need to be installed as part of the rehabilitation of the site. Furthermore, due to the large volume of the interior spaces, heating/cooling cost could be costly if not properly designed.

Lack of Vision for Core Buildings

Exelon is using a portion of the site for office space, storage, and backup power. The company has plans to incorporate battery storage and a liquefied natural gas (LNG) refueling station along the river into its operations. These plans do not involve using the historic buildings, which can make these structures dispensable.

Isolation and Low Pedestrian Traffic

A combination of zone classifications and Interstate 95 has cut the site off from residential and commercial areas. Even though SEPTA bus routes are in the vicinity, they do not appear to be pedestrian friendly. This is due a lack of bus benches/shelters, signalized crosswalks, and sidewalks. Furthermore, the Atlantic City Amtrak line runs adjacent to the site but the closest stop/station (the Pennsauken Transit Center) is across the river in New Jersey .

Image 6.5 - Asbestos warning sign on site (E. Gruendel, 2016)

Image 6.6 - Ceiling of the Turbine Hall (S. Bley, 2012)

6.3 Opportunities

Economic Stimulus

Incorporating new activities onto the site has the potential to increase and diversify the local economy.

Employment Opportunities

Due to its vast size the level of deterioration a lot of work will be needed to rehabilitate the area. This will result in hiring a vast number of workers from the region. Once the building and site have be rehabilitated and new forms of business come into fruition, resulting in new job opportunities with various skill levels can occur.

Incorporating Goals with New Activities

Even though Exelon's future plans for the site were listed as a potential weakness, it can also be an opportunity. Currently the company has plans to branch out into battery storage and a filling station for liquid natural gas via the Delaware River. This could an opportunity to fulfill the company's commitment to sustainable energy R&D and investing in cleaner energy.

Education Tool for the Industrial Past

When built and throughout a good portion of its history, the Richmond Station was considered to be one of the most advanced electrical generation plants. With a majority of the original equipment and infrastructure still in place, this place offers an unique glimpse into the Philadelphia's industrial past.

Image 6.7 - American Ninja Warrior competition held at the Richmond Power Station (T. Gralish, 2016)

Image 6.8 - Historic Photo of H. Liversidge Terminating Direct Current Service on Oct. 4, 1935 (Philadelphia Historical Commission)

6.4 Threats

Climate change

As the effects of climate change cause more extreme weather patterns, the historic infrastructure on site will be more susceptible to harm from impact damage, water infiltration, and colder/hotter temperatures. Additionally, due to the location of the site on the banks of the Delaware River, rising water levels is a great concern.

Regulations/Policies

Different agencies (local, state, and national) have the potential to affect what happens on the site and the surrounding area. Currently, the area zoned as Heavy and Medium Industrial. If zone changes cannot be made, it will greatly diminish the range of potential new uses for the site. Changes to currently established rules and regulations, can also cause issues for the redevelopment of the site.

Changing Corporate Attitudes

When constructed the Main Building was integral to the message the owners of the Pennsylvania Electric Company wanted to project. The current owner (Exelon) is a Fortune 100 company, and the largest electric holding company in the country. If executives and board members feel that preserving the building deviates from their core mission, preservation plans can be impacted.

Value of Scrap Metal

In 2010, it was estimated that it will cost $10 million to demolish the Main Building, and Exelon would only have been able to reap $2-3 million from the sale of scrap metal.[3] This was one of the factors that saved the building from demolition. In the past 12 months the price of scrap metal has doubled.[4] If the price continues to rise, it can be an incentive to take the building down.

1. Zach Patten. "Eight of the Coolest Abandoned Places in Philly." Curbed Philly. 2013. Accessed November 23, 2016. http://philly.curbed.com/maps/eight-of-the-coolest-abandoned-places-in-philly.

2. Jessica Lussenhop. (11 May 2016). "Inside decaying US prison, former inmates are guides". BBC Online. Retrieved 11 May 2016.

3. Marshall Tidwell and Haley Van Wagenen. Richmond Station-Building Pathology Assignment. University of Pennsylvania. May 7, 2011

4.Tom Buechel. "12/7/16 Scrap Price Update: Copper, Steel Up." IScrap App. December 07, 2016. Accessed December 20, 2016. https://iscrapapp.com/blog/12716-scrap-price-update-copper-steel-up/.

Image 6.9 - View of the Delaware River from site (D. Pape, 2016)

Image 6.10 - Interior Shot of the Boiler House (P. Hiller, 2016)

7.0 Comparables

The most significant realization that came to light in researching comparable developments is the vast number of successful global adaptive reuse projects that have occurred within a Power Generating Station building typology. Despite their unique challenges, all were able to overcome their difficulties. It is significant that this has also been realized in Philadelphia, where Chester Station has become a successfully reused power station, and Delaware station, just a mile down stream, is undergoing rejuvenation.

Image 7.1 -The machine room of the Tejo Power Plant in Lisbon, Portugal. Wikicommons

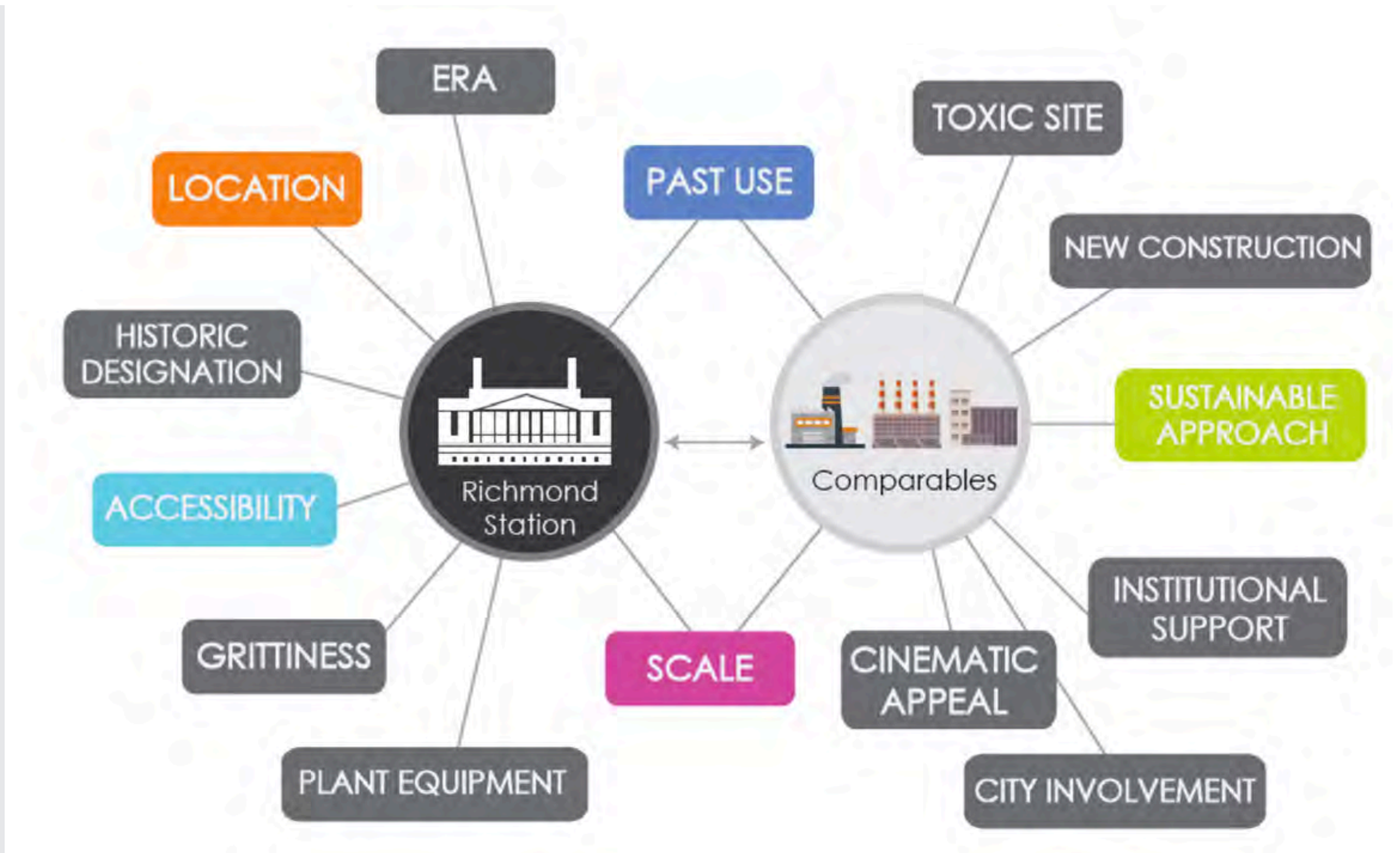
Most of the comparables analyzed were vacant facilities that have been or are in the process of being returned to productive use. Due to the extensive amount of case studies looked at 30 comparables on four different continents, we created a method of filtering these in order to choose the most relevant precedents (Figure 7.17). This was executed by creating an excel table with a column containing twenty three case studies, and a top row containing the criteria we deemed necessary to seek. One by one, we checked which characteristics these included or covered.

The fourteen criteria or characteristics were chosen in order to cover several values, defining features or aspects that not only covered the precedents but in some way related to the Richmond Station. These range from past use (power plant) to verifying if these had a historic designation prior to the adaptive reuse, in order to qualify for historic tax credits. Richmond station was denied historical designation, so it's important to look at other precedents that were able to acquire funds and investment without a historical designation. Nowadays there is an appreciation for abandoned sites, what we would call "industrial grittiness", that's another benchmark that some of these other cases studies share. Another important one is toxicity. Remediation of former power plants is very costly, so it's beneficial to see how it was done in other sites.

7.0 Comparables

Out of the fourteen characteristics, we focused on past use, scale, location, accessibility and sustainability (Figure 7.2). These are characteristics that directly control what the proposed use or uses will be. The first three (past use, scale, and location) are the most defining qualities of Richmond, therefore entail challenges and opportunities at the same time, but nonetheless we must keep in mind when proposing a new use. The last two (accessibility and sustainable approach) are characteristics we wish to explore to the Richmond Site.

Image 7.2 - Nicole Declet



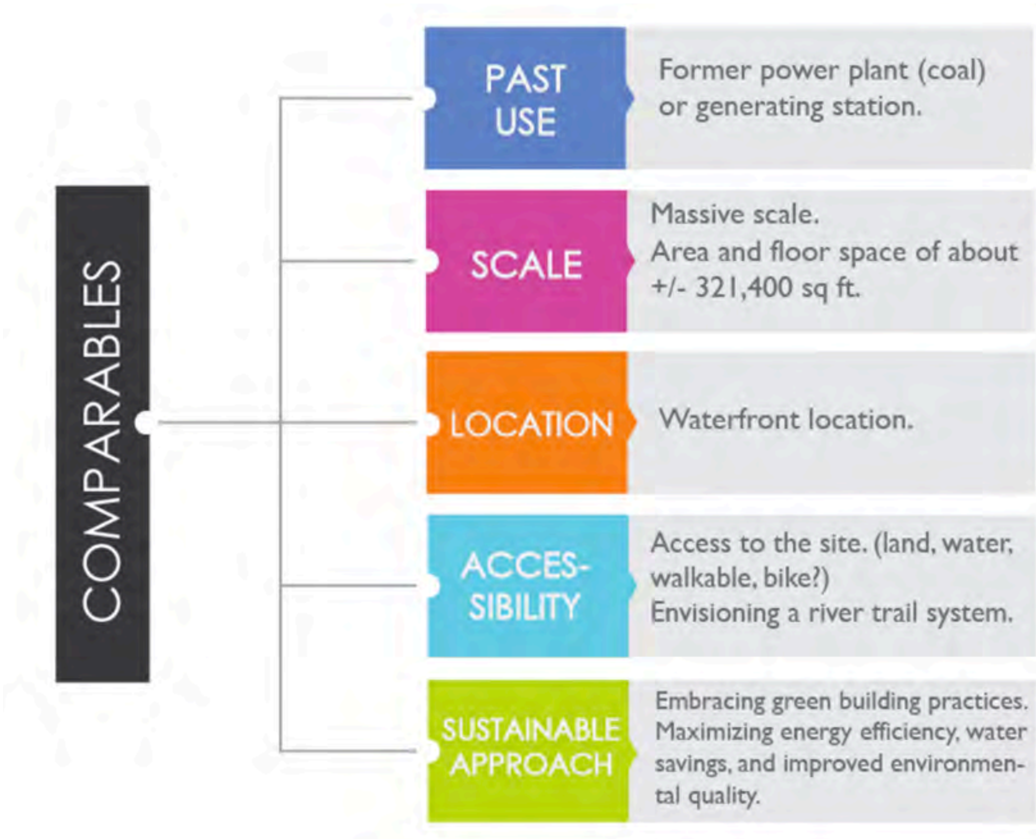


Image 7.3 - Nicole Declet

Accessibility refers to how we can access the site. Is it just by car, or is there a river trail available, or possibly arrive through the port. Some of these projects or case studies provide access to previously closed rivers and canals. This in turn makes the area safer and more welcoming, which could boost the real estate in that part of the city. Sustainability refers to incorporating energy efficiency or being creative with energy use where the site could possibly become a creative/ experimentation laboratory.

Image 7.4 - Chester Station, Wikicommons

Chester Waterside Station in Chester, Pennsylvania (1916)

The first case study presented was the Chester Waterside Station in Chester, Pennsylvania. Chester is one of the case studies that mostly resembles Richmond Station before its reuse. It's a former electricity generating coal and oil plant situated on a waterfront location. In terms of scale, it's slightly bigger than Richmond Station, with a square footage of 396,000. It was also abandoned around the same time as Richmond. In 2004, it was renovated for office use including a multi-purpose meeting room, concert, party areas, basement, food court, fitness center, river walk and parking. They also expanded the river walk access.

Overall, the cost was around 80 million dollars. Due to the toxicity of the site, it took six months to complete remediation (oil pollution and asbestos). The city was involved in this, investing 11 million dollars for environmental cleanup and new roads. Although the majority of the historic fabric was retained, two additional stories were added on top of the original four story frame. According to the company involved in the construction, "The adaptive reuse of this former power plant, constructed in 1916, included complete facade repair and restoration to maximize the benefit of historical tax credits. CVM's assessment led to targeted restoration that addressed carbonation-related distress and freeze-thaw damage to architectural precast concrete cornices, columns and the rusticated water table base."[1&2]

Image 7.5 - Bethlehem Steel, Wikicommons

Bethlehem Steel Corporation in Bethlehem, Pennsylvania (1857-2003)

Bethlehem Steel Corporation was known as America's second largest steel producer and largest shipbuilder. A decline in the steel industry in addition to other problems led to the company's bankruptcy in 2001, creating a financial gap in the city. Instead of demolishing the structure or leave it to perish, the community became involved and worked together to readapt the space. In 1999, the city's three local taxing bodies established a Tax Incremental Financing (TIF) district on the property, in order to transfer any future tax dollars coming in from new business to help revitalize the plant.

The site is now home to SteelStacks, an arts and entertainment district. It includes the ArtsQuest Center, a contemporary performing arts center, the Sands Casino Resort Bethlehem, a gambling emporium, and PBS39, a local community owned public television station. It's also popular as a music hub, featuring three outdoor music venues, 1,000 concerts and eight different festivals annually. They decided to keep most of the equipment, featuring the plant's five blast furnaces in its campus. Wildly successful, a total of 70 million dollars has been invested into the project. This number includes federal grants and contributions from corporate and private donors. It officially opened in 2011 and so far more than one million people have visited SteelStacks.[3]

Image 7.6 - Joliet Correctional Center in Joliet, Illinois, Wikicommons.

Joliet Correctional Center in Joliet, Illinois (1858-2002)

This case study was mostly chosen because of its redevelopment plan. JCC is a former prison, 160 acres in total, which closed due to budget cuts. Like Richmond, it has been featured in motion pictures. The city overtook a redevelopment plan for the Joliet Correctional Center including how to connect the site to its nearby context (something we wish to explore at Richmond Power Station). They also wish to preserve the prison for its historic significance and tourism potential, and they seek to develop guided tours of the penitentiary for Route 66 travelers. A condition assessment of JCC was included as part of the redevelopment plan along with recommendations for basic stabilization of the site. Most importantly, the panel offered three development scenarios requiring different amounts of public support and private funding. Proposing several scenarios for Richmond Station is something that has been previously pondered in our studio.[4]

Image 7.7 - Seaholm Power Plant, Wikicommons

Seaholm Power Plant in Austin, Texas (1951-1989)

The Seaholm was also a historic power plant decommissioned around the same time as Richmond. Smaller than Richmond in scale, its square footage is 130,000. It's also considered the only historic power plant building in the US that has been reused for a large-volume recreational purpose. It was redeveloped as a sustainable, mixed-use, adaptive reuse development (commercial, retail, exhibition, and residential space) and major civic activity center, to be served by a light rail station with direct access to the town. Seaholm also has a lake that connects the site to the rest of downtown. Like Richmond Power Station, the site was contaminated with asbestos, lead paint, mercury and oil/sludge. The contaminant remediation program was around 13 million dollars. The city of Austin contributed 18.6 million dollars to the project.

An interesting aspect of this site is that was not designated at the time of the development agreement in 2008. It had been considered for the National Register of Historic Places but did not become one until 2013 when official construction began. Perhaps to qualify for historic tax credits? Another interesting aspect was how they worked alongside UT Austin to develop a sustainability program (development of a rain catchment system, landscaping and stormwater management). Could an academic institution be involved in the redevelopment of Richmond Station?[5]

Image 7.8 - Wollomoloo, Sydney, Australia, Wikicommons.

Wollomoloo Finger Wharf in Sydney Australia (1915)

The Wollomoloo Finger Wharf opened in 1915, closed in the 1980s and operated as a wool exporter. It closed due to new container ports that contained larger wharf facilities. This timer constructed wharf is basically two side sheds connected by a roadway in between. Originally the wharf was going to be demolished in favor of a new marina and resort complex. However, public support stopped demolition and unions imposed a green ban, stopping demolition. It was eventually redeveloped as a complex housing including a hotel, restaurants, and residential apartments. In summary, it's a waterfront location (like Richmond Power Station), and its accessible through its marina.[6&7]

Image 7.9 - Ottawa Street Station, Lansig Michigan, HOK.com

Ottawa Street Station in Lansing, Michigan (1939-1989)

Ottawa was a former municipal electric and steam utility generating station (301,390 sq. ft.), sold in 2007 and redeveloped as corporate headquarters. It's a waterfront location in the city's central business district, a better location than Richmond Power Station. This was another precedent where no historic designation prior to construction. The building became designated a year after construction began maybe to qualify to historic tax credits. Plans for this site extends the city's river trail system and adds an extensive riverside patio, perhaps a possibility for Richmond Power Station. It's considered an extremely successful project, winning several awards, such as "Green Project of the Year," and "Excellence in Economic Development." As part of their sustainable approach, architects installed high performance glass that appears clear but absorbs light in order to maintain the plant's historic look.[8]

Image 7.10 - Pennovation Center, Philadelphia, Pennsylvania, Wikicommons.

Pennovation Center in Philadelphia, Pennsylvania (1890s-2009)

This 58,000 sq. ft. building was formerly known as DuPunt Co. paint factory and lab, who shut down in 2009. The University of Pennsylvania invested 40 million dollars in its redevelopment, known as Pennovation Center (3 story office and lab center). Part of Penn Connects 2.0, seeks to include more buildings to the university while expanding open campus. Although no longer a paint factory, this "hub for innovation, research and entrepreneurialism" continues to use the space as a research site. When DuPont Company purchased the building from Harrison Brothers in 1917, paint manufacturing continued until the 1950s when DuPont began to concentrate on research and product development projects, primarily automotive. Is there a possibility to reuse Richmond Station as a research center?[9]

Eastern State Penitentiary in Philadelphia, Pennsylvania (1829-1971)

Built in 1829, one of the largest, most expensive public structures in the US at the time, operated until 1971. Today it operates as a museum and historic site, getting up to 220,000 visitors each year. A tour has also opened up the conversation on the US prison system and its failings with the exhibit: "Prisons Today." Some cells are still filled with original rubble and debris from years of neglect. They also host "Terror Behind the Walls," an annual haunted house Halloween event. It's interesting how they stabilized certain sections as ruins and developed others for exhibitions. Possibility for Richmond Station?[10]

Image 7.11 - Eastern State Penitentiary Philadelphia, Pennsylvania, Wikicommons

Image 7.12 - Hearn Generating Station, Ontario, Canada, Wikicommons.

Hearn Generating Station in Ontario, Canada (1951-1990s)

A smaller case study (40,000 sq. ft.), the Hearn opened in 1951 and the power station was once the largest enclosed space in Canada, still owned by Ontario Power Generation. Like Richmond, the Hearn has been on the spotlight as an event host, but its future is still uncertain ("Neglected but photogenic film location"). Although abandoned, there have been investments on new construction, such as theaters and pop-ups. Most recently, it made the headlines for hosting the Luminato Festival, which lasted seventeen days in June. As a consequence, it has become a temporary hub for arts and cultures, ideally becoming the "world's largest temporary community and cultural center under one roof." A few case studies have been compared below to demonstrate comparisons of scale.[11]

Image 7.13 - Scale Comparisons, Nicole Declet

Scale comparison's with Richmond demonstrates that it is not particularly larger than some of the other comparable sites that we have looked at. Almost all the comparisons were of the same era, are located on a body of water, and used more or less the same sorts of mechanical and building technology. Pathologies and remediation remain the same across the board, it has not stopped redevelopment, instead development has occurred because of the sorts of unique opportunities these magnificent buildings sites have to offer.

7.0 Comparables

Ultimately, the following three cases were decided to closely inform and construct our preservation and interim use approach:

1. Eastern State Penitentiary (Philadelphia, Pennsylvania)

-Important precedent for stabilized ruin approach as well as providing a
-framework for how such a project in Philadelphia is funded.
-Case study that uses multiple approaches through the different phases of development
-Funding from non-profits and government organizations

2. Tejo Power Plant / Electricity Museum (Lisbon, Portugal)

-Similar location on the outskirts of a major city
-Provided important catalyst for modernization of the city
-Provides a model for the use of a retired power production site as a museum of industrial archaeological heritage
-Significant development for the city of Lisbon which allowed it to grow and develop into the modern age
-Still owned by an electrical producing company who takes pride in their company's electrical heritage.

3. Hearn Station (Toronto, Canada)

-Still owned and operated by the energy company, who still use the site for energy production and storage, same as Richmond Power Station
-Is an example of reusing a space while still maintaining the ruin aesthetic, which we as a group have identified as an integral characteristic to the Richmond site

Image 7.14 -
Tejo Power Plant,
GoogleSites Electrical
Generator Diagram

1. The Chester Waterfront Redevelopment Project: A Brownfield Conversion in Progress. Environmental Services. Brown and Caldwell Quarterly. 1999. Accessed 14 September 2016 at: http://www.brownandcaldwell.org/Quarterly%5CQ_Summer99_Page4-5.pdf
2. Wunsch, Aaron. "Delaware County Electric Company, Chester Station." Washington, DC: Historic American Engineering Record, National Park Service.
3. "What Is SteelStacks?, SteelStacks." SteelStacks. Accessed 28 September 2016. http://www.steelstacks.org/about/what-is-steelstacks/.
4. Joliet Correctional Center Redevelopment. Report. Chicago Metropolitan Agency for Planning, Urban Land Institute Chicago. Joliet, IL: City of Joliet, 2012.
5. Seaholm Development Project. Accesssed 24 November 2016 Online at: http://www.seaholm.info/project.html
6. "Finger Wharf." Wikipedia. Accessed 18 September 2016 Online At: https://en.wikipedia.org/wiki/Finger_Wharf.
7. Williams, Sue. "Sydney Finger Wharf Marks Century as Wharves' Popularity Grows." Domain. November 06, 2015. Accessed 18 September 2016 Online at: http://www.domain.com.au/news/sydney-finger-wharf-marks-century-as-wharves-popularity-grows-20151105-gkoeba/.
8. "Ottawa Street Power Station." Wikipedia. Accessed 14 September 2016 Online at: https://en.wikipedia.org/wiki/Ottawa_Street_Power_Station.
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10. "Eastern State Penitentiary." Wikipedia. Accessed 23 September 2016. https://en.wikipedia.org/wiki/Eastern_State_Penitentiary.
11. Macrae, Emily. "How the Hearn Pushes the Possibilities for Adaptive Reuse in Toronto | Cityscape | Torontoist." Torontoist Main RSS. 07 June 2016. Accessed 18 September 2016. http://torontoist.com/2016/06/how-the-hearn-pushes-the-possibilities-of-adaptive-reuse/.
12. "Tejo Power Station." Wikipedia. Accessed 14 September 2016 Online at: https://en.wikipedia.org/wiki/Tejo_Power_Station.

8.0 Tolerance for change

The tolerance for change section focused on diagramming all of the significant elements in the site and assigning them a value. These spaces included the interior and exterior spaces, and the elements were graded taking into consideration fabric, form, function, machinery, architectural elements and views. This original list of significant elements stemmed from the character defining features.

Image 8.1 - Interior of Boiler House, N. Declet, Site Visit (2016)

The range follows ICOMOS sensitivity to change key, and our criteria takes into account the interpretive value and its integrity. The integrity is the ability of a space to convey significance; it informs the interpretive value. It refers to how much of the space has remained unchanged. Each of the categories were given a value, ranging from 1 to 3.

· 1= equals no tolerance for change. Meaning, that particular element is highly sensitive to change because it's very significant. With spaces like these, our response is to hold off and restrain from altering it.

· 2= indicates moderate tolerance for change. The element may have undergone some alterations but the element still retains general attributes.

· 3= indicates high tolerance for change. These are elements where a greater level of change is acceptable.

The exterior includes the overall site and auxiliary buildings the coal's exterior and Richmond Station's (main building) exterior. The interior spaces include the boiler house, the turbine hall, operating room and the switch house. Overall, we focused on the process of the former power plant station since the site and main building works as a system. Each space is dependent on the other. It's a sequence of spaces, a series of volumes interconnected by a sort of assembly line. This has been mapped and diagrammed showcasing the process on a general floorplan (movement from coal tower to conveyor belt, boiler house and so on) and through sections.

8.0 Tolerance for Change

Image 8.2 - Mapping tolerance for change

Exterior Spaces

Auxiliary Building

This refers to the outbuildings and other features in the site, such as the train tracks. Train tracks we considered has the lowest tolerance for change. We know some of these have been paved over, but the existing train tracks should be retained as much as possible. Auxiliary buildings are not as significant as the Richmond Station. Their overall form is intact but these spaces can accommodate other uses.

Coal Tower

The Coal Tower is another case where we could not assess the interior, because we did not have access to it. For these reasons, we focused on its exterior.

Richmond Station

For the exterior of the Richmond Station, we took into account the openings (windows, the tunnel/atria), the material, and the roofs of each of the volumes that comprise Richmond Station, trims and secondary features (pediment, pilaster, engravings, cornice, and textured surface).

Interior Spaces

Boiler House

In the Boiler House, some of the equipment may remain, while other elements can withstand alteration without affecting the overall character of the space.

Turbine Hall

In the Turbine Hall, the ceiling (double barrel vault) is is highly significant. Machinery and equipment, such as the crane and the turbines are to be kept.

Operating Room

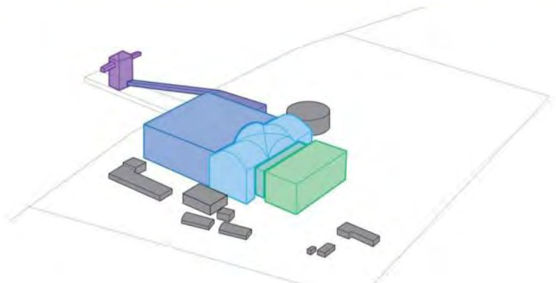
We were unable to access a large portion of the "Connecting volume" located between the Turbine Hall space and the Switch House. For these reasons, we could only grade the Operating Room. It's a small but very significant space.

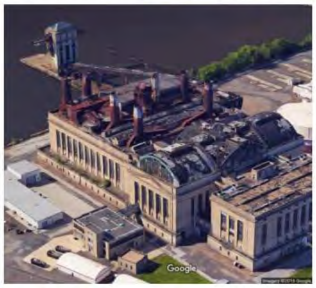
Switch House

The form in this space has a moderate tolerance for change.

Exterior Spaces: Site/Outbuildings

Overall Site/Outbuildings	Interpretive Value	Integrity
A &B: Houses rotary frequence convert	2	2
C: Houses control room	2	1
D: Locker Room	2	2
E: L shaped building (storage)	3	3
In Use: Administration Building	2	2
In Use: Garage Building	3	2
Machinery Shop	1	1
Pump House	2	1
Richmond Station	1	1
Train tracks	1	2
Views	1	2





Exterior Spaces: Coal Tower

Coal Tower:	Interpretive Value	Integrity
Form	1	1
Fabric	1	1
Machinery	1	1
Architectural Details	2	1

Exterior Spaces: Richmond Station

Richmond Station: Exterior	Interpretive Value	Integrity
Coal Tower	1	1
Boiler House	1	2
Turbine Hall	1	2
Connecting Structure	1	2
Switch House	1	1
Main Building: RS	1	1
Fabric	2	1
Machinery	1	1

Image 8.3 - Interpretive values and integrity analysis for exterior spaes.

Interior Spaces: Boiler House

Boiler House:	Interpretive Value	Integrity
Form	1	1
Fabric	2	1
Machinery	1*	1

Interior Spaces: Turbine Hall

Turbine Hall	Interpretive Value	Integrity
Form	1	2
Fabric	1	1
Machinery	1	1
Architectural Elements	2	2

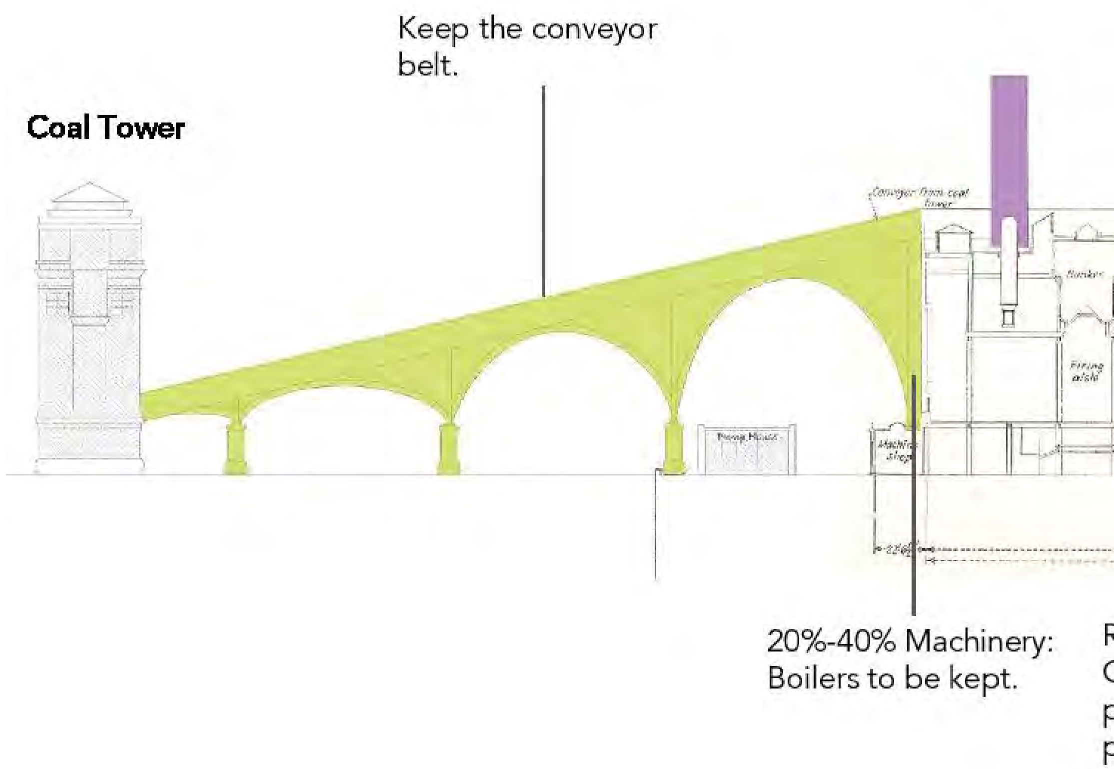
Interior Spaces: Operating Room

Operating Room:	Interpretive Value	Integrity
Form	3	3
Fabric	1	2
Machinery	1	2
Views	1	1

Interior Spaces: Switch House

Switch House:	Interpretive Value	Integrity
Form	2	1
Fabric	1	1
Machinery	2	2
Architectural Elements	2	2

Image 8.4 - Interpretive values and integrity analysis for interior spaces.



	Form	Fabric	Machinery*	Architectural Elements	Views
Coal Tower	1	1	1	2	N/A
Conveyor Belt	1	1	N/A	N/A	1
Boiler House	1	2	1	N/A	N/A
Turbine Hall	1	1	1	2	N/A
Operating Room	3	1	1	N/A	1
Switch House	2	1	2	2	N/A
C & D: Rotary frequence converters	2	2	2	N/A	N/A
E: Houses control room	2	2	2	N/A	N/A
F: Locker Room	3	3	3	N/A	N/A
G: L shaped building (storage)	3	3	3	N/A	N/A
A: In Use: Administration Building	2	2	N/A	N/A	N/A
B: Garage Building	3	2	N/A	N/A	N/A
I: Machinery Shop	1	1	N/A	N/A	N/A
H: Pump House	1	1	N/A	N/A	N/A

Image 8.5 -
Overall Values for exterior spaces.

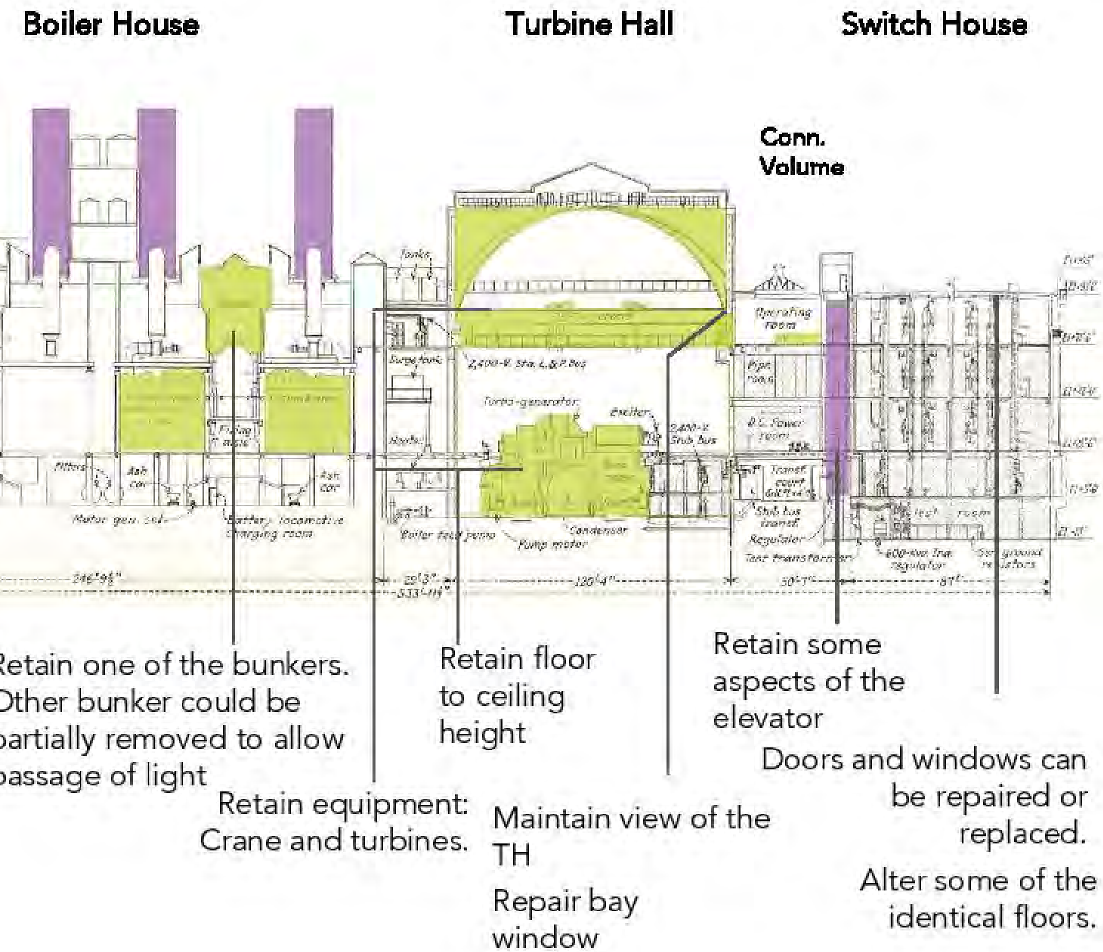
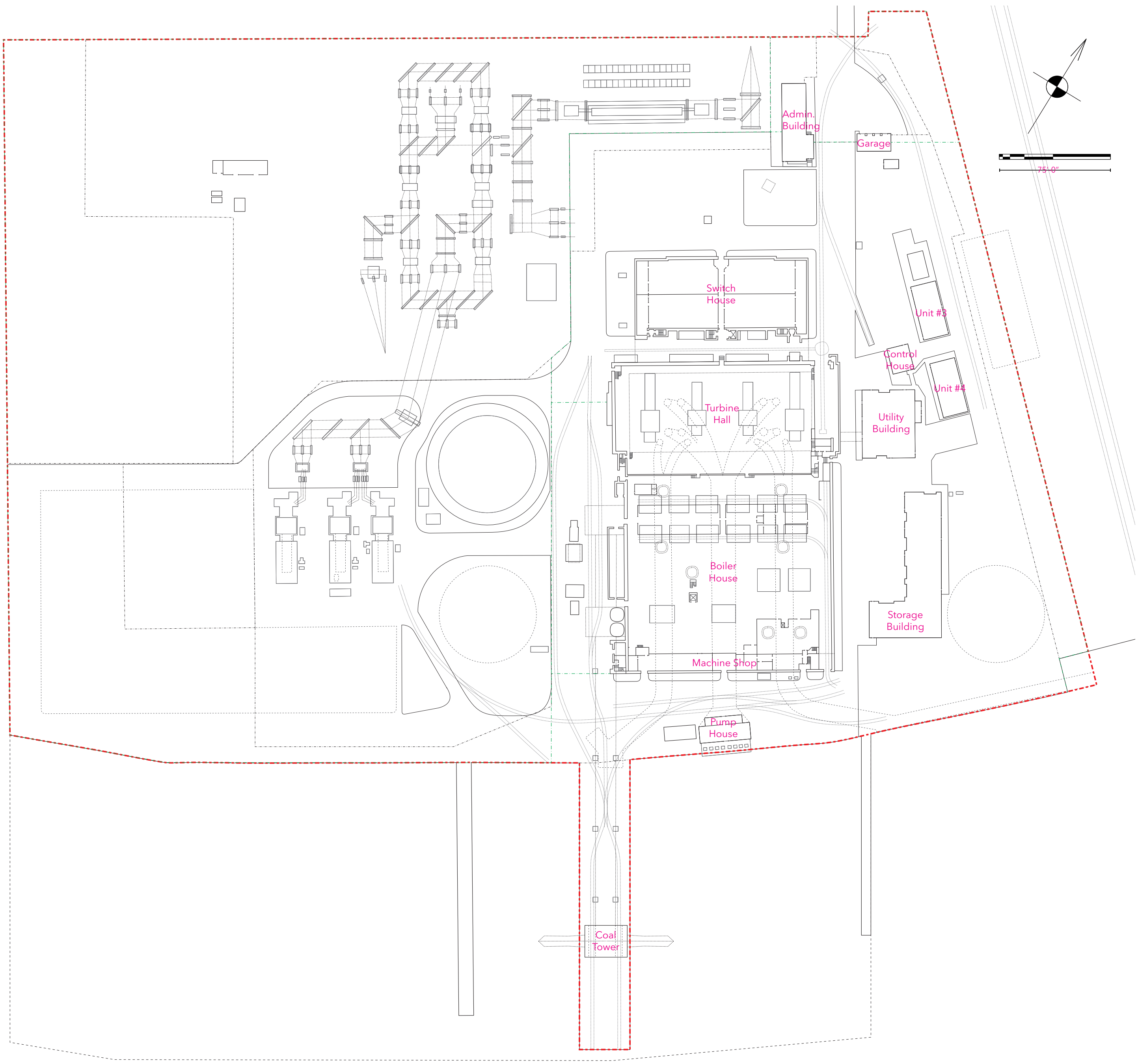


Image 8.6 -
Overall TFC Findings.

In conclusion, there are certain elements that will have minimal impact on how we move forward with our preservation plan and others that need to be preserved as they are. For interpretive value, 20-40% of the machinery in the Boiler House should be kept in order to tell the evolutionary history of the site. Also in the Boiler House, one of the bunkers should be kept for interpretive value, but the others can be removed to allow for passage of light. The Turbine Hall has the lowest tolerance for change; the over-head crane and turbines should all remain. The turbines are integral to the structure and will be difficult and costly to remove regardless. The generous floor to ceiling height should not be interrupted with any reuse of the space. As an important view, the bay window should be restored; as well as preserving the view from the Operating Room into the Turbine Hall. In the Switch House, aspects of the elevator should be retained. Because of the repetition inside this portion of the historic core, alterations can occur to the identical floor plans to make the space usable.

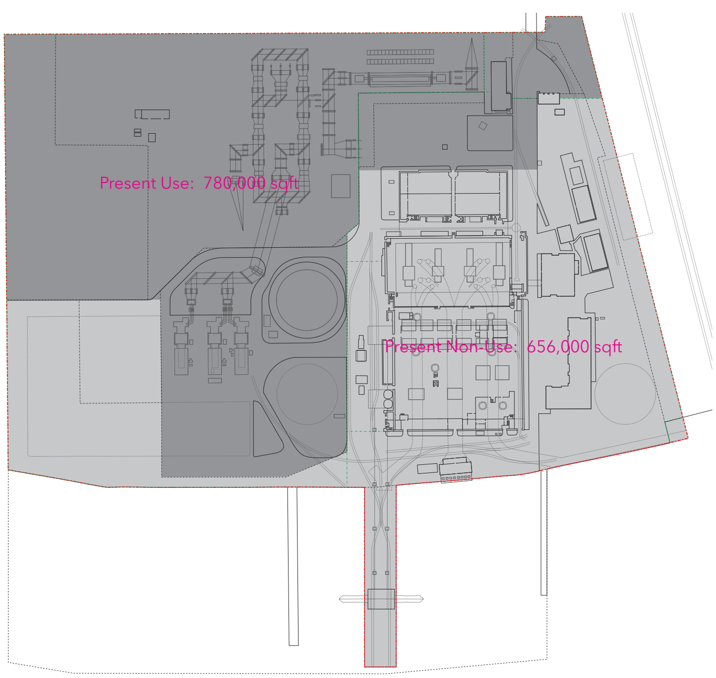
9.0 Preservation Approach

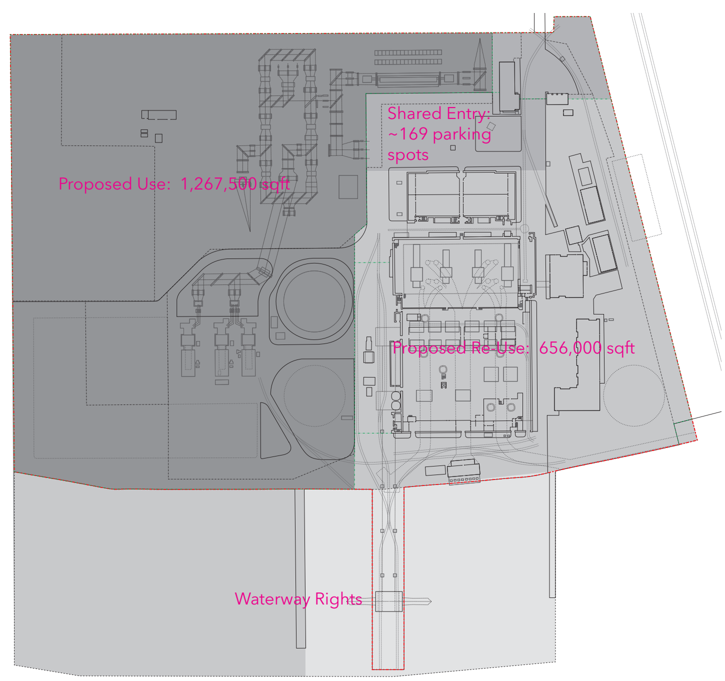


9.0 Preservation Approach

The following section of this report will discuss the preservation approach of the Richmond Power Station including an overall preservation concept, a breakdown of three possible scenarios, and a discussion on possible interim and long-term uses for the site. In order to frame this discussion, however, it is important to understand that the focus of this approach is on the portion of the Exelon site which is not currently being used for energy production, so-called the historic core. Image 9.1 depicts the site in its present-day form. While much of the northwest portion of the site is actively engaged with energy management infrastructure, the rest of the site and its accompanying buildings–including the Switch House, Turbine Hall, Boiler House, Pump House, Coal Tower and the auxiliary buildings on the northeast portion of the site–are not presently used nor occupied. Image 9.2 depicts the present-day use diagram where only about half of the total site is in use by Exelon, albeit with some storage infrastructure in the historic core area. This preservation approach focuses on this historic core area for adaptive reuse, while allowing Exelon to maintain energy production on the rest of the site. Since there is only one access point to this site, reconfiguration of the entry sequence may be necessary for shared usage.

Image 9.1 - Existing Site Plan
Image 9.2 - Existing Use vs Non-Use Diagram
Image 9.3 - Proposed Use vs Adaptive Re-Use Diagram

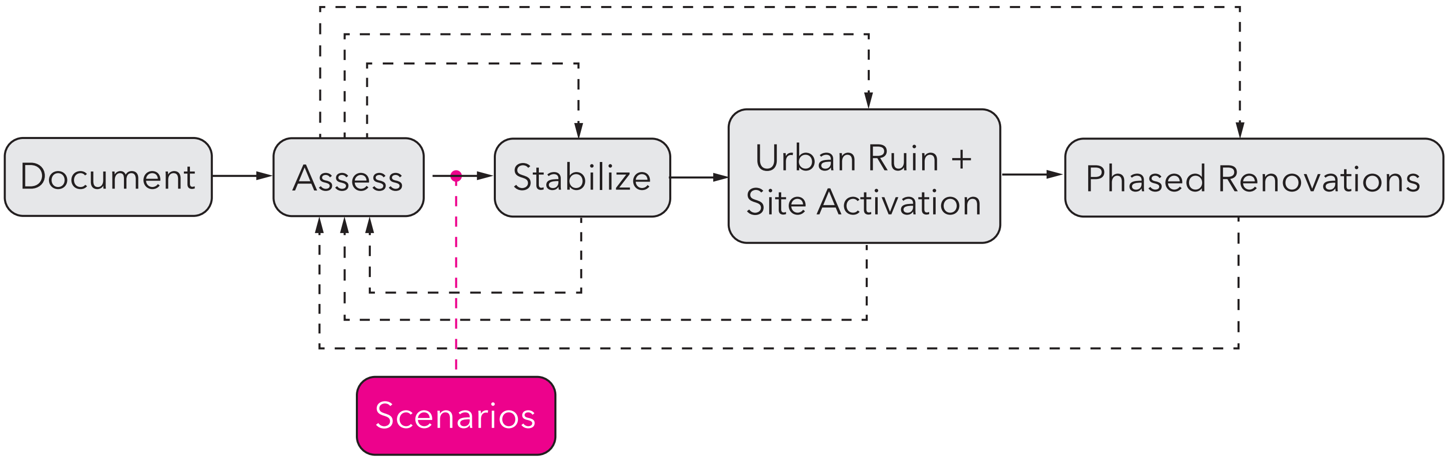




9.1 General Preservation Approach

Based on the research that has been conducted, this preservation plan is organized into a series of steps that aim to maintain and enhance the existing character defining features and overall significance of the site and the structures upon it. The preservation plan for Eastern State Penitentiary in Philadelphia was highly influential to this approach, as it uses a flexible and modifiable take on interpretation, interim uses, and adaptation. As previously stated, the site's primary value was its use in the production of energy for over sixty years in the twentieth century. Therefore, the preservation of the site's production systems and equipment is of high priority. While not all of the equipment in the buildings need be preserved, it is important that the method of production remains clear to future users of the structures. Additionally, this site has seen a nuanced appreciation as a ruin since being decommissioned thirty years ago. This preservation plan expands upon this value, calling for an overall stabilization of the structure with interim uses, such as tours, which capitalize on its ruinous features. Ultimately, however, it is the goal of this report to advocate for the site's adaptive reuse, at least in a portion of the site, so that the building can regain a sense of purpose for Exelon and for the future users of the site. The following is a diagram depicting the proposed preservation approach.

Image 9.4 - General Preservation Approach Diagram, Emily Gruendel



This plan is phased so that heavier adaptations and renovations, which would require a larger budget and more time to undertake, transpire after more pressing steps have been taken. This way, more time is available for planning and appropriating funds for these more extensive modifications, and more critical steps, such as the stabilization of the site, occur much sooner. Each of the steps build upon one another, and emphasize continued assessments and reassessments to ensure that the site is well maintained and adaptations remain viable and relevant. Additionally, each phase of this plan works to raise the visibility of the site in terms of public awareness and appreciation. This way, the Richmond Station and its plans for the future can continue to foster outside support from the local community, the city of Philadelphia, and beyond.

Document

The first phase of the preservation approach is to simply document the site, in its entirety, as it sits today. A relatively inexpensive and quick task to undertake, documenting the site is critical regardless of any future plans for this land. Due to the site's accelerated rate of deterioration, this documentation phase should focus first with the most significant and at-risk features with thorough photographs, drawings, and any other relevant documentation techniques. It is recommended that this phase of the preservation plan be undertaken in the first six months. This phase will also be necessary for the National historic register process. This process should address of the site that was overlooked during the HABS documentation back in 2000, such as the other aspects of the site that are not part of the historic core, such as the administration building and garage building.

Assess

The goal of the assessment phase is to thoroughly understand the present conditions of the site in order to better plan for future adaptations, uses, and necessary maintenance. The challenge of this phase is that there are numerous assessments that may need to be undertaken by varying outside consultants. While still a relatively inexpensive step towards the historic core's overall adaptive-reuse, these assessments are crucial to frame the future phases of this preservation approach. Once these assessments have been conducted, a more targeted plan on where to remediate and to what extent can determined. After the initial stabilization and environmental remediation, interim programs can be incorporated into the site. The various assessments that will need to be conducted include, but are not limited to:

- A full conditions assessment of the interior and exterior of all of the structures on the site.
- A complete inventory needs to be made of the various types and amounts of equipment that remain on the site and their level of integrity.
- Testing and sampling to confirm the presence and location of contaminants and other potential health and environmental hazards, including the soil on the site.
- The structural strength and integrity of the main aspects of the site that were vital to the production of electricity, including; The Switch House, the Turbine Hall, the Boiler House, the Coal Tower, the Pump House, the Conveyer, the auxiliary buildings on the site, and the pier.
- Feasibility studies of potential adaptive and interim uses to gauge the cost and ease of such modifications
- Owner goals and ambitions for the site should be reported on thoroughly in order to access the appropriateness of potential adaptive and interim uses.

It is also important to note that this assessment phase needs to be continuously revisited during each of the following phases in order to ensure that the site remains safe, well maintained, and economically viable. It is recommended that the various assessments and decisions regarding this site's maintenance, adaptive use, and feasibility be determined within the next 18 to 20 months.

9.0 Preservation Approach

Stabilize

The stabilization phase is the first, relatively large task to be undertaken for Richmond Station. Richmond is continuously deteriorating due to a lack of maintenance and care and if present conditions persist, the site will no longer be recoverable within the next decade. Therefore this site and the structures on it need to undergo a complete and thorough stabilization effort that goes far beyond present-day efforts.

The first step for this is to completely secure the site from external access, particularly during the night and weekend hours when Exelon employees are not present. Such efforts should include installing taller, more permanent fencing and gates around the site which aim to disable access by potential vandals. Additionally, functional security cameras need to placed throughout the site. The addition of security guards who canvas the site routinely both during on and off hours will also aid in deterring potential vandals. Installing exterior lighting may also increase the safety and security of the site. It also may be useful to reinstall the exterior architectural lighting which was historically employed on the site.

Furthermore, this stabilization phase needs to take great strides in preventing the site from deteriorating any further. Such a process will entail completely fixing the roofs of the buildings on the site, specifically the roof of the Turbine Hall. Enclosing the remainder of the building envelope from the elements will entail fixing, replacing, or sealing openings. The site may also need some remediation of water damage with temporary or permanent HV/AV treatments during this time. The basements of the auxiliary buildings on the northeast end of the site are presently filled with 15+ feet of water and will need to be drained, and sealed to prevent any future flooding of the spaces.

Urban Ruin + Site Activation

The next phase of the preservation plan aims to begin to employ activities and use on, around, and within the presently unused portion of the Richmond Station site. While this phase is broken down into two distinct parts—urban ruin and site activation—it should be noted that these parts need not be undertaken separately, but are envisioned as complementary to one another. Depending on the overall goals for the future use of the site and the feasibility of each aspect of this phase, the various projects within this phase can be conducted strategized to meet the immediate needs of the site.

Focusing on the major structures on the site—the coal tower, boiler house, turbine hall, and switch house—a number of tasks will need to be undertaken so that the spaces may be used and occupied, if only for the interim use of a tour, including:

Enable the power station, or at least parts of the station, to be accessed, taking into consideration access points and circulation.
Repair, replace, or reconstruct necessary aspects of the structure so that spaces are safe for occupancy.

Undertake the necessary life safety upgrades in order to allow for inhabitation
Add the necessary amenities for visitors, such as accessible restrooms.

On the exterior of the site, numerous upgrades and adjustments will need to be undertaken so that the site can be actively visited and used. Such changes include:

- Preserving and repairing the exterior of the power station.
- Completely restoring exterior architectural lighting
- Engage the waterfront with an interim use.
- Activate the site with additional interim uses.
- Undertake regularized site maintenance.
- Employ landscaping and other design aspects on the site.
- Consider demolishing non-significant and unnecessary structures on the site.
- Conduct basic life safety upgrades on the site, such as the erection of railings along the side of the water and pier.

Phased Renovations

The final step of the preservation approach is to undertake renovating and adaptively reusing the site and the structures on the site for more permanent functions. This is the largest and most costly phase of the preservation approach. However, the site can and should be broken down into a series of parts so that the entire site need not be completely renovated all at once, but can be phased appropriately. Depending on the overall goal of these restorations, it may make sense to undertake these phases in a particular order. The following is a break-down of these major sections of the historic core in a prioritized sequence of adaptive reuse. Aspects of the historic core that are not included (the pump house, the coal conveyor, and the auxiliary buildings) are not included from this list as they cannot support independent adaptive reuse efforts and will either need to be paired with other preservation efforts or interim uses.

- Switch House

While an arguably less significant structure on the site, this space will be fairly simple and quick to renovate and reuse, relative to the other spaces on the site. This space may be more easily transformed into office or smaller workspaces.

- Connecting Volume

While one of the smaller spaces within the main portion of the station, the connecting volume does maintain the operation room which overlooks the turbine hall. This room is very significant and, while it is in a state of dilapidation at the moment, it may not be as easily converted without removing or altering the equipment in the space.

- Turbine Hall

One of the largest and more significant areas on the site, this space needs some of the most work and will therefore be one of the most costly projects within the overall adaptive-reuse scheme. This space is also relatively flexible, so the cost of reuse of this space will be dependent upon the scale of the design, and the plan for removing or preserving the four large turbines in this space.

- Boiler House

This is the largest of the volumes at Richmond station and maintains numerous boilers and a labyrinth-like configuration.
This space will need significant alterations and adjustments in order to be useful and occupiable space for adaptive re-use efforts.

- Coal Tower

While somewhat separated from the main structure of the station, the coal tower has numerous levels and prime water-front views making it a very flexible and interesting space to reuse.
The adaptation of this space will be mostly cosmetic and should probably relate to the intended adaptations of the site and waterfront.
Interim uses may still be employed on the site where complete renovations have not been undertaken

It should be noted that while it is not suggested, consideration may need to be made for the partial or complete demolition of the station in accordance with the project's feasibility and functionality. It would be preferred to mothball portions of the site in lieu of demolition so that significant pieces of Richmond station are not completely lost.

Image 9.5 - South Side of the Boiler House, Group Site Visit, Emily Gruendel

As the general preservation plan suggests, there is a moment where this plan needs to begin to specify itself in the way in which the site is ultimately preserved and re-used as per the scenario that plays out. This moment in time in which

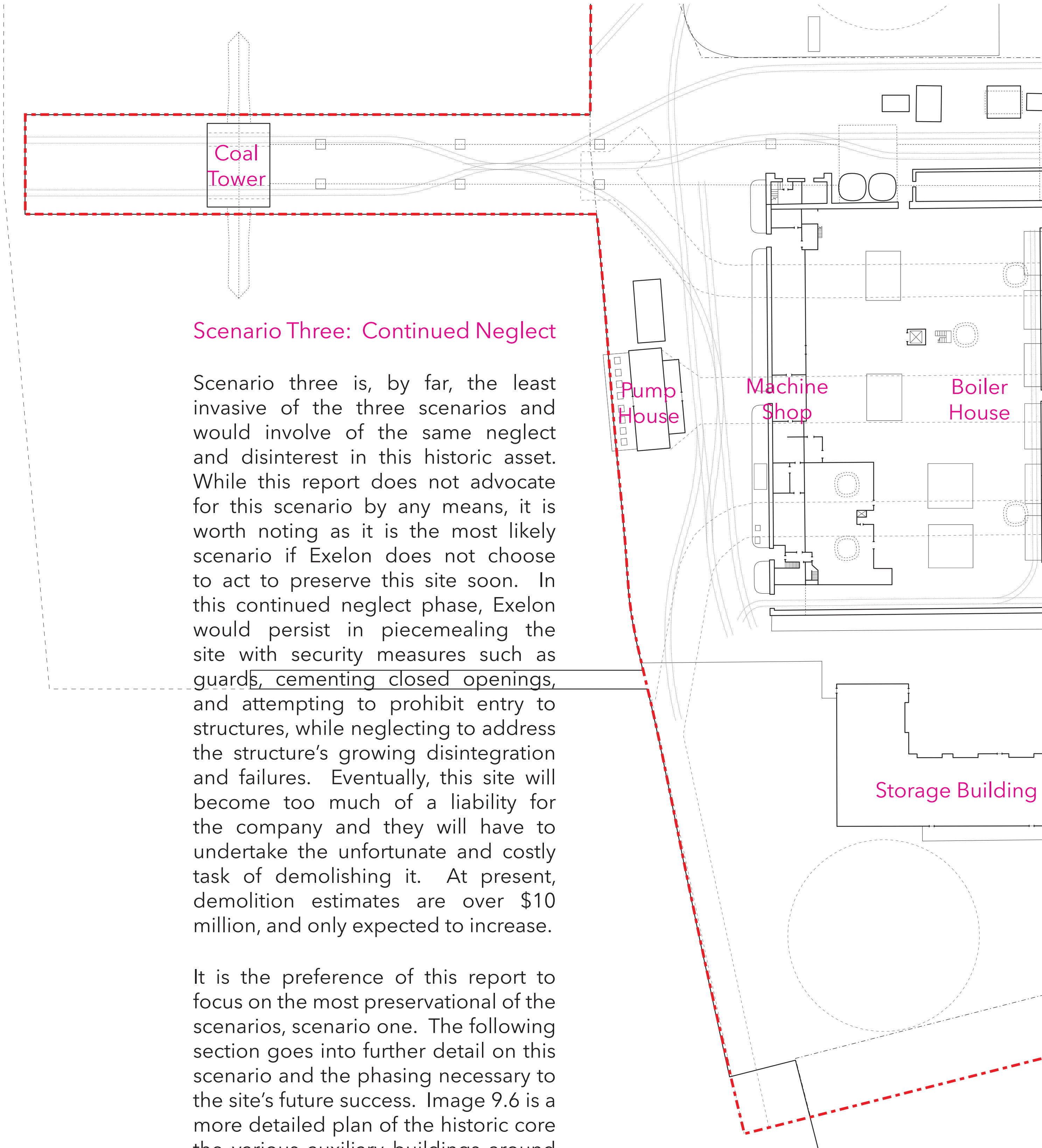
a scenario is activated would occur between the Assessment and Stabilization phases and is dependent upon what Exelon chooses to do with their site. This study has outlined three possible scenarios below. While any number of possible scenarios may be undertaken, and variations derived, what is important to understand in the following three is that they rank from most invasive to the least invasive and take into account different levels of Exelon participation in the process. The following depicts the three scenarios in a general sense. More emphasis will be placed on scenario one following this brief overview.

Scenario One: Activation and Re-Use

The most invasive scenario of the three, scenario one, or the Activation and Re-Use Scenario, focuses on the exiting bifurcation of the site by Exelon. By subdividing the parcel of land, Exelon has the unique opportunity to either sell or long-term lease the land where the historic core is to a non-profit, N.G.O., or another corporation who is interested in preserving the building and adapting the site for more green-energy development and production. This scenario still takes into account the phased renovations of the site and utilizes the general preservation approach of documenting, assessing and stabilizing the structures. By selling or leasing this portion of the property, not only can Exelon rid themselves of an impending liability (either permanently or temporarily) but the project has a better chance of being placed on a national register and therefore receiving tax credits for preservation efforts. Without tax credits, this site cannot be feasible for adaptation.

Scenario Two: Stabilization and Mothballing

Scenario two does not bifurcate the site, but rather allows Exelon to maintain ownership of the historic core. Due to the company's interest in expanding their energy production at Richmond Station, this scenario would require Exelon to undertake the stabilization of the historic core, to prevent any further deterioration of the main buildings on the site. Exelon would also need to mothball the building, completely sealing it from anyone attempting to trespass. The portions of the historic core that would need to be stabilized and mothballed include the Switch House, the Turbine Hall, the Boiler House, the Pump House, the Coal Tower, and the Coal Conveyor. This scenario would then allow Exelon to demolish select auxiliary buildings on the northeast portion of the site so that they might expand upon their corporate goals, such as battery storage, while still maintaining the essential and historically significant portions of the site. In this scenario, the historic core would be wait-listed for future adaptations when funding is more readily available and more clear goals have been outlined by Exelon, while the least significant auxiliary buildings would be removed.



Scenario Three: Continued Neglect

Scenario three is, by far, the least invasive of the three scenarios and would involve of the same neglect and disinterest in this historic asset. While this report does not advocate for this scenario by any means, it is worth noting as it is the most likely scenario if Exelon does not choose to act to preserve this site soon. In this continued neglect phase, Exelon would persist in piecemealing the site with security measures such as guards, cementing closed openings, and attempting to prohibit entry to structures, while neglecting to address the structure's growing disintegration and failures. Eventually, this site will become too much of a liability for the company and they will have to undertake the unfortunate and costly task of demolishing it. At present, demolition estimates are over $10 million, and only expected to increase.

It is the preference of this report to focus on the most preservational of the scenarios, scenario one. The following section goes into further detail on this scenario and the phasing necessary to the site's future success. Image 9.6 is a more detailed plan of the historic core the various auxiliary buildings around the site.

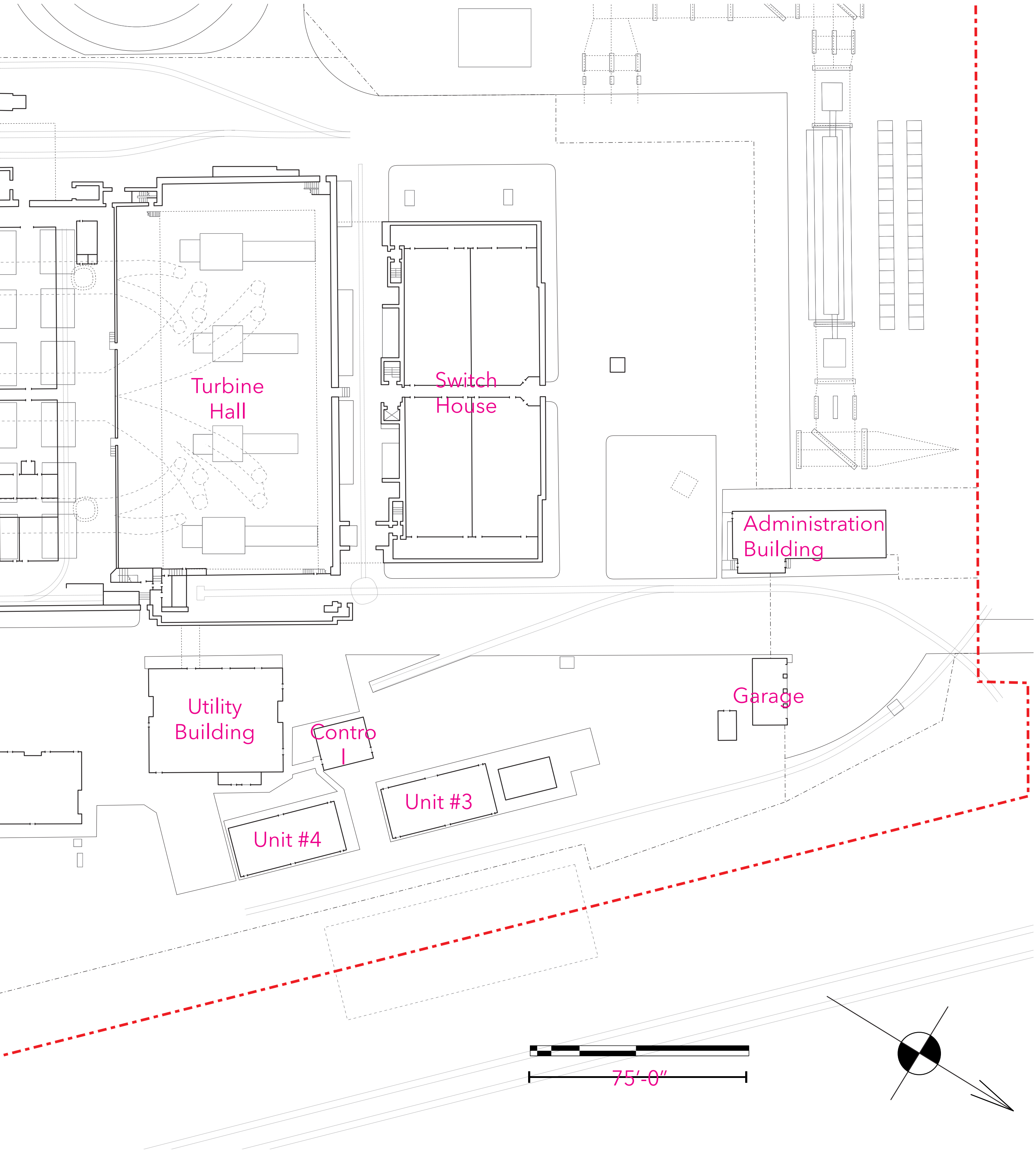


Image 9.6 - Site Plan of the Historic Core, Emily Gruendel

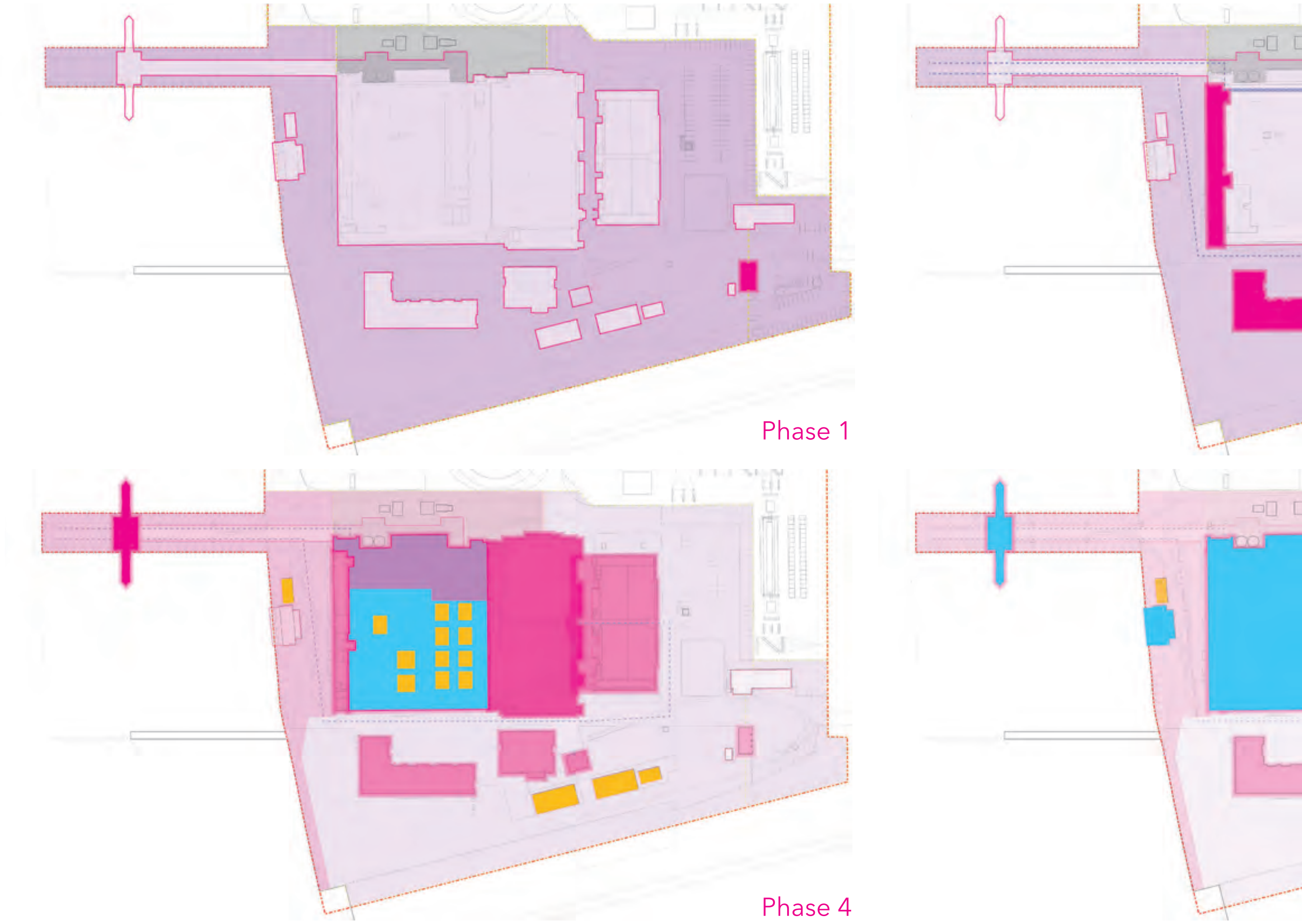


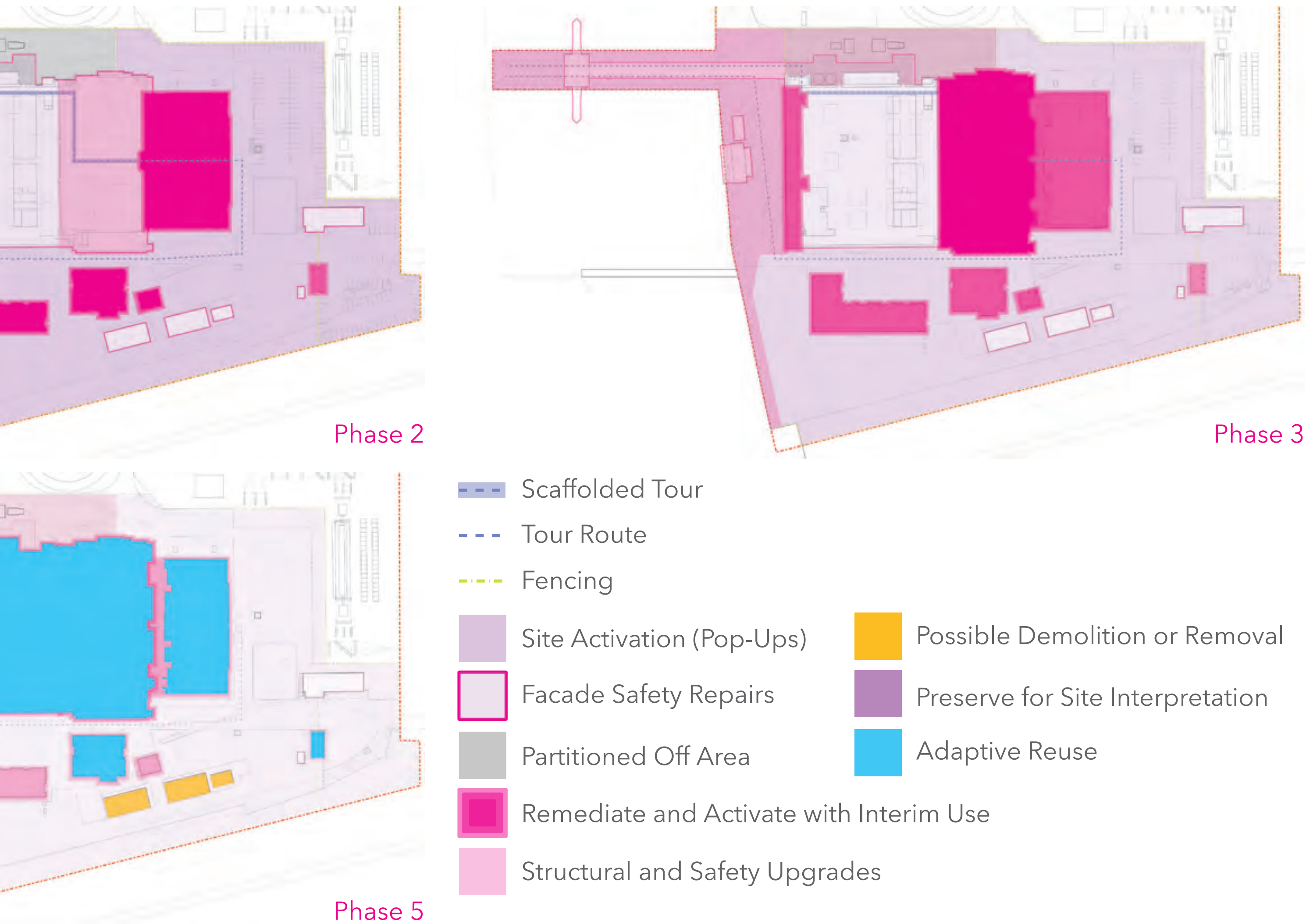
Image 9.7 - Scenario One Phase Diagrams, Emily Gruendel

9.3 Scenario One: Activation and Re-Use

Zooming in on the historic core of scenario one, the site has been subdivided and sold or long-term leased by Exelon to a third party entity interested in using tax credits to invest in its restoration and re-use. This scenario has been broken down into five distinct phases and are illustrated above (Image 9.7). The following section breaks down and describes these phases in greater detail, prioritizing adaptations by the amount of time estimated to complete them. The smaller, more easily adaptable stabilization phases are timed earlier to allow for the input of interim uses quicker and to begin to bring people to the site. Longer, more extensive processes are located in later phases so as to allow for more time in planning and financing such endeavours.

Phase 1: Site Activation

The first phase of this scenario would occur within the first year of the ownership or lease and would involve activating the site in order to increase awareness about the project to local Richmond residents and the greater Philadelphia community. Before people can access the site, however, the third party entity will need to



make some investments into the site. Specifically, minor safety upgrades and building repairs will need to be made to the exterior of the buildings. These upgrades would include removing any hazards that risk falling off the building and adding guard rails around the waterfront. This part of the phase may also involve partitioning off the site, partially, where hazards are more severe. For instance, the southern side of the building where the coal conveyor meets the boiler house may need to be fenced off because of the potential levels of hazardous materials and contamination from coal dust. This phase will also necessitate the proper, yet temporary sealing off of the buildings not yet restored nor in use so that vandals and visitors alike cannot gain access to the interior of the historic core. This may involve more heavy installments of fencing, security guards and systems, and night lighting. Reconfiguring the entry sequence and parking amenities will also be necessary during this phase in order to allow for public access. The garage building near the entry would be adaptively reused and allocated to the third party entity for office and administrative purposes. Once all of this is complete, the public may begin to come to the site for small pop-up events--such as flea markets, movie nights, ice skating, and beer gardens--and tours of the exterior of the site. If it hasn't been completed yet, the site should be nominated for the national historic register and rezoned mixed use industrial so that tax credits may become accessible for the second phase of this plan.

Phase 2: Partial Urban Ruin

The second phase of this preservation plan involves more remediation and preservation efforts on the existing structures of the property, including the Switch House, the Control House, the Utility Building, the Storage Building, and the Machine Shop. These spaces are all relatively small and would involve less effort to remediate and re-use for interim functions, such as rental spaces for small industrial entities or industrial maker spaces for local entrepreneurs. Additionally, these auxiliary buildings may be used for more long-term interim uses and not simply pop-ups. For instance, the control house would be ideal for a small bar which could expand to the exterior during the summer months, and would cater to local workers in the area of Port Richmond. The tours from phase one would also extend to the interior of the site. Since preservation efforts would not be complete in the interior of the historic core, scaffolding, curated walkways, and minor remediation measures would need to be taken to ensure the safety of visitors. During this phase it is also crucial that efforts be made to make roofing fixes to the turbine hall, or install a temporary tarp system to prevent any further deterioration of the interior of the site and its machinery. So-called the Partial Urban Ruin phase, Phase two begins to extend that site activation and public interest into more long-term endeavours by bringing in more permanent users, such as tenants, and expanding the public realm ever so slightly into the historic core.

Phase 3: Turbine Hall Restoration

The third phase of this scenario focuses on the restoration of the Turbine Hall. The most breathtaking of spaces, the Turbine Hall will necessitate a heavy amount of work to restore it to it's former glory and re-use it for either rentable space, public events, or a combination thereof. The roof will be one of the more costly of the fixes, as well as the select removal of less significant machinery on the lower level of the space. However, early estimates suggest that the structure of the roof is sound and most of the fixes will be for aesthetic and safety purposes only. This phase of the scenario should also look to conduct further safety and structural checks on the pier to determine what the next steps of the coal tower renovations might entail. While light pedestrian traffic is allowed during this phase on the pier, future permanent adaptive reuse may involve heavier load necessities and therefore proper assessment is needed to determine the appropriate upgrades. It would also be during this phase that areas which were partitioned off, like the south side of the Turbine Hall and Boiler House, be remediated thoroughly so as to allow for public access to the entirety of the exterior of the site. This phase of the project would be at least 5-10 years into the future.

Phase 4: Boiler House and Coal Tower

The most demanding phase of this project, phase four involves the remediation, stabilization, and partial adaptive reuse of the boiler house and the coal tower. The boiler house is, by far, the largest spaces in the historic core and possesses a lot of unknowns. While Exelon has already undertaken the removal of friable asbestos in this area, the boiler house still remains a labyrinth of unknown hazards and machinery. Therefore this space has been reserved for renovation 15-20 years in the future when more funding is available for the endeavour. The third party entity at this time would undertake preserving approximately one third of the boiler house for tour and interpretation purposes, allocating the other two thirds of the space for complete adaptive re-use for industrial rental purposes. This would involve the possibility of removing some of the boilers and inserting more occupiable spaces into the area, taking advantage of the existing skylighitng and sidelighting windows.

During this phase the Coal Tower will also need to be remediated and preserved on its interior. It is thought that much of the coal-related machinery exists inside this tower, and while there is not an existing elevator in this six-storied structure, it has the potential to be re-used for a plethora of functions. This space was also left until the later phasing due to the number of unknowns regarding the structure and it's internal logistics, however it is anticipated to become a very sought after space after remediation due to it's proximity and views of the riverfront.

Phase 5: Adaptive Re-Use

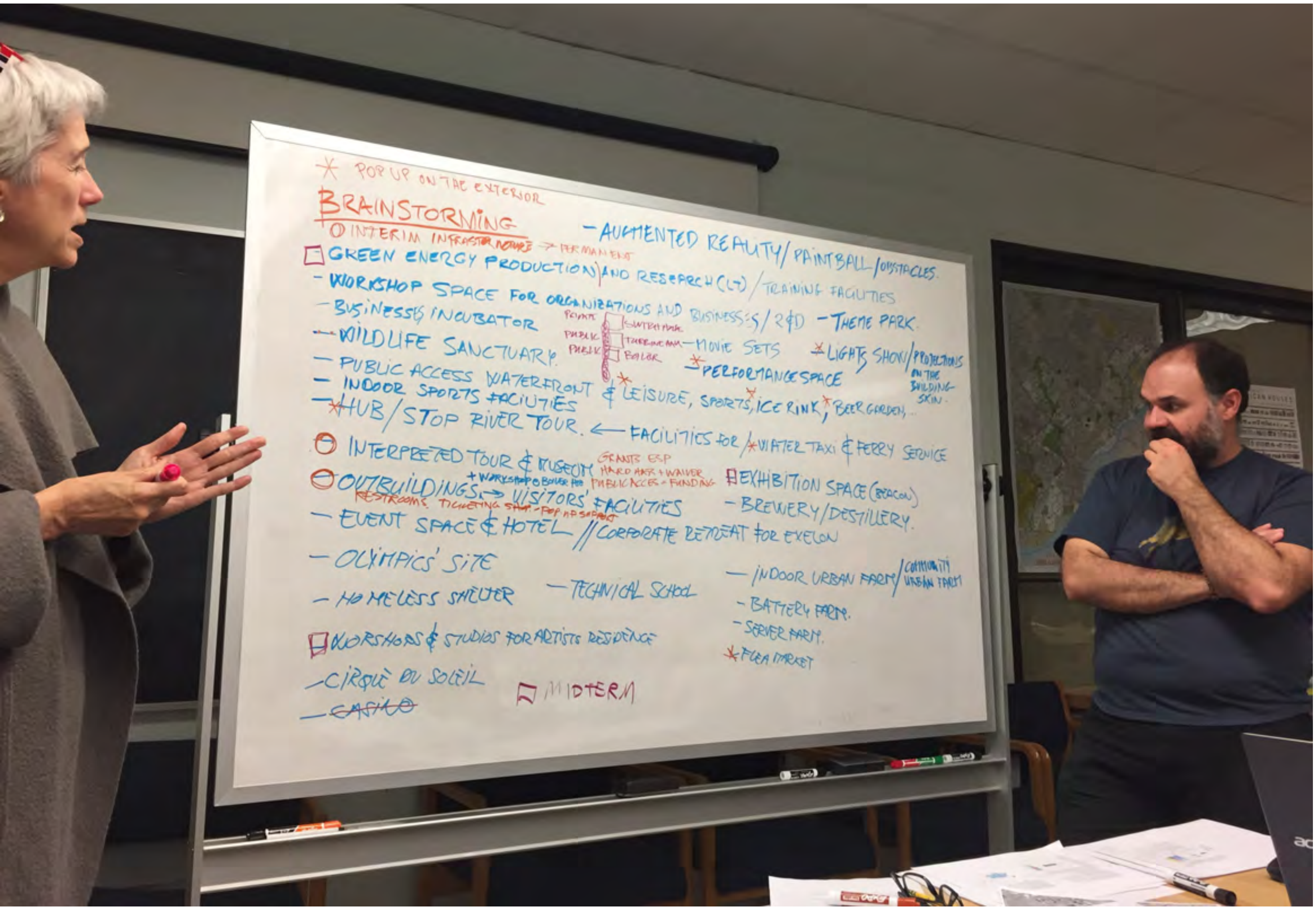
Closer to thirty years in the future, phase five will be underway at the Richmond Power Station. This phase involves taking all of the spaces that have already been remediated and fully adapting them for more permanent functions. Substituting interim uses for long term uses, such as green energy production, this phase prepares the historic core to become a major fixture for decades to come. If the site has undergone a long term lease, Exelon will begin to explore either retaking the site from the third party entity, or re-leasing it to them for continued success. Whatever the case, by phase five, the Richmond Power station will be well known and a prosperous site within Philadelphia and beyond.

Image 9.8 - Interior of the Turbine Hall, Group Site Visit, Emily Gruendel

9.4 Interim Uses

The following section explores the variety of possible interim uses that were discussed and explored for the Richmond Power Station, as depicted in Image 9.9. The purpose of interim programs are twofold. First, interim uses should help to generate funds that can be applied towards more permanent restoration efforts and second, interim uses should help to garner public support for further developments. Such programs that can fulfill these purposes include guided stabilized ruin tours the insertion of rentable office, studio, small retail, and maker-spaces (see Image 9.9). It is estimated that interim uses can be activated at Richmond Power Station within the next five to ten years, with the possibility of becoming a part of the more permanent adaptive reuse plans for the site. Interim uses are meant to be in operation while the phased restoration and renovation work is being performed. The rehabilitation of exterior spaces such as the pier area could be addressed by incorporating native plant life and benches to create a park-like environment. Aspects that illustrated how the station functioned, such as the train tracks, should be retained and incorporated into the landscape design (see Image 9.11). The following sections explore a few of these interim uses in greater detail.

Image 9.9 - Interim and permanent uses class discussion, Emily Gruendel



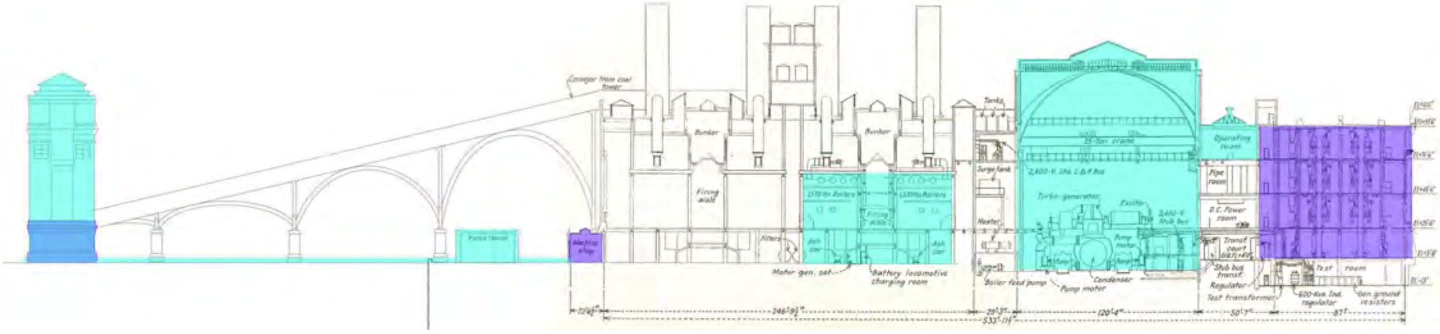


Image 9.10 - Diagram showing the location of interim programs. Teal areas indict locations of guided stabilized ruin tour. Purple areas indict proposed locations for office, studio, and retail space. Araba Prah

Stabilized Ruin Tour

A stabilized ruin tour not only allows the public to experience the site, but also highlights key character defining features and garners support for the site and its significance. Such tours would provide educational opportunities for people to learn more about the electrical generation in Philadelphia during the twentieth century. This type of educational and public exposure to the site can lead to additional sources of funding and a growth of potential stakeholders. Stops on the tour will focus on significant operational components of the site. The stabilization, and general cleaning and maintenance of toured spaces would be of high priority for this interim use. Based on the analysis of character defining features, the following areas are proposed to be a part of the tour (see Image 9.12):

- The Pier
- Coal Tower
- Pump House
- Conveyor Ramp
- The Boiler House
- The Turbine Hall
- The Control Room

This tour can begin with a boat ride from a location near center city along the riverfront, during which an explanation of Philadelphia's twentieth century industrial history and electrical production can occur. Visitors will then disembark the tour boat along the pier and make their way to the Coal Tower, where the guide will give a more detailed explanation of how coal entered the site. Another option to begin this tour would be to arrive on the site from the Richmond Avenue entrance by personal or public transportation. From here, visitors would make their way across the site and to the coal tower where the tour would begin. Ticket offices, public restrooms, additional parking, and a souvenir shop may need to be added or incorporated into the site to allow for these tours to operate on a regular basis. The stabilization and cleanup of the Coal Tower's interior will allow for visitors to ascend the space and allow for glimpses out along the waterfront. This tour would simulate the views and procession of the plant's operators. After descending the tower, visitors will traverse the pier, learning about the role the conveyor and pump house played in the operation of the station. The tour will then move to the interior of the station, winding its way through the Boiler House, Turbine Hall, and Control Room. During this procession, the guide will explain how each of these spaces and their various equipment functioned. Areas that are

Image 9.11 - Possible before and after of pier area looking towards the river. Natural planting and benches will be incorporated on the site to create a park-like atmosphere. Rail tracks found on site should remain and be incorporated into the design, for instance as part of pathways. Araba Prah

not a part of the tour can be sectioned off with temporary walls and covered with graphics and illustrations that depict how the space appeared and operated in its prime.

Office, Studio, and Retail

Office, studio, retail, and small makers-spaces are all programs which tend to have relatively flexible spatial requirements. This is beneficial if future applications of the spaces call for adjustments. While these programs are designed for short-term use, they may also become permanent fixtures on the site if they are successful and remain relevant. The following areas have been selected as potential spaces for these programs (see Image 9.13):

- The ground floor of Coal Tower
- The machine rooms
- The Switch House

These spaces were chosen due to their relative ease of access, location, flexibility of the space, and the ease of adaptation.

Ground Floor of Coal Tower

The ground floor of the coal tower covers approximately 2200 square feet. This area could be a potential spot for small retail and restroom areas for tourists and other visitors. Incorporating retail that correlates with water-related activities, such as kayaking or canoeing, would be preferable to take greater advantage of the waterfront.

The Machine Room

The Machine Room, located along the riverfront facing side of the Boiler House, covers approximately 5800 square feet. This area could be a good candidate for office, studio, and makers-spaces. Similar to other spaces in the main building, this area has a high floor to ceiling height (approximately 20 feet), great water-front views, and skylights. Heating and cooling such spaces can be difficult and costly, which may be a hinder the ability to maintained lease the space to tenants. A possible way to address this is through the compartmentalization of these spaces. Also known as the 'Russian Doll Model', this scenario entails installing a smaller, temporary structure within a larger space, thus creating a room within a room. This smaller area or pod can be heated and cooled to the occupant's preferences. Pods can also be standardized or customized to meet the user's needs. Since activities will take place in these pods, a full rehabilitation (adding flooring, painting walls, and similar requirements) of the Machine Room may not be required.

Switch House

Like the Machine Room, the Switch House could be a good candidate for office, studio, and makers-spaces. The total square footage of the Switch House is approximately 76,000, thus providing 19,000 square feet of space per floor. The conventional range for office space planning is typically 150-350 square feet per person. Theoretically, this means that the switch house could be organized to accommodate over 200 employees. Depending on the interest level for these spaces, the Switch House could accommodate one large company or become a shared workspace environment- following co-working models such as WeWork and The Grove. A more intensive rehabilitation of the switch house or the Russian Doll model can also be applied.

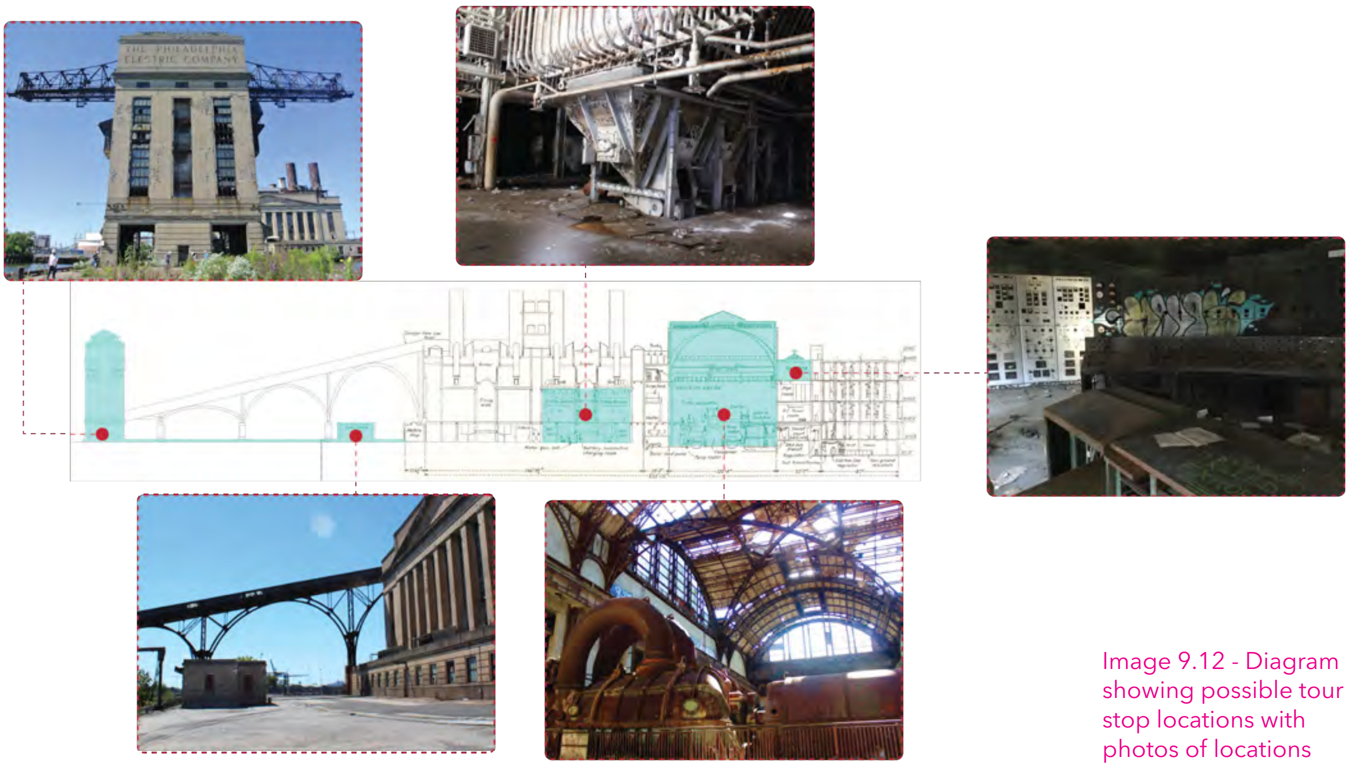


Image 9.12 - Diagram showing possible tour stop locations with photos of locations

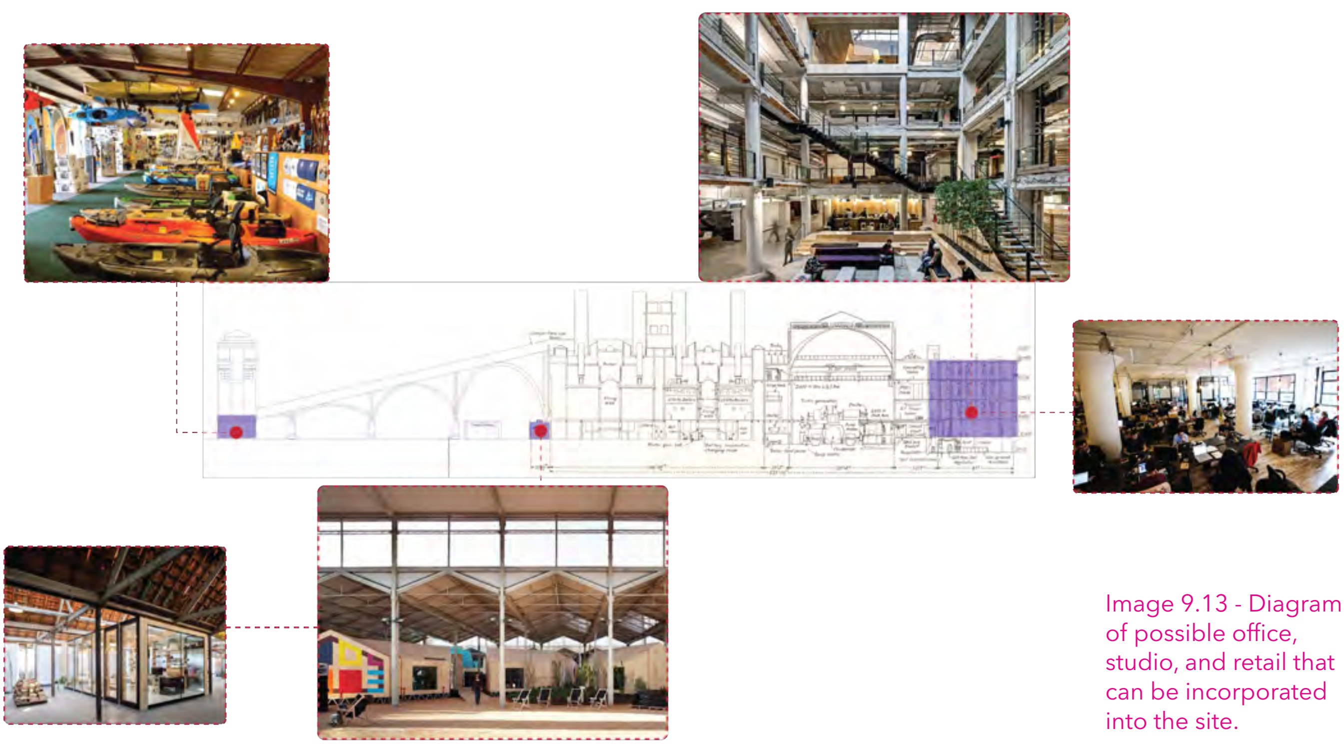


Image 9.13 - Diagram of possible office, studio, and retail that can be incorporated into the site.


Center
North Delaware District
Church
North District
Erie - Torresdale
MFL
Tioga
Bridesburg
Kensington
K&A
Aramingo Ave
Tioga St
Richmond St
Frankford Ave
Port Richmond
Frankford Creek
Allegheny Ave
Tioga Marine Terminal
I-95
Delaware River
Camden County

10.1 Connections to Master Plans

10.1.1 Introduction

Image 10.1.1 - Figure 1 -The area encompassed by the River Wards district.[a]

The potential preservation of Richmond Power Station lies within a network of current master plans created by the city and the neighboring community. The site's industrial heritage and continued use create various hurdles, mainly because of the immense scale and the costs of remediation. Within the network of the planning efforts, the preservation of the station has the potential to follow the guidelines for use and zoning, along with the implementation of various services the neighborhood of Port Richmond is interested in. This section will focus on how our preservation plan can tie into the efforts of the An Industrial Land & Market Strategy for the City of Philadelphia, the River Wards District Plan, the Master Plan for the Central Delaware, and the Strategic Plan for the Richmond Corridor Association. These four master plans encompass or outline the same relative boundary that is created for the industrial cluster around the Richmond Power Station; typically including the neighborhoods of Port Richmond and Bridesburg.

Richmond Power Station has significance through its connections with the Philadelphia Electric Company and the development of industry, but lacks qualities that made the adaptive reuse of Chester Station and Delaware Station more feasible. The reuse of Chester Station was made possible by a company that will willing to see the station's renovation costs as part of their long-term plan. Its location off of a major transportation route and connections to a more suburban area also made the site more feasible for office space. Delaware Station has a closer connection of the Philadelphia neighborhood of Fishtown, which has a high level of current construction. Through the analysis of the current master plans, and various stakeholder interviews, a couple of key elements that were considered to be significant about this region are its industrial heritage - and continued industrial zoning, limited public space for a high concentration of people, and the importance of waterfront access.

10.1.2 River Wards District Plan

The River Wards District Plan is part of the larger Philadelphia2035 master plan that is defined as the "blueprint for a 21st-century city that thrives with new growth and opportunities, connects to the region and the world, and renews is valued resources for future generations."[1] Adopted in August 2015 by the Philadelphia City Planning Commission (PCPC), the River Wards District Plan looks to create land use plans, planning focus areas and Capital Program recommendations based on civic engagement. This district includes the neighborhoods of Fishtown,

10.1 Connections to Master Plans

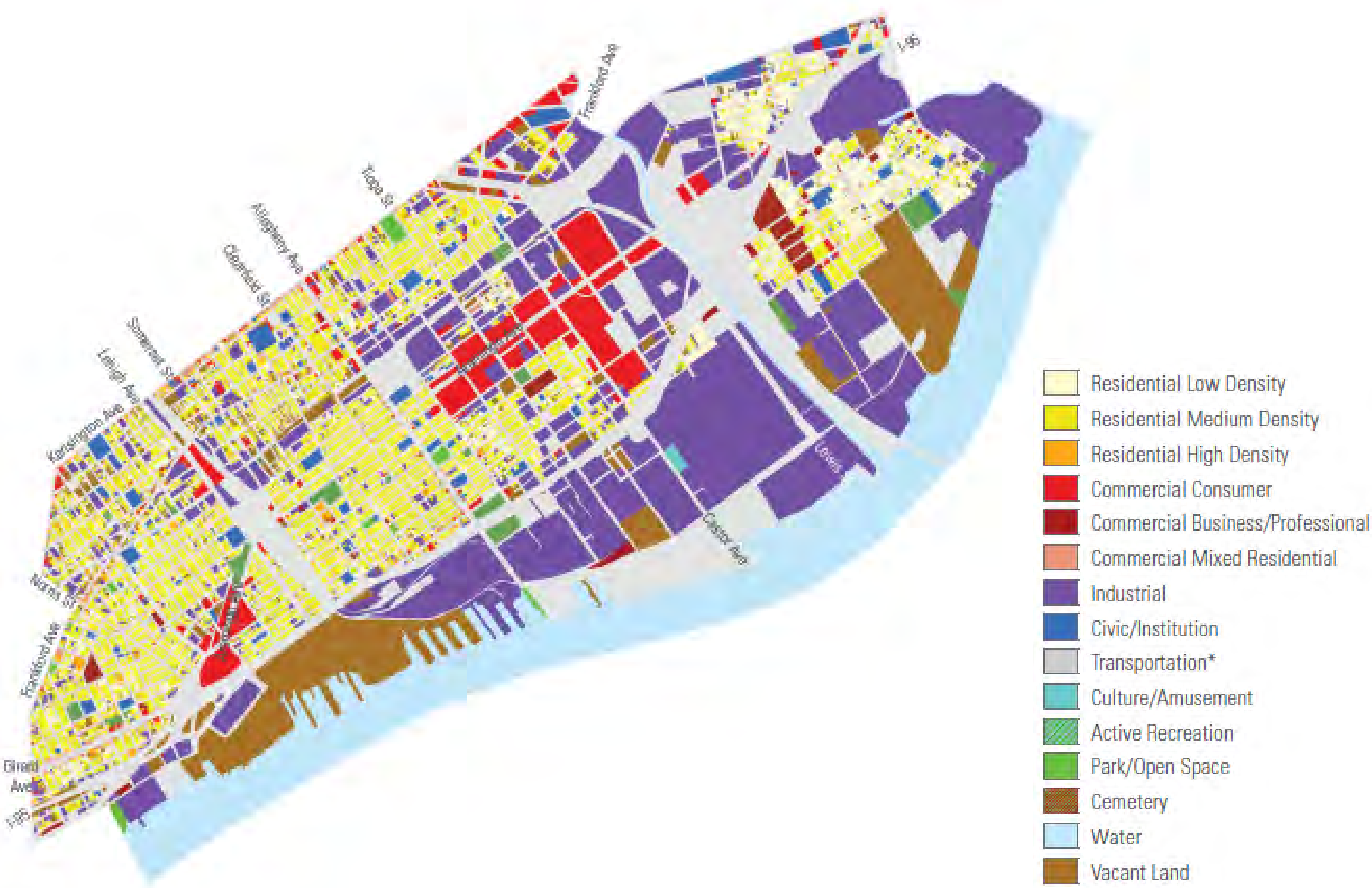
Olde Richmond, East Kensington, Kensington, Port Richmond and Bridesburg (fig. 10.1). Historically, the River Wards District has been known as an industrial and manufacturing center. It now has a wide range of business sectors, and is growing.

Port Richmond

Port Richmond was established as a district in 1847, and was consolidated into the city in 1854. By the late 1800s, the neighborhood became a major terminus for colliers who ship coal. It was also at this time that electrified trolley cars reached Port Richmond from Center City. The neighborhood has always had a strong immigrant population, historically Polish immigrants. Between the years 1882 and 1909, three Catholic cathedrals were constructed on Allegheny Ave to serve the Polish, German and other immigrant communities. In 1974, the construction of the Betsy Ross Bridge finished, linking the neighborhoods of Bridesburg and Port Richmond with Pennsauken, New Jersey, which was another industrial hub.

The neighborhood historically was a racially homogenous, white community, but it has been growing more racially and ethnically diverse. There has been large growth in the Latino population, from 11% in 2000 to 20% in 2010. In the River Wards District, the foreign born community makes up 8% of the population. This population is mainly concentrated in Bridesburg and Port Richmond closer to

Image 10.1.2 - Figure 2 - The 2015 landuse in the River Wards[b]



olish community centers and businesses along Allegheny Ave. The PCPC has projected growth for the entire district of the River Wards, following the growth in the number of housing units, housing occupancy rate and educational attainment in the district from 2000 to 2010.

Economy

At one point in Philadelphia's history, the city was considered to be the "Workshop of the World;" a center of industrial production and power. Currently, the River Wards District economy, that historically was an industrial production center, comprises industry, retail, healthcare, educational and food service enterprises. A variety of transportation options for the residents make it possible to commute to various parts of the city, but the majority of the residents work in the Center City district. 22,000 residents are employed outside of the district, with only 2,100 people living and working within the district. The unemployment rate within the district in 2010 was higher than the rest of the city of Philadelphia at 18.3%. The PCPC attributed this rate to the shift in the district's economy, a need for job and skills training and the lack of access to jobs available in other parts of the city.

Compared to other districts within Philadelphia, the River Wards has the highest percentage of housing units built before 1939 than any other district. This makes the housing stock significant, but historic homes can be difficult and expensive to maintain without proper education. With many of the residents living in poverty, especially in the Port Richmond and Kensington neighborhoods, the majority of the historic housing stock is in poor condition.

As of 2011, the Port Richmond neighborhood at 7,050 jobs in the industrial These positions are concentrated along transportation infrastructure; near subway and bus terminals. Historically, these jobs would have been concentrated along the waterfront and freight rail lines. The decrease in industrial businesses in the district has left a "legacy of large, vacant industrial facilities."[2] Many of these properties have been renovated into Makers Movement properties, but these buildings are all on a smaller scale.

Relationship to Richmond Power Station

The themes of preserving the longevity of Richmond Power Station are mentioned throughout the River Wards District master plan, especially within the context of the importance of industrial clusters in this district. In the 18th and 19th centuries, the River Wards contained the city's most important industrial centers, with the addition of manufacturing and maritime trades in the later 19th century. By the end of World War II, there was a decline in industrial production in the city. The industrial clusters remain in the River Wards, with an emergence of the clean and creative industry in the 21st century, continuing the "legacy of industry" of the district.

Within Philadelphia, the River Wards has the largest concentration of active utility facilities. This includes "power generation, energy storage and distribution, wastewater treatment, and solid-waste process."[3] Industrial businesses are responsible for 40% of employment in the district, which historically were attracted to the River Wards' "waterfront, rail and highway access, and utilities."[4] The Richmond

10.1 Connections to Master Plans

Power Station is within the Lower North Delaware Industrial District, which contains over 900 acres of industrial land. It is bound by the old Reading Railroad coal piers to the former Philadelphia Coke site east of I-95.

Moving Forward

The Philadelphia City Planning Commission defines their three main concepts to improve the studied districts as thrive, connect and renew. In the River Wards District plan, PCPC gives seven points under these concepts that should be used for future planning efforts. A diversifying economy and growth in the industrial sector within the River Wards puts the adaptive reuse of industrial properties more viable.

With the predominance of industrial land along the waterfront, both active and vacant, gives the district a unique resource. The PCPC believes that there is an opportunity to "reinvest in and manage waterfront areas to better serve the long-term needs of the city, waterfront industries, and adjoining neighborhoods."[5] Because this waterfront land in the River Wards District makes up the major industrial clusters, there is a need for a shift in city-wide policy that will protect these areas, along with organizational and support mechanisms for the businesses.

Many of the older industrial buildings are suitable for new industrial uses that require a large, single-story structure with limited partitions, characteristics that the Richmond Power Station lacks. Contemporary structures to the Richmond Power Station, including the Delaware Station in the Fishtown neighborhood, are within dense residential areas. These structures are more suitable for adaptive reuse, including "residential, commercial, and arts and cultural spaces."[6]

Moving forward, the PCPC has recommended creating several historic districts to preserve the character of the River Wards, including a Richmond Industrial Historic District which includes Richmond Power Station. For a district with a strong cultural and built heritage, along with the greatest concentration of historic building stock, only 31 properties are listed on the Philadelphia Register of Historic Places.[7] By creating historic districts instead of listing individual buildings, the neighborhoods and industrial clusters will remain more cohesive. To create further public green spaces along the Delaware River, there is also a proposed Delaware River Conservation Overlay, which "promotes and protects a system of parks and trails along the Delaware River Greenway by requiring a fifty foot buffer along the western bank of the Delaware River."[8]

The considerations and recommendations included in the River Wards District plan can help to further inform our preservation plan for the Richmond Power Station by creating a framework of significant factors that should be preserved and promoted. These factors can be compared to the Philadelphia Industrial Development Corporation's An Industrial Land & Market Strategy for the City of Philadelphia, a master plan for the industrial land within Philadelphia.

10.1.3 An Industrial Land & Market Strategy for the City of Philadelphia

Produced by the Philadelphia Industrial Development Corporation (PIDC), this master plan focuses on the industrial landscape of Philadelphia and the corporation's belief that the city's "long-term economic health depends in part on its ability to attract, accommodate, and retain industry as part of a balanced and diversified economy."[9] They are promoting the longevity of sites with industrial zoning by creating industrial clusters that will not allow for rezoning, but understand that recent industrial development is looking for larger parcel sizes and one story structures. By protecting existing industrial clusters and promoting new industry, the PIDC believes that employment opportunities and tax revenues will grow.

As a whole, industrial jobs make up 20% of the city's total employment, approximately 100,000 positions.[10] The industrial sector offers strong wages and a variety of positions from entry level to highly skilled. It also contributes more than $322 million to the city in direct taxes annually, approximately 15% of the annual tax revenue.[11] The city is suited to future industrial growth, focusing on areas that exhibited earlier decline or abandonment of earlier industrial activity.

Like the River Wards District Plan, the PIDC report also looks at the importance of restoring the historic industrial building stock. Again, the master plan focuses on the adaptive reuse of later one-story industrial structures that are easily adapted to modern uses. Because these structures are more likely found in suburban areas and on the edge of the urban core, the PIDC commented that "the

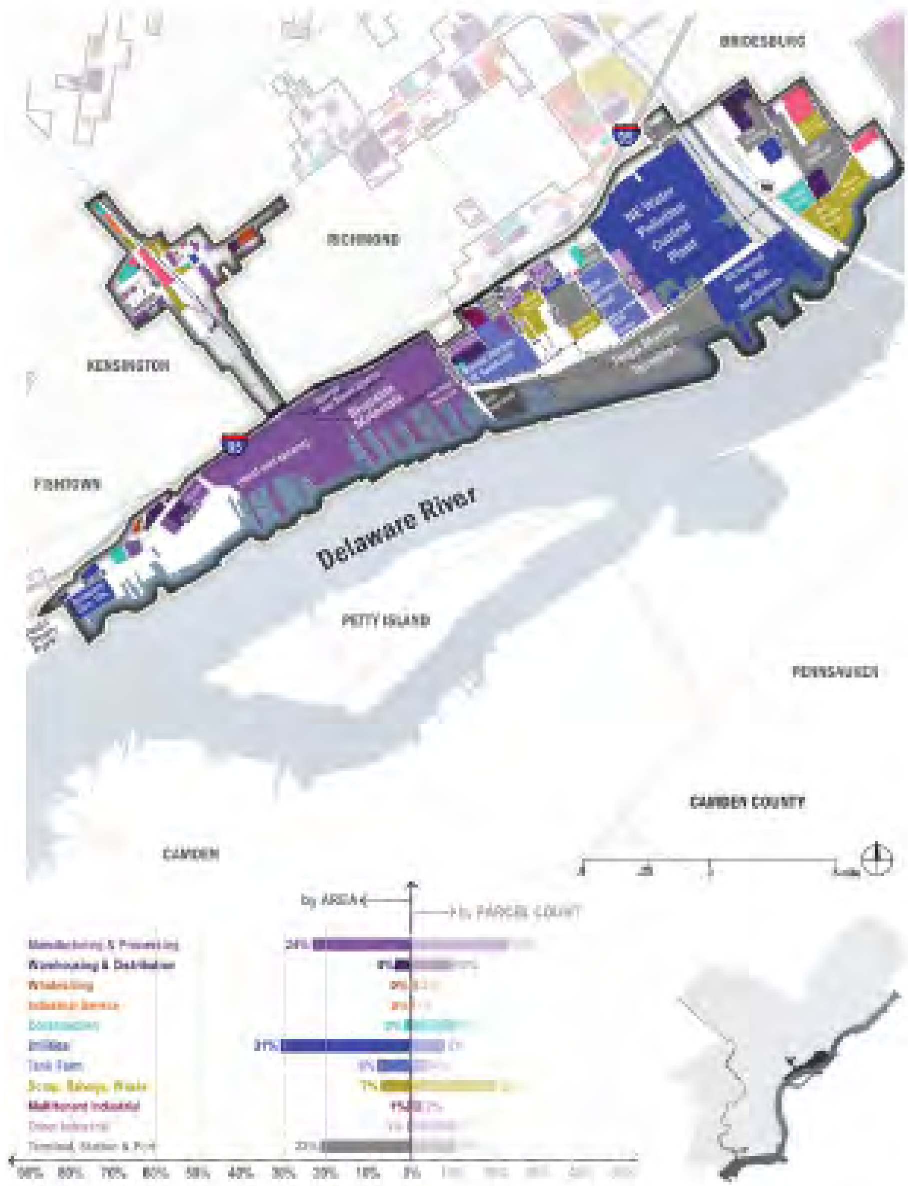


Figure 10.1.3 - Figure 3 - The zoning proposed by the PIDC for the Lower North Delaware industrial district.[c]

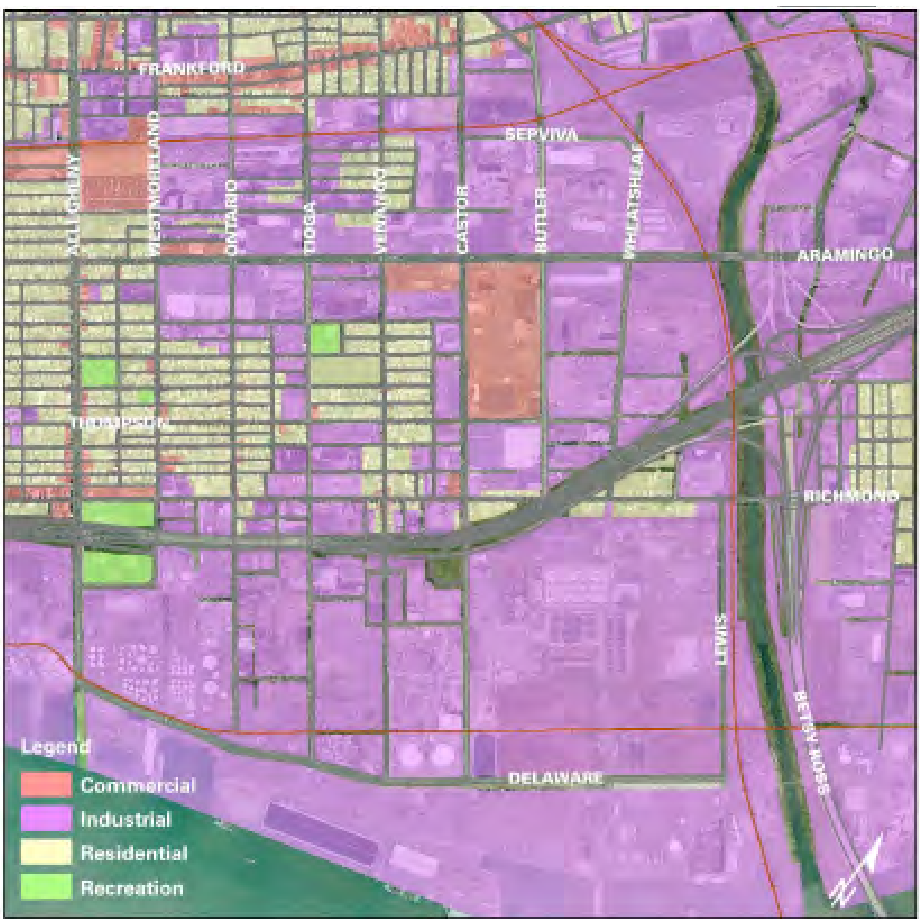
largely obsolete physical legacy of the Workshop of the World endures, lying visibly fallow," mainly due to the large number of vacant industrial structures.[12]

PIDC believes that the strengths of Philadelphia's industrial base include: "local access to a workforce suited for industrial employment, strong institutional assets in key sectors like education and health, an advantageous location at the center of the Northeastern U.S. megaregion with regional access to a large consumer market, and a growing commercial and passenger airport with unusually close proximity within city limits."[13] Along with major strengths, the industrial core of Philadelphia lacks a large inventory of buildings suited for modern industrial uses, educated workers for highly skilled positions, and job training for modern industries.

Lower North Delaware

The Richmond Power Station is situated within the Lower North Delaware industrial district (fig. 10.3). Districts were created by the PIDC based on areas that showed similar opportunities and challenges regarding their "geographies, development patterns, access and infrastructure."[14] The districts along the Delaware River waterfront were defined by the buffer created by I-95 between the industrial and residential areas, as well as large parcel sizes. Common issues are development pressure on land values, desire of the neighborhoods for river access and major

Figure 10.1.4 - Figure 4 - The area covered by the RCA study.[d]



utility infrastructure in place. The master plan looks at the number of industrial parcels, average industrial building size and average industrial building age.

The PIDC has labeled all of the industrial zone parcels in the Lower North Delaware as having a land value per square foot between $0.02 and $2.41.[15] This is mainly from their use as utility and transportation sites; with large land areas and particularly designed structures. The PIDC is recommending transferring the zoning of these sites, including Richmond Power Station from Heavy Industrial to Utilities and Transportation zoning to "directly enhance the marketability, functionality, attractiveness, and compatibility of productive industrial sites."[16]

Recommendations

The Industrial Land and Market Survey for Philadelphia includes a number of strategies to promote and expand the city's industrial economy. They include: leveraging strengths for advanced manufacturing, promoting "green" industries, supporting traditional manufacturing, developing an industrial workforce, and marketing on the behalf of the industrial sector.[17] Under the scope of advanced manufacturing, the PIDC recognizes the importance of utilizing connections between the industrial sector of the city and the major educational institutions. The PIDC also believes that by promoting the development of "green" industry, a newly formed sustainable industrial sector would be another form of capital for the city. By expanding upon existing sustainable industries, Philadelphia is in a place to become competitive within the larger region in this sector. Potential benefits of sustainable production include: "connecting Philadelphia firms to a key driver of future industrial demand, increase the level of advanced manufacturing in the City, and diversity the range of advanced manufacturing in the city."[18] The historic preservation of existing industrial structures is included under the theme of creating a "green" industrial sector. PIDC acknowledges that the city has no policies in place regarding the reuse of historic industrial sites that do not fit within the norm of typical modern industrial reuse.

10.1.4 Plan for the Richmond Corridor Association

The Richmond Corridor Association (RCA) was founded in 1998 by business leaders in the Port Richmond neighborhood who wanted to improve the conditions of the local industrial and residential communities. It exists of an approximately two square mile area along Richmond Street and Allegheny Avenue (fig. 10.4). The plan was created to "provide direction to the RCA for growth and resource allocation while further optimizing collective strengths to take advantage of opportunities as well as addressing weaknesses, challenges and threats."[19]

A business survey conducted for the plan identified the strengths of the Port Richmond industrial core as: excellent location, multimodal transportation options, the port facility, the residents and workforce, low cost of property acquisition, and the safety of the neighborhood. The identified challenges and threats for development include: illegal dumping, graffiti, insufficient parking, existing infrastructure is not compatible with modern urban industrial needs,

Image 10.1.5 - D. Pape, Site Visit (2016)

Philadelphia wage tax, high transportation costs, increased stormwater costs, loss of industrial land to retail and residential development, existing infrastructure not conductive to truck movements, and overall appearance leaves poor impression on clients and prospective employees. A closer examination of the zoning of the Richmond Corridor Association's assessment area shows the importance of industrial processes in the Port Richmond neighborhood. The majority of the residential zoned parcels are surrounded by the either industrial or commercial zoned areas, with limited access to recreational land (fig. 4).

Strategic Plan

The RCA has developed a seven step strategic plan to address the challenges of the industrial landscape of the surveyed area. It includes: (1) business retention and attraction, (2) clean-up, enforcement and public realm improvements, (3) support investments in parks and recreation, (4) wayfinding and environmental graphics, (5) transportation improvements, (6) managing RCA, and (7) promote environmental sustainability.[20] Projects to solve these challenges involve new landscaping, improved lighting and improved pedestrian crossings, and road repairs. Many of these improvements will occur in industrial and commercial

areas that are closely integrated with residential clusters, which Richmond Power Station is not.

The main two issues that the RCA has stated that are going to affect the redevelopment of vacant industrial zoned parcels are the obsolescence that was caused by the decline of manufacturing, which left behind a complicated interconnected framework of ow industry functions in the Port Richmond neighborhood. Another issue is the lack of resources available to maintain and modernize infrastructure in formerly industrial areas. The RCA wants to focus on creating a plan to minimize the vacant properties within industrial clusters to limit vandalism and illegal trash dumping, and to improve the quality of life of the residents of the neighborhood. Many of their ideas for how to accomplish this goal come from An Industrial Land & Market Strategy for the City of Philadelphia, focusing on positioning industrial land for investment, rezoning selective industrial clusters to promote growth and creating strategies for expanding and retaining industry.

A major feature of RCA's plan to support investments in area parks and recreation is their involvement in the East Coast Greenway that was created by the

Delaware River City Corporation (DRCC) that will run along Allegheny Ave and Delaware Ave to Lewis Street. This greenway will create a further link between the commercial corridor of Port Richmond and the Richmond Power Station by providing safe pedestrian pathways to the site. RCA's plan to support business with environmental sustainability efforts will potentially create new uses at the Richmond Power Station site.

10.1.5 Master Plan for the Central Delaware

The current master planning efforts along the Delaware River have not reached the Richmond Generating Site yet, but plans for north of the study area in the Master Plan for the Central Delaware are in the works. The focus of the study is to restore the life and vibrancy of the city to the declining industrial area along the waterfront of the Delaware River. Written by the DRWC Planning Committee, the master plan identifies eight principles for development along the waterfront. These principles are: "(1) create a network of civic and public spaces that are distinctive public amenities as well as catalysts for private development, (2) promote the development of new, low- to mid-rise, dense and walkable residential neighborhoods, (2) accommodate diverse land uses along the waterfront, (4) incorporate best practices in sustainability, (5) participate in creating a pedestrian-friendly and balanced transportation plan that supports

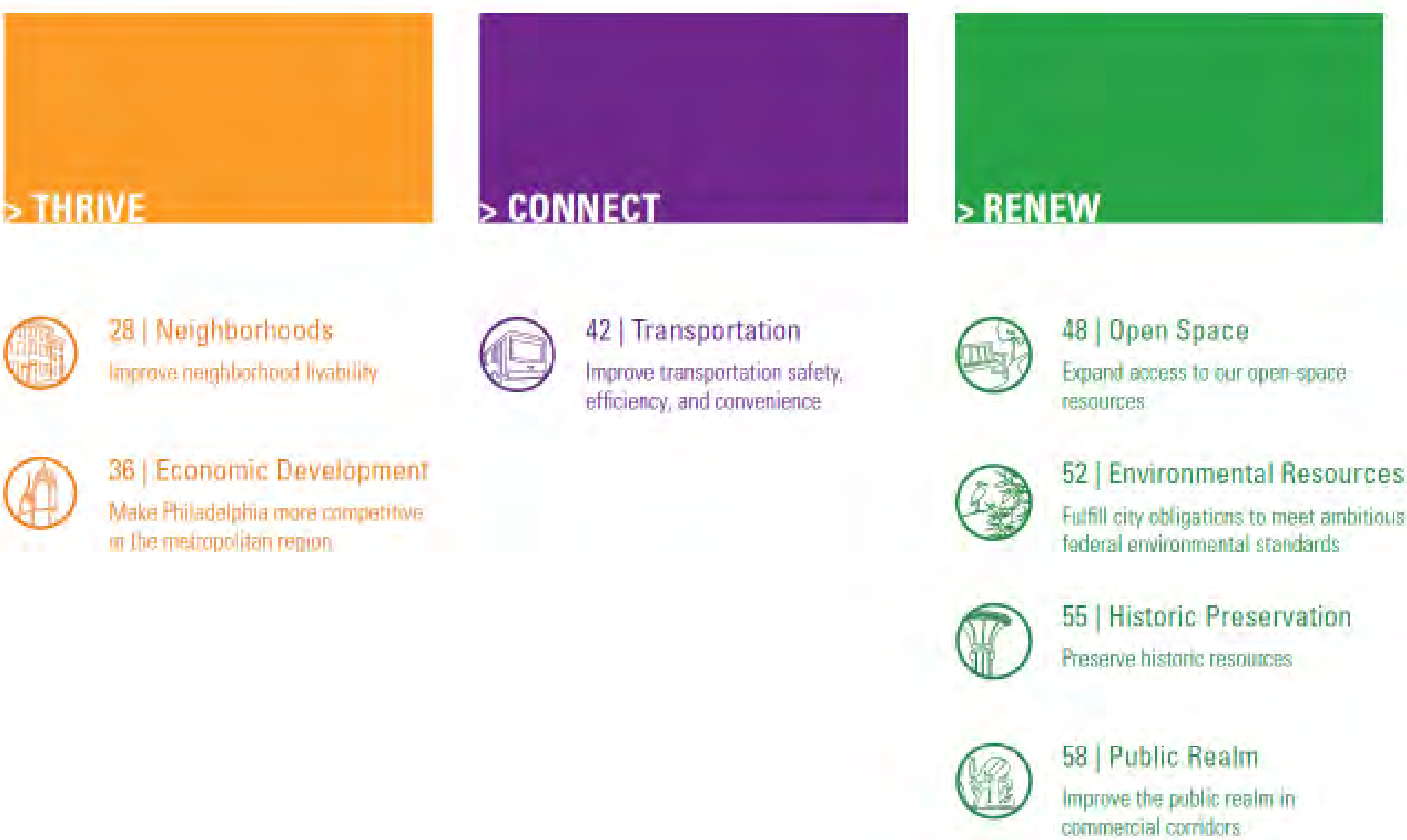


Figure 10.1.6 - Figure 5 - The principles of "Thrive, Connect, Renew" in the River Wards plan[e]

the walkability of the waterfront and its strong connection to the city and the region, (6) create strong inclusionary opportunities for economic development for minority-owned, women-owned, and disadvantaged businesses, (7) create a plan that can be implemented in discrete increments over time, and (8) create a truly Philadelphia waterfront."[21] While not specific to Richmond Power Station, these principles can be used to inform the preservation plan for the site.

10.1.6 Recommendations for the Richmond Power Station

Moving forward, the analysis of current master planning efforts called out many features of the surrounding area and key principles that can inform our preservation plan for Richmond Power Station. This analysis can be condensed down to four main recommendations -

1) The continued industrial use of the site
2) The principles of "Thrive, Connect, Renew" (fig. 10.5) found in the River Wards District Plan
3) The needs of the Port Richmond neighborhood
4) The importance of historic designation

10.1.7 Continued Industrial Use

An important feature of the Port Richmond neighborhood is the legacy of industrial clusters that is part of their cultural heritage. The PIDC calls out the industrial cluster of the Lower North Delaware as an important feature in the industrial landscape of Philadelphia. There is also a need for the continuation and expansion of the industrial clusters within the city in order to keep industry and employment from leaving the city for suburban areas. Currently, industrial jobs make up 20% of city-wide employment, with $322 million in direct taxes from industrial business to the city each year.

Because the Richmond Power Station is surrounded with other city utilities and transportation industries, the industrial cluster of the Lower North Delaware is unlikely to change. In the future, the area bounded by I-95 and the Delaware River, and the two sets of railroad tracks to the north and south, will continue to be zoned as heavy industrial. Industrial businesses will hopefully be attracted to Richmond Power Station because of the ease of access to transportation and a clear connection to the wider city of Philadelphia.

10.1.8 "Thrive, Connect, Renew"

The River Wards District Plan outlined the future steps needed for the River Wards District under the categories of "Thrive, Connect, Renew." While the entirety of the PCPC's plan does not apply for the Richmond Power Station, parts are applicable. This includes keeping employment within the district. Currently, only 2,100 residents of the River Wards district actually work in district - 22,000 residents work out of district. The unemployment rate for the district was at 18.3% in 2015, higher than that of the city. By incorporating future uses that will create jobs, the preservation plan for Richmond Power Station can help to improve the employment rates for the Port Richmond neighborhood.

An important feature of the preservation plan for Richmond Power Station should include a focus placed on environmental sustainability. This could include developing a set of design guidelines for the adaptive reuse of the existing structures, or focusing on drawing clients of "green" industries. By introducing elements such as photovoltaic panels in the ceiling of the turbine hall to let in natural light and convert sunlight into electricity, we can highlight the site's history as an electricity producer. Philadelphia has recently made a commitment to create 10,000 jobs over the next ten years in green energy, along with the investment of $1 billion of public and private funds.[22] The focus will be placed on job training and providing support for small businesses.

10.1.9 Port Richmond Neighborhood

Currently, the site of the Richmond Power Station is separated from the Port Richmond neighborhood by the size of the industrial cluster and the buffer created by the construction of I-95. As a growing neighborhood, in terms of size, age diversity and ethnicity, the site's preservation plan can attempt to fulfill some of the needs of Port Richmond. There is currently an increase in the number of housing units available, the housing occupancy rate, and the level of educational attainment by the neighborhood's residents. As a neighborhood in transition, the preservation plan for Richmond Power Station can include creating further public space and employment opportunities for the neighborhood.

The preservation of the exterior envelope of the buildings in the historic core will help to improve the aesthetics along the industrial street of Delaware Ave, making it more appealing to visitors. Part of the the Master Plan for the Central Delaware included attempting to connect the industrial riverfront to residential communities through a network of walking and biking paths. This is an element that should be encouraged in the preservation plan for Richmond Power Station.

A historic feature of the Richmond Power Station is public access to the waterfront, and its is a current desire of the Port Richmond neighborhood. People used to be able to fish in the Delaware River from the site, but the site is now closed off to visitors. Increased visitation to the site would also help to increase awareness about the significance of the historic buildings. There is limited public space in Port Richmond, and the Richmond Corridor Association is looking to provide funds to sites that are willing to create public parks and recreation space.

10.1.10 Historic Designation

The top priority of the Richmond Power Station preservation plan should be to list the site on the Philadelphia and National Registers of Historic Places. Listing the site on the National Register will provide access to historic tax credits, which will be needed for the adaptive reuse of the site. The Philadelphia Register will work to preserve the historic core of the site, and can provide public awareness about the Richmond Power Station. It has now been over a decade since the last attempt to list the site on the Philadelphia Register, and with the time passed and different political leadership another nomination should be presented to the Philadelphia Historical Commission; the old nomination should be updated to reflect the current significance of the site.

Now that the Chester Station and Delaware Station have been listed on the National Register of Historic Places for access to historic tax credits for their adaptive reuse projects, there is precedence for listing the remaining PECo station. Currently, only the Delaware Station is listed on the Philadelphia Register; this nomination was fought by the developers, but was passed by the Historical Commission. With the reuse of both Chester Station and Delaware Station, the Richmond Power Station is the last PECo station that retains all of the internal machinery.

10.1.11 Conclusions

The analysis of current master planning efforts show that due to its location in an industrial cluster, not much has been done to look at how the historic core of the Richmond Power Station could be adapted for a new use. By adapting the principles within the master plans for guiding recommendations for the preservation plan, we can align our thoughts for the future of the Richmond Power Station to fit within the scope of what other stakeholders hope to occur in the surrounding area, making our plans more feasible.

1. Philadelphia City Planning Commission, "River Wards District Plan," ii.
2. Ibid., 11.
3. Ibid., 17.
4. Ibid., 40.
5. Ibid., 21.
6. Ibid., 40.
7. Ibid., 55.
8. Ibid., 93.
9. Philadelphia Industrial Development Corporation, "An Industrial Land & Market Strategy for the City of Philadelphia," iv.
10. Ibid., vi.
11. Ibid., vi.
12. Ibid., x.
13. Ibid., 8.
14. Ibid., xiii.
15. Ibid., 56.
16. Ibid., 59.
17. Ibid., 74.
18. Ibid., 75.
19. RCA Steering Committee, "Plan for the Richmond Corridor Association," 5.
20. Ibid., 8-9.
21. Delaware River Waterfront Corporation, "Master Plan for the Central Delaware," 14.
22. "Philadelphia Energy Campaign," http://phlcouncil.com/PEC.

a. PCPC, 3.
b. PCPC, 21.
c. PIDC, 43.
d. RCA, 7.
e. PCPC, 26.

10.2 Stabilization Strategy

The Richmond Power Station is in a state of dilapidation, with conditions ranging from serious safety hazard to aesthetics. The following section summarizes a variety of conditions observed over the course of two site visits. Access to the interior of the buildings was limited, therefore an analysis of the interior conditions is superficial. In-depth assessment of the interior infrastructure is highly recommended before proceeding with a treatment testing plan.

Image 10.2.1 - Close-up of Coal Tower showing exposed rebar, staining and vandalism. (K. George, 2016)

The conditions assessment and testing treatment recommendations are categorized by priority. Safety hazards take high priority followed by conditions that pose a risk to the longevity of the building and its materials. Such examples are the roof tiles, the flooding of the site in the basement of the interior and exterior concrete spall. Lowest in priority are aesthetic conditions.

Prioritized Conditions

Overall, the conditions were organized following the preservation plan and Scenario I. For each phase, the high, medium and low priorities are listed. High priority begins with any requirement to make the space weather tight, such as sealing broken windows or open spaces in the Turbine Hall. This is an interim solution in order to make the building weather tight. Another priority is keeping water out of the building, which requires removing the flooding at the basement level. According to some reports, this is occurring because the river is no longer pumping water to create the steam necessary to power the turbines.[1]

PHASE I: Some spaces will not be activated during Phase I, but in order to prepare for this step, we have to prevent the space from getting worse. Concrete Spalling due to rebar corrosion is addressed during Phase I. This represents a safety hazard for tours or groups of people who are in the site, so it warrants repair.

PHASE II and III: Previous spaces that had been sealed now are ready for repair and replacement in order to activate the space, such as the Switch House. At this stage, the Turbine Hall roof would be restored as well as replacing and repairing the windows in doors, and repairing metal corrosion. In PHASE IV the Boiler House is ready for activation. Another aspect addressed once activation of a space is ready is bringing building up to code, such as stabilizing the staircases to allow entrance of the public to some parts of the building and incorporate fire protection systems.

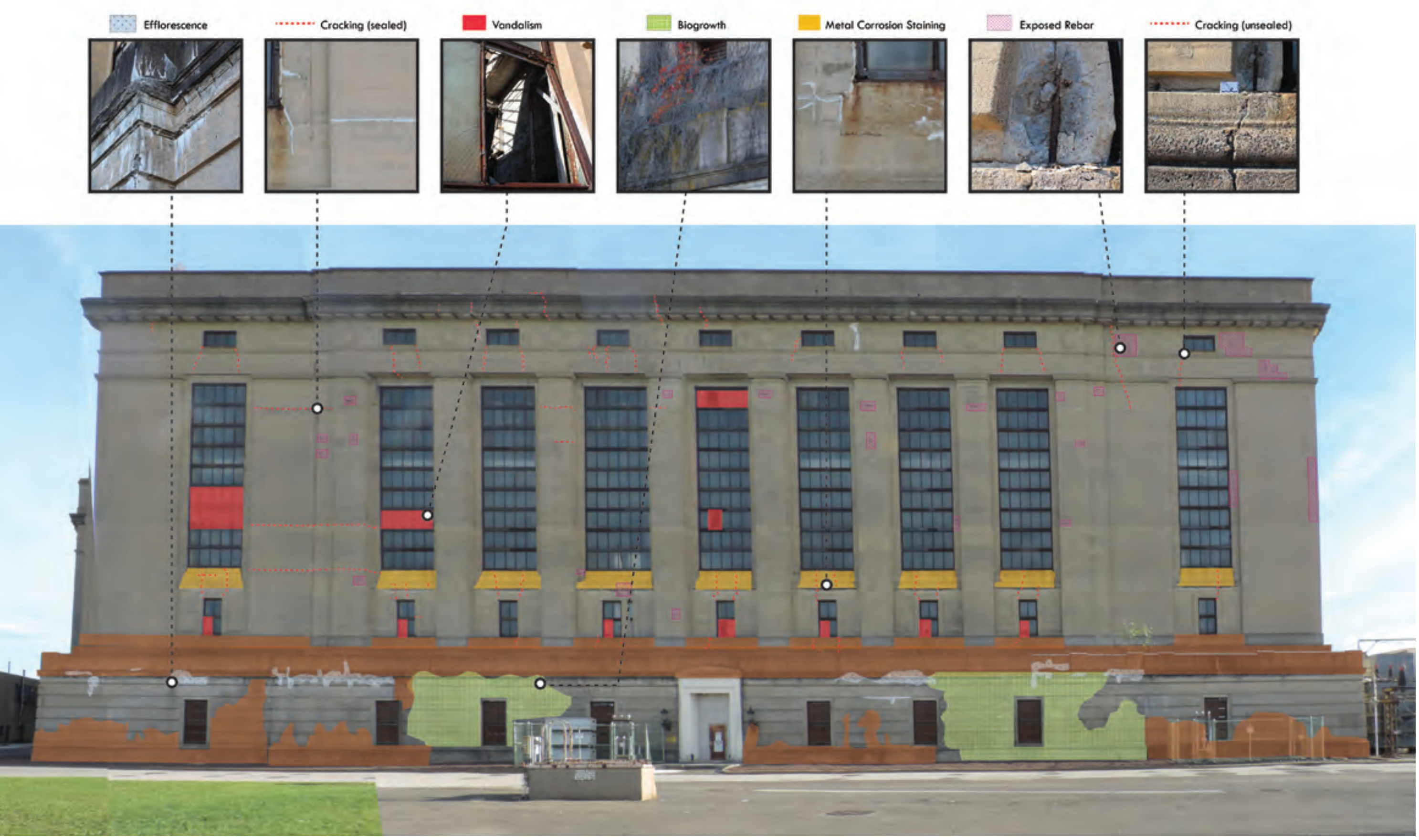
Analysis and Limitations

Before any treatments or monitoring programs are considered, an expert in the field should make an in depth structural assessment of the Richmond Power Station. These should include current conditions (identification of structural system), properties of concrete and reinforcing steel, damage assessment (corrosion), locating hidden flaws and defects (voids, trapped moisture, etc) and any building code requirements.

These can be performed by direct measurement and using non destructive and destructive testing methods. The method should follow "ACI 228.2R Nondestructive Test Methods for Evaluation of Concrete in Structures," which covers visual, tactile and sounding methods (ex: used to identify delamination of concrete) and devices such as pachometers (locate approximate depth of embedded metallic objects), surface penetrating radar (locate subsurface flaws) and electrochemical corrosion testing.

Properties to test on the concrete include compressive strength, air content, microcracking, chloride concentration and carbonation. Petrographic analysis of the concrete at Richmond Power Station, as described in "ASTM C856 Standard Practice for Petrographic Examination of Hardened Concrete" would cover many of the previously mentioned properties. Chloride content analysis

Image 10.2.3 - Rectified facade consitions survey.



and Carbonation testing (reduction in concrete PH) is recommended at the Richmond Power Station as well. Common testing references for concrete sampling and testing include "ASTM C42 Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete" and "ACI 214.4 Guide for Obtaining and Interpreting Compressive Strength Results." "ACI 228.1R In-Place Methods to Estimate Concrete Strength" can also help estimate concrete strength by discussing pin penetration (ASTM C 803), pulse velocity (ASTM C 597) and rebound hammer (ASTM C 805).

Properties to test on the reinforcing steel include yield strength and corrosion damage. For yield strength refer to "ASTM A370 "Standard Test Methods and Definitions for Mechanical Testing of Steel Products." Common corrosion testing include "ASTM C 876" Half-cell potential, which informs the owner of the likelihood of corrosion in the building.

See Appendix B for a list of conditions, listed by priority, and recommendations for treatments.

Prioritized Conditions: Phase I

Requirement for making space weather tight and safe for access

1- High Priority	2- Medium Priority	3- Low Priority
Turbine Hall Roofing: **Turbine Hall Interior:** • Flooding at the basement level • Seal windows **Boiler House Interior:** • Prevent flooding at the basement level (average of 14' per year) • Seal windows	**Switch House Interior:** • Seal windows	**Richmond Station Exterior (shell):** • Concrete Spall **Coal Tower Exterior (shell):** • Concrete Spall

Prioritized Conditions: Phase II & III

Requirement for activation of space

1- High Priority	2- Medium Priority	3- Low Priority
Switch House Roofing: **Switch House Interior:** • Replacement or repair of windows and doors • Stair construction up to code (Safety and accessibility) • Metal railing corrosion (Safety and stability)	**Turbine Hall Roofing Restoration:** **Turbine Hall Interior:** • Concrete Spall (Safety Hazard)	**Turbine Hall Interior:** • Replacement or repair of window and doors • Insulation installation in select areas • Stair construction up to code (Safety and accessibility) • Metal railing corrosion (Safety and stability)

Prioritized Conditions: Phase IV

Requirement for activation of space

1- High Priority	2- Medium Priority	3- Low Priority
Boiler House Interior: • Insulation installation in select areas • Stair construction up to code (Safety and accessibility) • Metal railing corrosion (Safety and stability)	**Boiler House Interior:** • Replacement or repair of window and doors	**Richmond Station Exterior (shell):** • Exposed Rebar (pacify) **Coal Tower Exterior (shell):** • Exposed Rebar (pacify)

Existing Conditions

Roofing

The highest priority for the stabilization of the main building at Richmond Power Station both for safety and degradation reasons is the replacement of the roof of the turbine hall. The ceiling of the Turbine Hall is an vaulted grid of steel members with Zonatile panels. Zonatile is a material that contains reinforced concrete and plaster. Due to the nature of the plaster, the tiles are decomposing at an increasing rate as more water gets into the roofing. Immediate interventions to remove the Zonatile roofing panels must be made for safety reasons. To stabilize the interior of the the turbine hall, a new roofing system must be implemented as soon as possible. Increased exposure to the elements will accelerate the corrosion of the turbines, railings and stairs, and degradation of the flooring.

The roof of the Boiler and Switch Houses are flat and covered in asphalt. They do not pose as much of an immediate threat to visitors or to the interior of the building, however a full inspection must be done as it has not been touched in over thirty years and is most likely leaking.

Flooding

Frequent floods at the basement level of the Turbine Hall and Boiler House (an average of 18 feet per year). Every rainfall finds its way into the building from either the top down or up from the river. If the river level rises, the building receives overflow. Historically, the river was used to pump water to create the steam necessary to power the turbines, helping to mitigate some of the fluctuations in water levels. Enclosure of the building at the basement and roof level is an important step towards mitigating water and therefore further deterioration.

Exterior Walls

The exterior walls of the main building of the Richmond Power Station is reinforced concrete with regular vertical columns of steel louver windows. Conditions observed were spalling around edges and corners, exposed rebar, staining and efflorescence. While many of these conditions are aesthetic, the spalling alludes to an underlying problem in the corrosion of the reinforcement in the concrete. This is an immediate concern and testing must be done to determine potential danger areas where there is hidden delamination (incipient spall).

Interior infrastructure: Stairs, Railings

The condition of the metal stairs and railings that provide necessary safety and accessibility around the Richmond site are in poor condition due to corrosion from continual exposure to moisture. The loss in section of material in many places show the lack of stability and will need to be thoroughly inspected and replaced where necessary before any activity can occur inside the building.

Applicable Tests:

ASTM A370
ASTM C42
ACI 214.4
ACI 228.1R
ASTM C803
ASTM C597
ASTM C805
ASTM A370
ASTM C876

Condition	Example	Treatment Options
Spall Concrete loss in small sections. Result of weathering or corrosion of interior reinforcing metal members.	 	Patching with compatible concrete formula and application with form-work to match original. Applicable Sources: NPS Brief 15 ASTM C856 ACI 228.2R Nondestructive Test Methods for Evaluation of Concrete in Structures ASTM C856 Standard Practice for Petrographic Examination of Hardened Concrete
Incipient Spall Spalling that has yet to occur but will unless an intervention is made.		Removal of piece to be reattached or patched over.
Exposed Rebar Reinforcing rebar exposed due to concrete spall.		Expose full area of corrosion; inspect to see if more than 20% loss has occurred. If less than 20, metal can be cleaned and a corrosion resistant should be applied. Square off concrete edges before applying patch material. Polarization resistance method (measure corrosion rates). ASTM Standard Test Method for Half-Cell Potentials of Uncoated Reinforcing Steel in Concrete (C876) ASTM A370 "Standard Test Methods and Definitions for Mechanical Testing of Steel Products.

10.2 Stabilization Strategy

Condition	Example	Treatment Options
Metal Corrosion The corrosion of metal members due to weathering.		Cleaning and rinsing metal with a dilute solution of mild detergent in water first. Extract any salt contaminants in the metal surface. Wax coatings as a protective coating and corrosion inhibitors to stabilize surface. A poultice, such as disodium ethylene diamine tetra-acetic acid (EDTA) mixed with cellulose powder can be used to remove certain salts. However, testing is needed to identify what salts are present in the metal surface. Testing: Metallographic examination of the corroded metal (examination of corroded metallic fragments)
Vandalism Graffiti, breakage, scrap metal scavenging		Organic solvents and paint strippers can dissolve and break down paints. Poulticing is considered an effective method to remove graffiti from masonry. Laser cleaning can also be used for graffiti removal. Harsh chemicals and abrasives are not recommended. A combination of cleaning materials and methods are required for successful graffiti removal. Testing mock up samples required.
Efflorescence Salt deposits or mineral salt residue adhered to the surface after water evaporates. Condensation in wall cavities that are not able to reach the exterior surface because of blocked weep holes can produce a dark coloration on the stone. Growth of salt crystals within the pores of stone can cause stresses that affect the stone's tensile strength, converting it into a powder.	 	Wet/chemical methods: (acids, bases, peroxides, detergents/ surfactants) Vacuum/ brush Poultice (the source or sources of salt would have to be removed in order to eliminate the problem all together) Otherwise, frequent maintenance using the clay poultice is needed. Other poultices used for masonry are sand and paper pulps. Testing mock up samples required.

Condition	Example	Treatment Options
Cracking Cracks that are 1/16-1/8 in wide, varying orientation and depth. Cracks can be structural or stress related.		Structural Crack: Injection of an epoxy to bond two sides of crack together. Aesthetic Crack: Route the crack, squaring off the edges and fill with a sealant.
Biogrowth Zones that include the growth of biological organisms, both macro and micro.		Carefully remove biogrowth after wetting to minimize further damage.
Loss Significant loss of original material.		Removal of Zonatile panels. Structural assessment of existing steel structure. Replacement of steel as needed; installation of modern water-tight roofing tile material.
Flooding Unwanted water collection on interior.		Traditionally the water intake was controlled through pumps that were used to bring water into the boiler house. These pumps no longer work and as a result the interior accumulates a large amount of water whenever there is a rain event. Installation of sub-pumps and grading of the site could mitigate the water intake issues.

Analysis and Limitations

Turbine Hall Roof

The lack of a roof in the turbine hall is the most highly prioritized conditions of the Richmond Site. Not only is it a major safety hazard but also a leading contributor to degradation on both the interior and the exterior. Immediate steps should be taken to create a roof over the turbine hall. Such a task appears daunting but the fact that the bones of the roof--the structural steel--are still intact and most likely in good enough shape to be used to re-roof the space. Because the structure is there, the largest cost towards roofing will be access and labor. A roofing material that is temporary such as a reinforced tarp or corrugated plexiglass or aluminum panels could be a quick and cost effective solution. If Register Nomination was achieved for the Station, the roof could be the first project done with tax credits to restore it to its original appearance and ward off further deterioration. The roof could also be a starting point for green energy production initiatives at Richmond with the installation of solar paneled roofs.

Exposed Rebar

Throughout the Richmond Power Station exterior, there is evidence of concrete loss resulting in exposed rebars and aggregate. This might have resulted from years of weathering or corrosion of the interior reinforcing member. A logical approach to address this problem is to pacify the exposed rebar before doing any patch work repair. In order to measure corrosion rates, the polarization resistance method can be used. Other referenced tests include ASTM Standard Test Method for Half-Cell Potentials of Uncoated Reinforcing Steel in Concrete (C876), which measures corrosion potentials against a copper-copper sulfate (CSE) reference electrode.[2]

Three basic protection techniques are commonly employed as basic protection methods for corrosion.[3] One technique is changing the environment around the reinforcing steel, either by decreasing the amount of chloride reaching the reinforcing steel to a value low enough to prevent severe corrosion, or (by using admixtures to the concrete) to essentially increase the concentration of chloride necessary to initiate corrosion. A second technique involves changing the nature of the rebar surface so as to be resistant to corrosion, either by surface treatment or by bulk alloying. A third technique involves changing the electrochemical nature of the surface or the rebar by impressed current, known as cathodic protection.[4]

Cathodic protection is a way to arrest corrosion without replacing the existing concrete. At Richmond Station, the spalled areas make up a small percentage and if the steel has not lost a considerable amount of its cross sectional area, than cathodic protection can be employed. If the recommended testing confirms the presence of chloride salts, we can conclude that chloride-induced rebar corrosion is occurring.[5] Calcium nitrite corrosion inhibitors could be used to combat this problem.[6] This method attempts to tie up the chloride ion in a compound of low solubility by re-passivating the reinforcing steel in the concrete, without removing sound concrete and without requiring a long term maintenance plan.

Another technique currently available to protect concrete is realkalization, which is a process to restore the alkalinity of carbonated concrete. The treatment involves soaking the concrete with an alkaline solution, in some cases forcing it into the concrete to the level of the reinforcing steel by passage of direct current.[7] These actions increase the alkalinity of the concrete around the reinforcement, thus restoring the protective alkaline environment for the reinforcement. Like impressed-current cathodic protection methods, it is costly. Other corrosion methods are also available but have a somewhat shorter history of use.

Concrete Spalling

Other types of spalling found in the exterior and interior of the Richmond Power Station will require re-patching that matches the original color, finish and texture. Concrete patching repairs can be either cosmetic or rehabilitational type repairs. However, any failed concrete found through testing should be removed prior to patching and repair.

Exterior concrete patching material can be air entrained or polymer-modified, and should incorporate an appropriate selection of aggregate and cement type, and proper water content and water to cement ratio.[8] Three main categories of surface repair material include polymer resinous mortar, polymer-modified cementitious mortar and plain cementitious mortar.[9] Polymer modified materials are not always the best solutions for repair of historic structures because of color differences. High moisture content found through testing in the adjoining concrete will restrict repair choices.

The new repair concrete mix should meet the performance and appearance requirements, and mockups should be constructed beforehand to demonstrate that the materials and methods proposed will produce an acceptable repair. In the event that concrete removal is required, the size of the chipping hammers should be limited. Electric hammers for detail chipping may be used if they don't exceed 15 pounds. If the concrete has an exposed aggregate or a surface texture, like the Richmond Power Station, a saw cut edge may be too visually evident. Diamond-tipped saw blades can also be used to methodically remove locations of failed concrete.

Richmond Power Station was made using poured in concrete showing the grain and finish texture. In order to replicate this finish once the concrete patching is performed, there are formwork construction and application methods that can be used to replicate the original texture. To conclude, in order to successfully repair concrete consider surface preparation, the installation of formwork, the development of concrete mix design, the concrete placement, its consolidation and curing.

Insulation

Several tools, such as infrared thermography can be used to identify areas of infiltration and thermal bridging. Mechanical depressurization and infrared thermography can be used to identify air leakage and heat loss locations.[10] The removal of historic fabric to introduce insulation into a historic building is not recommended to the loss of historic fabric. Installing insulation on solid masonry walls should be avoided if it requires covering or removing finishes and when the thickness increase alters the historic character of the interior. The installation of the insulation should comply with the U.S. Department of Energy's R-value chart based on climate zones in order to determine the recommended amount of insulation to be installed.

Adding insulation in cold climates result in a lower drying rate and therefore an increase of freeze thaw cycles, and prolonged periods of warmer and colder temperature on the material.[11] Basically, materials in insulated buildings will become colder during the winter months and stay wet for a longer period of time after a rain event. This in turn might speed the deterioration of some materials. Any difference in the amount of spalling of the wall is an indication that the same type of deterioration will occur more frequently throughout the building once the walls are insulated.

Efflorescence found in the building also known as movement and crystallisation of salts, and corrosion of the rebars, is a sign of prolonged damp occurring in the Richmond Power Station. These are some limitation with adding insulation, therefore careful planning and design is required to install effective insulation that does not cause long-term problems or exacerbate current conditions. It might also create new problems or cause displacement of dampness and salts.[12] Some considerations include reducing levels of water vapor moving through the wall assembly either by installing ventilated cavities or vapor control layers. The

Image 10.2.3 - Historic view of the construction of the Turbine Hall roof, showing the steel structure, still intact today. (PECO Archives)

insulation must also account for the drying out process prior to installation and afterwards.

Typical moisture sources in solid walls are water from rainfall but it is unusual for driving rain to pass through directly in most solid walls. Generally, the rain only saturates the exterior portion of the wall. Rising damp is another source of moisture, but at Richmond Power Station this does not seem to be a problem. Typically, people inside the building generate moisture. This is not an issue at the moment, but as the inside of the building becomes reused it might become one.

Overall, only certain portions of the building that will adaptively reused should be insulated, such as the Boiler House and the Switch house. After extensive thermal analysis is performed through testing and monitoring on the building, installing insulation might prove to be cost-effective long term. Typically, the full payback period is of 30 years or more but this varies.[13]

Impermeable materials such as closed cell insulation, plastic vapour barriers, cement renders, and vinyl wallpaper should not be employed in the building due that these trap moisture with the wall system. More useful material for external insulation include hemp-line composites, mineral wool and wood fibre panels.[14] Depending on the outcome of the insulation installation, it may not even be necessary to install insulation. However, testing and monitoring is needed in order to confirm this.

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10.3 Sustainability Recommendations

Image 10.6.1 - Coal Tower (E. Gruendel, 2016)

Incorporating environmentally friendly practices into new construction and renovation projects has changed from being optional to a requirement. In 2009, Bill 080025 passed in Philadelphia requiring all new municipal buildings over 10000 square feet to use 20% less energy than standard comparable structures and to achieve LEED Silver status.[1] Furthermore, in 2014 Philadelphia placed 11th in the Green Building Adoption Index (GBAI), with approximately 25% of new commercial buildings in the city being LEED certified. The GBAI analyzes trends in green building across the country, and determines which cities have the highest number of sustainably designed buildings.[2] This trend of creating more ecofriendly infrastructure is expected to rise as stricter energy regulations are enforced and fuel costs continue to rise. The building trade is not the only industry experiencing this shift towards sustainability. Companies across the country are finding ways of incorporating and highlighting their commitment to sustainability. Exelon, the current owner of the Richmond site, is one of these organizations.

When the station opened in 1921, it was praised as one of the most efficient electrical generation plants of its time. Exelon is a leader in energy development and production in the United States. Within the past year it became the largest electric utility company in the country, with an electricity output of 155 terawatt hours. As a corporation, Exelon has pledged to take a more active role in integrating sustainability into its portfolio and environmental impact, stating:

> "At Exelon, a commitment to sustainability is central to our mission of providing reliable, clean, affordable and innovative energy products… our values of operational excellence and environmental stewardship drive our commitment to conduct business in a way that minimizes environmental impacts and supports our employees, customers and the communities in which we operate". [3]

Currently Exelon's green power portfolio contains solar, wind, hydroelectric, landfill gas, and nuclear power, with plans to expand these services as renewable and sustainable energy becomes more in demand.[4] Incorporating sustainability and green practices into the redevelopment of the Richmond Power Station not only complies with Exelon's commitment to sustainability but also meets the city's efforts towards having more ecofriendly infrastructure.

The Main Building (comprising the Switch House, Turbine Hall, Boiler House, and connecting volumes) contains approximately 384,000 square feet [5] of space that can be rehabilitated for new programs and uses. To restore the rich history of energy production on the site, an aspect of energy production and development should be included in future plans. A sustainable energy research center, would achieve this. One of the greatest issues of the twenty-first century is how to provide for insatiable energy demands, without causing irrevocable harm to the planet. Sustainable energy, also known as renewable energy, refers to power (typically electrical) derived by renewable and low emission sources. The US Environmental Protection Agency defines this as "resources that rely on fuel sources that restore themselves over short periods of time and do not diminish. Such fuel sources include the sun, wind, moving water, organic plant and waste material (eligible biomass), and the earth's heat (geothermal)."[6] These are the sources that the research center will focus on.

The sustainable energy center will be a way of connecting the site's past with its future. In addition to being a place of research and innovation, the site should implement strategies to become more ecologically friendly. The proposals outlined in the next sections are meant to be implemented under Scenario 1 of the Preservation Plan (see Section 3.6: Preservation Approach for more information

10.3.1 Long Term Program: Sustainable Energy Research Center

According the Energy Information Administration, electricity generation with natural gas and renewables is expected to surpass coal generation by 2028.[7] Furthermore, policy changes, tax incentives, and technology development have reduced the cost of systems used to generate green electricity, making them a more viable option for energy production.[8,9] With the expected surge in ecofriendly energy production, research will be needed to develop more efficient means of producing, storing, and transporting green electricity.[10] For instance the National Renewable Energy Laboratory (NREL) has five satellite facilities scattered across the nation with the purpose of studying the effects of photovoltaic systems in different climates. With Exelon being the 9th largest producer of solar electricity in the country , a program similar to the NREL could be a good fit for the center. [11]

The facility should be all encompassing, a think-tank focusing on a wide range of sustainable energy technologies. The individual organizations that will make up this green coalition should be from diverse backgrounds: public, private, educational, and non-profit. Each organization will have their own designated space within the adaptively reused Main Building, with access to a wide range of communal spaces such as research and fabrication laboratories, a library center, kitchen/breakrooms, and conference rooms. The placement and design of communal spaces should encourage cross collaboration. A model for this type of program is the Energy Innovation Center in Pittsburgh, PA; a 200,000 square foot adaptive reuse historic school. This center is notable for achieving LEED Platinum status, in addition to Historic Tax Credits. Rehabilitation costs for this project was approximately $40 million.[12]

The research center could be located in the Boiler House. Excluding the two rows of boilers that are to be retained for historic interpretation, there is approximately 84,600 square feet of already established floor space (excluding intermediate floor space created by metal grate catwalks). Once extraneous equipment is removed, the total floor area could be increased by creating permanent floors on levels where the catwalks currently exist. Adding these extra floors could increase the total floor area to more than 170,000 square feet. Anticipated basic rooms and spaces needed for this type of development include:

- Office space
- Information desk
- Research and fabrication laboratories
- Library center
- Conference rooms
- Communal kitchen/break rooms
- Restrooms
- Storage rooms
- Shipping and receiving area
- Circulation areas (hallways, stairways, elevators, etc...)
- Janitorial closets
- Mechanical systems rooms/closets

Since each floor will be approximately 247 by 183 feet with existing windows on only on two sides (the northeast and southeast elevations), it is important that space planning take into account the availability of natural light. Spaces that do not require natural lighting (such as bathrooms, storage rooms, and janitorial closets) should be located in the center of the floor space. This will allow for offices, conference rooms, and communal areas access to natural light. Office spaces, the library center, and communal kitchen/break rooms should be given priority and located on the periphery. Devices and strategies to pull natural light as deep into the floor space should be utilized. Also, incorporating awareness and education should be integrated into the design. This can be accomplished through color coding the various systems in the building- similar to

Image 10.6.2 - Exterior of the Energy Innovation Center, Pittsburgh, PA. (www.eicpittsburgh.org/)

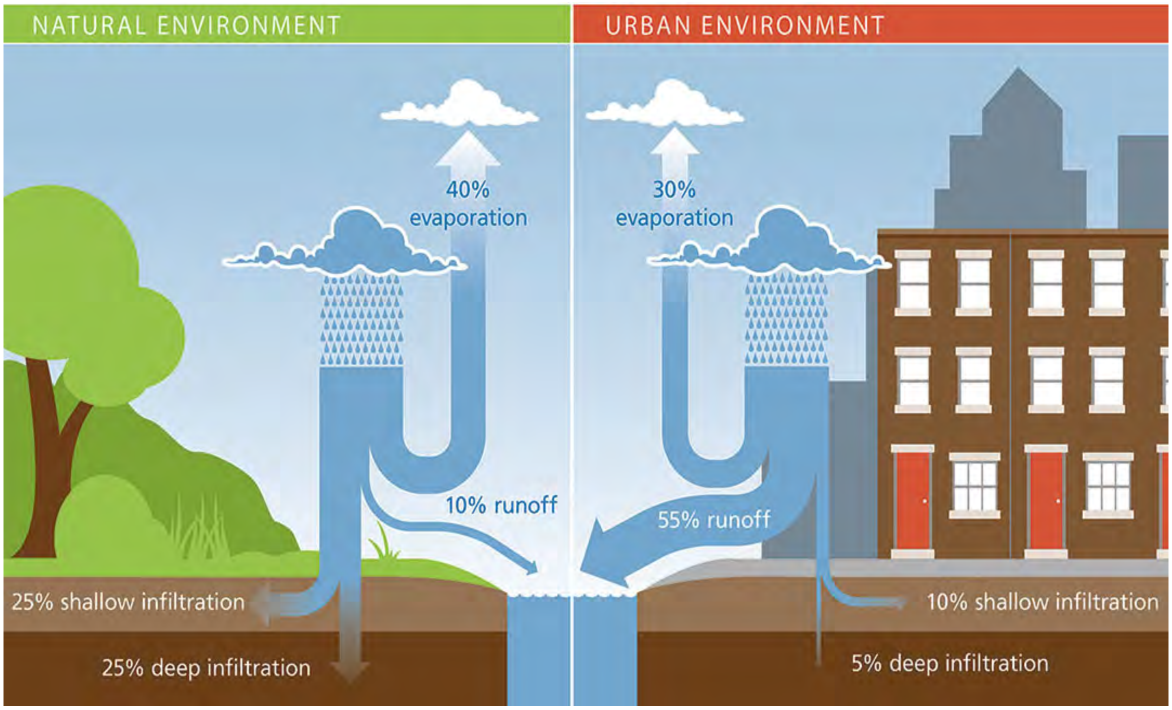
Image 10.6.3 - Interior of Energy Innovation Center showing color-coded systems (www.eicpittsburgh.org/)

Pittsburgh's Energy Innovation Center and the Pompidou Center in Paris, France-

10.3.2 Sustainability Design Recommendations

Philadelphia, like other cities across the country, has stormwater management regulations in place to reduce the rate, volume, and pollutants from runoff generated on developed sites. This runoff carries fertilizer, oils, and containments into bodies of water. In the case of combined sewer systems, high volumes of stormwater can cause raw sewage to be dumped into water systems such as the Delaware River. The roofs of the main and auxiliary buildings cover approximately 179,000 square feet; there is the potential of collecting 4,443,026 gallons of water that would otherwise run into the sewer system or directly into the Delaware River. This is enough water to fill more than six Olympic pools. Popular stormwater management techniques involve green infrastructure and water collecting devices such as cisterns. "Green infrastructure refers to natural systems that capture, cleanse and reduce stormwater runoff using plants, soils and microbes." This not only helps to fulfill city regulations, but also contributes to site beautification. Examples of green infrastructure that should be incorporated into the Richmond site are: rain gardens, bioswales, and green roofs. It is strongly recommended that native plants be used in these systems. In addition to the green infrastructure, cisterns should be used to collect roof water from surfaces that can't support vegetation, such as the roofs of the Turbine Hall and the Coal Tower. Water can be transported into cisterns through the careful placement of leaders and gutters. It is important that any infrastructure added to the buildings doesn't diminish its significance and appearance. Even though these systems, along with the other proposals outlined in this section, are meant to be implemented in Scenario 1 of the Preservation Plan, stormwater control techniques can also be incorporated into Scenario 2 (mothballing the buildings).

Image 10.6.4 - Diagram illustrating stormwater runoff in a natural environment vs. urban environment (City of Philadelphia)



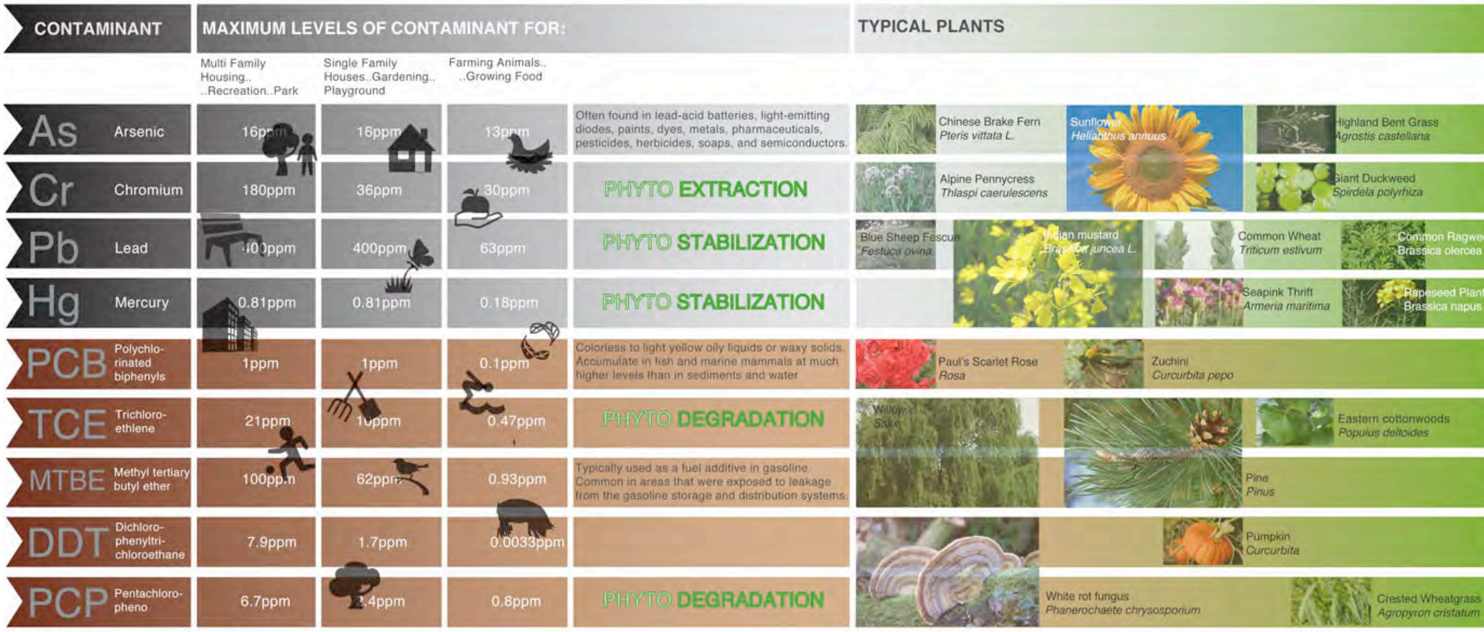


Image 10.6.5 - Diagram showing the variety of plants used in phytoremediation (www.urbanomnibus.net/)

The following proposals are meant to serve as examples on how sustainable design solutions can be incorporated into the renovation of the Richmond site. These recommendations focus the following aspects: remediation, storm water control, and energy use reduction through retaining the existing infrastructure, heating systems, and energy producing systems. These topics either currently affect the site or will need to be addressed if the area is to be occupied.

Remediation

Even though the exact type, concentration, and location of potential environmental and health hazards are unknown, contaminants such as: asbestos, lead, mercury, nickel, tin, cadmium, antimony, arsenic, as well as radioisotopes of thorium and strontium have been found on decommissioned electrical generation plants.[13] These heavy metals and radioisotopes are present because of the use of coal to generate electricity. Environmental remediation involves using various techniques to clean up contaminants such as heavy metals, volatile organic compounds, radionuclides, and other hazardous materials. The US Environmental Protection Agency lists a wide range of techniques used in environmental remediation, and the chosen technique depends on the type of contaminant, zoning classifications, and intended use of the property. Before the actual remediation can take place there are certain procedures that need to be implemented.

After the pre-cleanup agreement is signed, the first step in the investigation stage of the remediation plan is a Phase I Environmental Site Assessment (ESA). This consists of a review of the land (above and below grade) as well as physical improvements to the property. This step costs around $1000 to $5000 depending on the size of the site. Next a Phase II ESA is conducted, which involves taking samples from various locations. This can range from $5000 to over $15,000. The ESA will help to inform the best remediation techniques. Since the Richmond site is architectural and historically significant, it is imperative that any remediation preformed be sensitive to the original fabric.

Once the exact containments and their locations are determined, a remediation plan can be created. Remediation techniques that are minimally invasive should be considered first. For the interior encapsulation should be considered to reduce the amount of damage to the historic fabric. This can be a strategy to deal with lead paint on walls. For the exterior, phytoremediation – a technique that uses plants to extract toxins- could be a strategy to clean contaminants from the ground. This type of remediation is less destructive than the traditional method of excavation and fill. Phytoremediation can also cost 90% less than exaction and fill.[14] Plants such as sunflowers and poplar trees have been used to clean sites. Phytoremediation does not only pull contaminants from the ground. The plants also "absorb significant amounts of water, reducing stormwater run-off, which the U.S. EPA has identified as the most important remaining uncontrolled source of water pollution." In addition to stormwater control, fast growing plants such as poplar trees can be used for biomass energy production [and research].[15]

Stormwater Control

Philadelphia, like other cities across the country, has stormwater management regulations in place to reduce the rate, volume, and pollutants from runoff generated on developed sites. This runoff carries fertilizer, oils, and containments into bodies of water. In the case of combined sewer systems, high volumes of stormwater can cause raw sewage to be dumped into water systems such as the Delaware River. The roofs of the main and auxiliary buildings cover approximately 179,000 square feet; there is the potential of collecting 4,443,026 gallons of water that would otherwise run into the sewer system or directly into the Delaware River. This is enough water to fill more than six Olympic pools.[16] Popular stormwater management techniques involve green infrastructure and water collecting devices such as cisterns. "Green infrastructure refers to natural systems that capture, cleanse and reduce stormwater runoff using plants, soils and microbes."[17] This not only helps to fulfill city regulations, but also contributes to site beautification. Examples of green infrastructure that should be incorporated into the Richmond site are: rain gardens, bioswales, and green roofs. It is strongly recommended that native plants be used in these systems. In addition to the green infrastructure, cisterns should be used to collect roof water from surfaces that can't support vegetation, such as the roofs of the Turbine Hall and the Coal Tower. Water can be transported into cisterns through the careful placement of leaders and gutters. It is important that any infrastructure added to the buildings doesn't diminish its significance and appearance. Even though these systems, along with the other proposals outlined in this section, are meant to be implemented in Scenario 1 of the Preservation Plan, stormwater control techniques can also be incorporated into Scenario 2 (mothballing the buildings).

Rain Gardens and Bioswales

Rain gardens and bioswales are designed vegetated depressions where runoff from impervious surfaces can collect and slowly percolate into the ground. Percolation rates are typically .5 inches per hour, but the minimum recommended rate is .25 inches per hour.[18] It is important that these systems be properly sized for the amount of anticipated stormwater flow. The main difference between bioswales and rain gardens are slope and size. Rain garden gardens are designed for level grades and bioswales are used in sloped areas. Furthermore, bioswales are designed to capture more water than rain gardens, thus cover a larger area.

The Richmond site will need to be closely evaluated to determine the best locations for rain gardens and bioswales. Areas that typically flood on site have not been documented. Part of the evaluation should involve finding these areas and documenting the grade of the land on site. Designs can then be creating taking advantage of the current conditions, or the site can be regraded as needed so that runoff moves towards particular areas. A potential area for a bioswale can be on or near the Pier, or the open area to the north east of the Garage Building. It is important to keep in mind that due to their size bioswales are usually engineered by specialists. Rain gardens on the other hand are less complex and there are a number of sources and calculators that can be used to compute the proper size. In the table below are some of the main components of each system.[19]

Rain Garden	Bioswale
• On neutral grade • 6-9 inches of ponding depth • Amended soils or native soils • Subdrain (enhanced rain garden) • A least 2 inches of concrete sand • Mulch • Plants	• On sloped grade • Incorporates curb cuts to allow water to enter system • 6-9 inches of ponding depth • Amended soils • Subdrain bedded in clean/washed aggregate • A least 2 inches of concrete sand • Designated outlet for overflow • Mulch • Plants

Green Roofs

Similar to bioswales and rain gardens, green roofs use vegetation and soil to absorb stormwater, thus reducing the amount of runoff from roofs. Green roofs can be classified into two main categories: extensive and intensive. The main difference between the assemblies is the depth of the growing medium. Extensive roofs have shallower soil depths, which limits the type of vegetation that can be used to sedums and grasses. Intensive assemblies on the other hand, have deeper soil depths, thus can hold a greater amount of water and varieties of plants such as flowers, shrubs, and trees. This type of green roof is often reserved for accessible rooftops, and can become elaborate/park like. A good area for an intensive roof could be the roof of the machine shop which is accessible through 1st floor doors in the Boiler House. The best areas to install a green roof are on shallow pitched surfaces. Many of the buildings on site fall into this category. It is recommended that an extensive green roof be installed on all auxiliary buildings and the roofs of the Boiler House and Switch House. In addition to stormwater control, vegetation also reduces localized heat island effect.

Image 10.6.6 - Example of a Rain Garden (BlueThumb.com)

10.3 Sustainability Recommendations

Retaining Existing Infrastructure (Energy Use Reduction)

"Becoming more energy efficient is the cheapest and fastest way to cut energy bills and reduce carbon pollution". [20] One of the biggest challenges in regard to sustainable design is how to make building more energy efficient. What is often overlooked is the amount of energy and materials that is required to construct new buildings. The phrase "the greenest building is one that has already been built", has been around for decades. It has become a recognized fact that existing buildings can be inherently "greener" when compared to the mainstream model of demolition then construct something new. The main and auxiliary buildings contain an enormous amount of embodied energy. "Embodied energy is the total energy required for the extraction, processing, manufacture, and delivery of buildings materials," or in other words the front-end impact of erecting a building. This energy is a reflection on how much carbon dioxide can be saved by reusing existing buildings.

The exact amount of embodied energy contained at the Richmond site is unknown, but a typical industrial building contains roughly 970 MBTU per square foot. Using the MTWAS Embodied Energy Calculator, the historic buildings on site contain an estimated 293,279,500 MBTUs or 2,550,257 gallons of gasoline. Furthermore, demolishing the buildings would require 3,079,434,750,000 MBTUs, or 26,777,693,478 gallons of gasoline.[21,22] Therefore, it is strongly recommended that any type of adaptive reuse retain as much of the existing structure as possible. Any additions or entrances constructed as part of the adaptive reuse program should incorporate materials and construction methods that have a low environmental impact. Especially, the locations of windows and skylights should be preserved. They not only provide natural light and architectural aesthetics, but also help to reduce the electricity needed for artificial lighting

Heating Systems (Energy Use Reduction)

A major concern in rehabilitating the site is the cost to heat the buildings. Space heating typically demands the most energy use in commercial buildings, followed by lighting. Due the large volumetric spaces in the Main Building space heating needs to be carefully designed to maximize heat potential and efficiency while minimizing the amount required energy. It is strongly recommended that a HVAC engineer with expertise in designing systems for large spaces be consulted when designing the heating and cooling system for the Main Building. There are a variety of options that can be used to efficient regulate the temperature in large spaces. Some techniques often used are: radiant flooring, close-source vents, and low velocity fans.

Studies have shown that radiant heating helps individuals feel warmer at lower temperatures than other methods of heating. Radiant floor systems apply heat directly to the floor through a network of heated water pipes. This keeps the heat close to the individual and spreads the heat through a large space instead of it concentrating in one area. If using a forced air system, having self-operating vents strategically placed close to where an individual will be standing or sitting can also help give the impression of the space being warmer than it actually is.

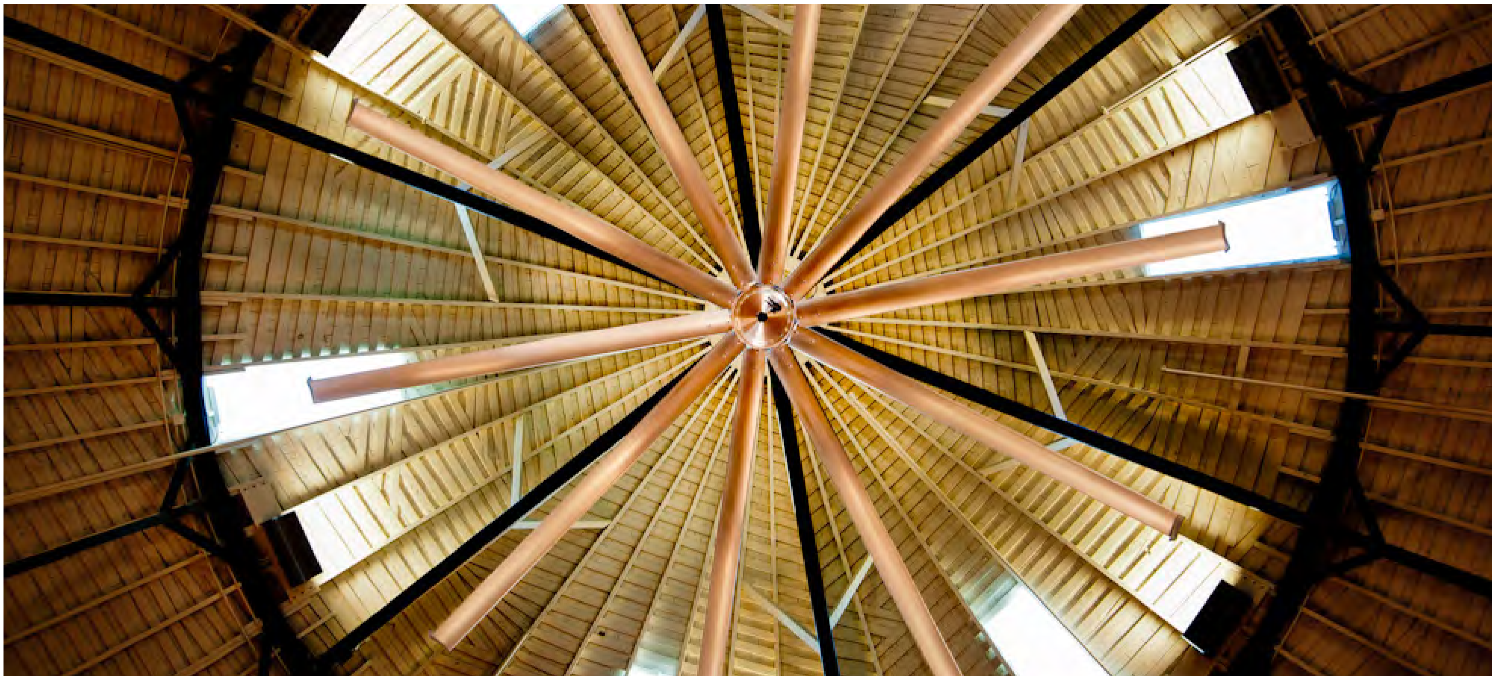


Image 10.6.7 - View of the north corner of the Main Building (E. Gruendel, 2016)

Image 10.6.8 - HVLS fan in the DeTurk Round Barn also seen as a "work of art" (www.design.bigasssolutions.com/)

Since warm air rises, one of the issues with rooms with tall ceilings is the stratification of warm air. This will be an issue with the Main Building with most of the floor to ceiling height ranging between 14 and 25 feet in the Switch House and Boiler House and the Turbine Hall with a maximum height of 130 feet. High-volume low-speed (HVLS) fans are often used in these situations to help regulate the temperature within tall spaces. These fans range from 7 feet in diameter to 24 feet. HVLS fans are used in a range of projects including adaptive reuse projects, such as transforming a 130-year old iron factory into a bowling alley. The Brooklyn Bowl incorporated four 10 foot diameter HVLS fans to help regulate the internal temperature, keeping customers comfortable and reducing HVAC cost by approximately 30%.[23] HVLS fans were also used in a project converting a historic barn with a 44 foot ceiling to a community event center. In this project the 24 foot wide fan not only helps moderate temperatures, but is also a sculptural piece- "blending its contemporary look with the historic structure's charm". [24]

Energy Producing Systems (Energy Use Reduction)

Electricity typically accounts for 61% of the energy consumed in commercial building.[25] A strategy to help reduce the amount of electricity that is produced using fossil fuels is to incorporate renewable electric generation on site. Photovoltaics are becoming more and more efficient, and a popular means of creating electricity for buildings. Technology and innovation have allowed these devices to be used in a variety of situations. The latest wave in this industry is building-integrated photovoltaics (BIPV) systems. BIPVs can range in appearance from ceramic shingles to completely transparent to be used for window glass. This technology could be utilized as a replacement glass for the many skylights through the Main Building and windows on the façade that get direct light. Another option could be to incorporate this technology into the roof of the Turbine Hall by replacing the deteriorating Zonatile with transparent or semi-opaque BIPV panels. With an approximate area of 46,000 square feet just for the Turbine Hall room, a significant amount of electricity can be produced. Also, this technology could tie into the sustainable energy research center outlined in Section 10.3.1.

Another green power that can be incorporated onto the site are wind turbines. The turbines can be placed along the edge of the site near the river, or the roof of the buildings. It is recommended that vertical axis wind turbines (VAWTs), particularly the Helix Wind brand, be used on the Richmond site because the uniquely designed rotors are "capable of capturing omni-directional winds to provide quieter, kinder small wind power". This design is more wildlife friendly because the appearance of the blades is more noticeable, reducing the chance of collision by birds or bats.[26] The integration of energy producing systems can also be part of future tours on the site, providing a demonstration on how electrical generation has evolved over the past 91 years.

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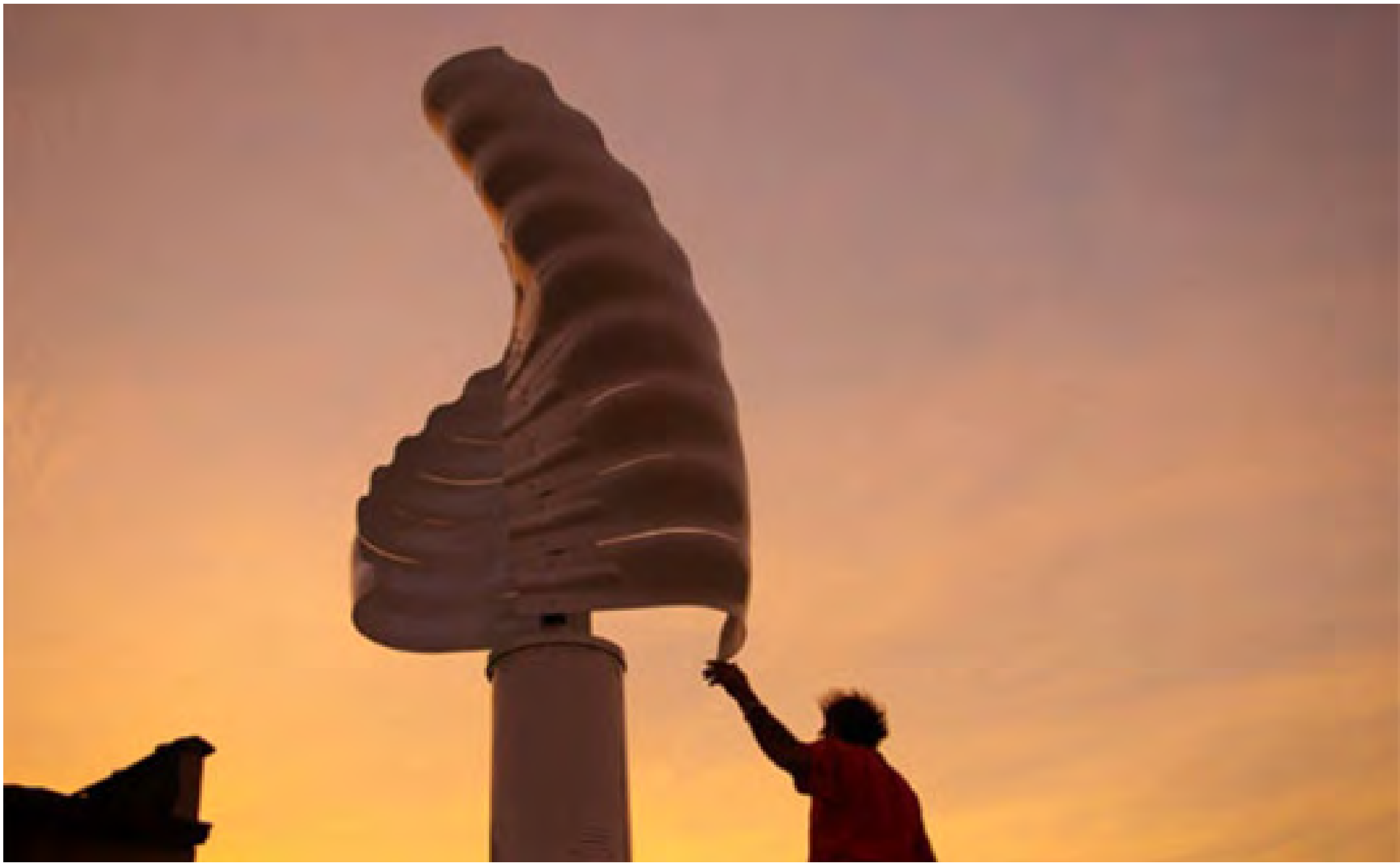

Image 10.6.9 - Building retrofits using BIPV (www.yelloblue.com/bipv/)

Image 10.6.10 - Helix Wind VAWT (http://inhabitat.com/)

10.3 Sustainability Recommendations

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3. Exelon Corporation Sustainability Report 2015. Report. 2016. Accessed December 8, 2016. http://www.exeloncorp.com/sustainability/Documents/dwnld_Exelon_CSR (1).pdf.

4. "Impact-Sustainability." Exelon. Accessed December 21, 2016. http://www.exeloncorp.com/sustainability/impact.

5. Richmond Station's Operator's Manual, date and author unknown, Archives of Walt Mansy.

6. "What Is Green Power?" EPA. March 29, 2016. Accessed December 17, 2016. https://www.epa.gov/greenpower/what-green-power.

7. "U.S. Energy Information Administration - EIA - Independent Statistics and Analysis." Annual Energy Outlook 2016. 2016. Accessed December 08, 2016. http://www.eia.gov/outlooks/aeo/pdf/0383(2016).pdf. ES-2

8. Systems such as photovoltaics, wind turbines, geothermal pumps, and methane gas collection systems.

9. "U.S. Energy Information Administration - EIA - Independent Statistics and Analysis." Annual Energy Outlook 2016. 2016. Accessed December 08, 2016. http://www.eia.gov/outlooks/aeo/pdf/0383(2016).pdf.

10. Green electricity refers to electricity produced from sources that do not negatively impact the environment.

11. "Solar." Solar Power: Clean, Renewable Energy. Accessed December 11, 2016. http://www.exeloncorp.com/companies/exelon-generation/solar/Pages/default.aspx.

12. "Energy and Innovation Center." The Urban Redevelopment Authority of Pittsburgh. Accessed December 17, 2016. http://www.ura.org/pdfs/showcase/Energy-Innovation-Center.pdf.

13. "Heavy Metals and Coal." Heavy Metals and Coal - SourceWatch. Accessed November 23, 2016. http://www.sourcewatch.org/index.php/Heavy_metals_and_coal.

14. Kühl , Kaja. "From Brownfields to Greenfields: A Field Guide to Phytoremediation." Urban Omnibus. November 10, 2010. Accessed December 17, 2016. http://urbanomnibus.net/2010/11/from-brownfields-to-greenfields-a-field-guide-to-phytoremediation/.

15."Planting Poplar Trees to Remediate Brownfields in Muskegon, MI." Planting Poplar Trees to Remediate Brownfields in Muskegon, MI | Delta Institute. March 11, 2015. Accessed December 12, 2016. http://delta-institute.org/2015/03/planting-poplar-trees-to-remediate-brownfields-in-muskegon-mi/.

16. The roofs of the main and auxiliary buildings cover approximately 178,650 square feet. For every inch of rainfall per square foot one can expect to collect .6 gallons of water. Since Philadelphia gets about 41.45 inch of rain per year, this yields 24.87 gallons per square foot. There is the potential to collect 4,443,025.5 gallons of water. An Olympic pool can hold 660,430 gallons.

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20. Energy Efficiency. NRDC. Accessed December 19, 2016. https://www.nrdc.org/issues/energy-efficiency.

21. The total square footage of the historical buildings is approximately 302350

22. "Welcome to the May T. Watts Appreciation Society Embodied Energy Page." Welcome to the May T. Watts Appreciation Society Embodied Energy Page. Accessed December 20, 2016. http://thegreenestbuilding.org/.

"Brooklyn Bowl | Architects & Engineers." Brooklyn Bowl | Architects

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25. “U.S. Energy Information Administration - EIA - Independent Statistics and Analysis.” Energy Information Administration (EIA)- Commercial Buildings Energy Consumption Survey (CBECS). Accessed December 19, 2016. http://www.eia.gov/consumption/commercial/.
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10.4 Resiliency Efforts

Image 10.4.1 - Coal tower on Delaware River, E. Oxland, Site Visit (2016)

In the 21st century, threat of climate change and specifically rising sea levels are the direst for the continued existence of Richmond Station. While there are numerous projections as to how high water will rise, the station's site will be challenged sooner rather than later. In other words, even with mild climate change the entirety of Richmond Generating Station's site would be compromised.

Like many other coastal cities, areas in Philadelphia adjacent to rivers or shoreline are projected to be inundated by rising sea levels, and makes Richmond Station's location directly adjacent to the Delaware River is precarious for the built fabric.[1] While there is infill several feet high abutting the river, the highest point on the site is between nine and twelve feet above sea level near Delaware Avenue, which puts it at risk of inundation in most climate change scenarios. The risk is also severe in disaster scenarios, not only due to the low elevation but the risk of contamination from surrounding property.

Nearby industry compounds the threat of rising sea levels due to the hazardous chemicals used or stored at them. Surrounding uses include a port, several chemical storage facilities, and a waste treatment plant. In addition to the chemical pollution that will occur when inundated, the power station is limited in physical barriers it may use to prevent sea level rise. If a levee system is put in place to try and reduce water intrusion on the site, it would require one of two circumstances: either the neighboring properties would have to commit to a similar system and try to divert the water towards an adjacent property such as Frankford Creek to the northeast of the power station, or completely surround the site with a system to allow the power station to function as an island. Both of these strategies are not ideal, so a third option is proposed: live with the temporary water that may cover the site, and design to occupy the highest portions of Richmond power station.

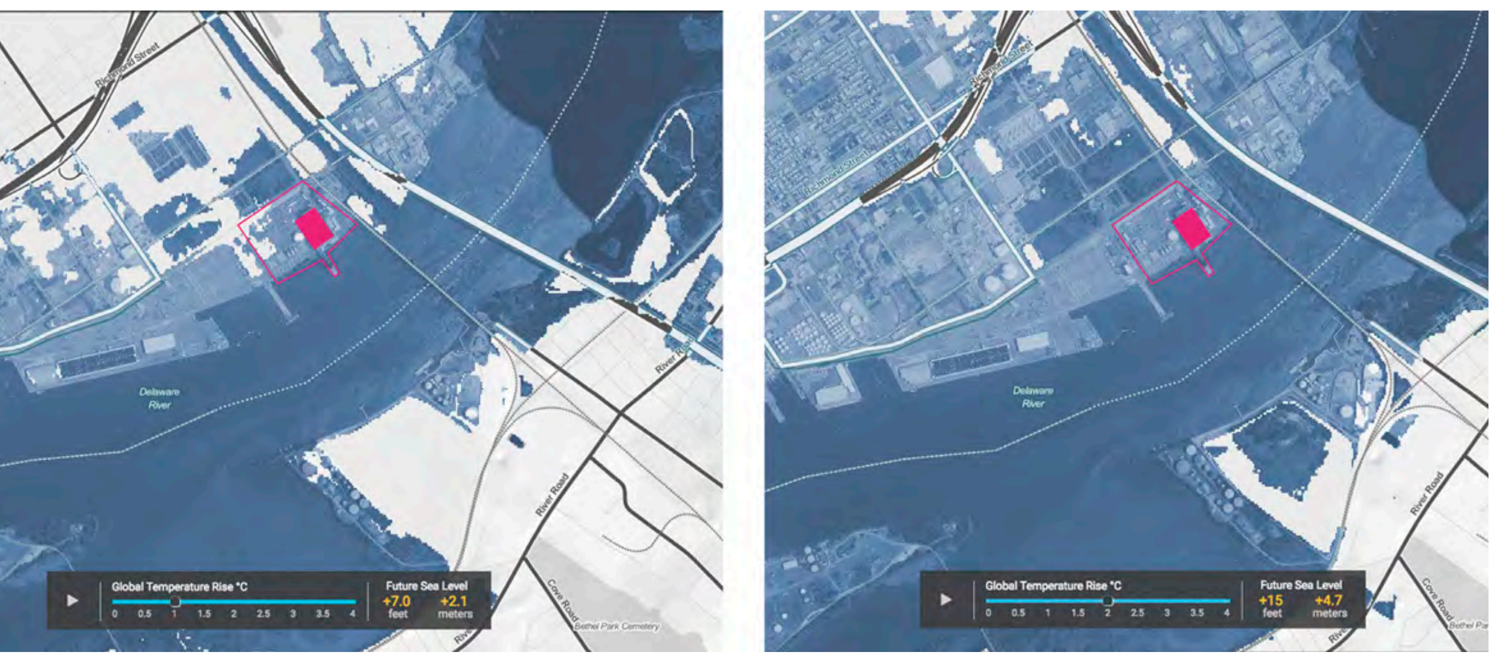
Projections for future sea level rise, given a 1-2 degree celsius rise in global temperatures, would cover most of the site in water by 2100. Methods for diverting this water into specific areas will be crucial for the continued use of Richmond Station. That is to say, avoiding the land from being inundated by 1 foot of water and rather sacrificing some land as an artificial lake would allow for most of the area to remain in use. When first constructed, the shoreline of the Delaware River was further inland by several dozen feet from where it is today.[2] A great deal of earth was transported to the site, along with several feet of land on site, were pushed out to add more space for the power station and pier to operate.[3] An area on site to store excess water for periods of high tide or other weather phenomena, which would include vegetation that best retains water, may be an effective way to deal with temporary water on site. As for permanent long term sea level rise, the location of the power station requires diversion towards other nearby land, especially the creek to the northwest.

While in the future the survival of Richmond Power Station must look towards the Delaware River, there is an immediate need for the site to re-enter the minds of the adjacent neighborhoods to showcase the history and impact that was once (and hopefully will be again) present between industry and Port Richmond.

10.4.1 Reconnecting to Port Richmond and Bridesburg

The historic connection that existed between Richmond Station and the Port Richmond neighborhood would be impossible to replicate to the intensity it once had, since many of the neighborhood residents would spend so much of their time working and commuting between the two. While a connection of employment has long since gone away, there is ample opportunity to create a connection based on recreation and leisure, as well as event making plans discussed in this report's interim uses and site development sections. A top priority that will have to occur for success is transportation planning on a neighborhood scale.

Figure 10.4.1 - Projections for sea level rise by 2100



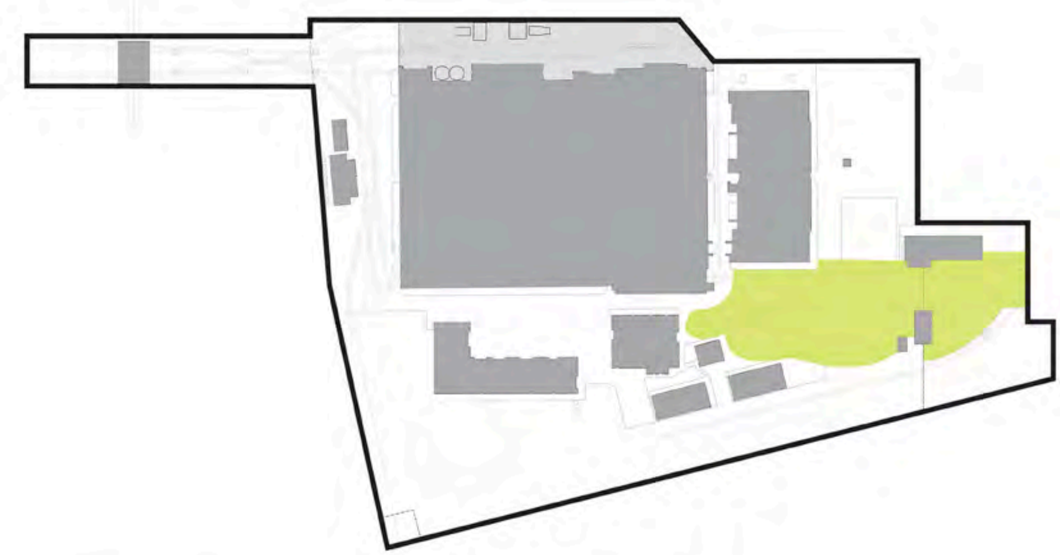
Because of the stark contrasts between zoning, that of two-story rowhouses on one side of I-95 and heavy industrial on the other, there is little movement between the two by residents or employees. As such, the relation to the Delaware River can feel cut off, but one site successfully connects the two. Pulaski Park is located on a pier and features green space and some minor amenities for leisure, and it is frequented by neighborhood residents. Although it is surrounded by wire fences, an unused dock, and trucking routes, it is still frequented by fishers and picnics.[4] Using Pulaski Park as one of several stopping points on the way to Richmond Station, the Delaware Avenue corridor could be transformed into an asset leading to the site.

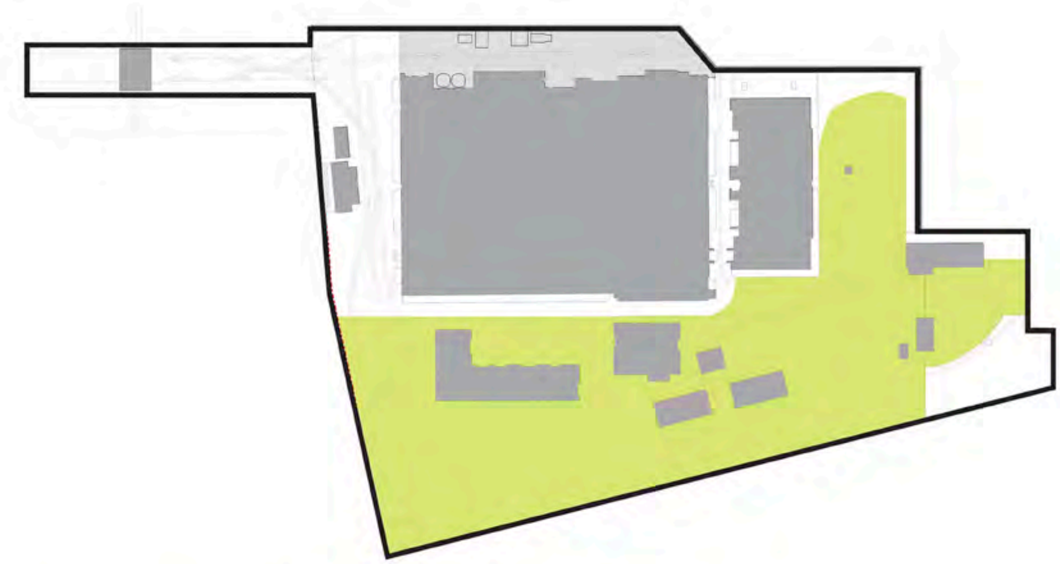
As mentioned in other sections, the interim uses for the land would involve many temporary sites, attractions, and events that would be advertised to the whole city of Philadelphia, but specifically to those in the Port Richmond and Bridesburg neighborhoods. These would include movie nights, swap meets, and several other events but opening up more of the Delaware River to be accessed would provide a park-like space that would be accessible for more time than any one event. As mentioned above, the river is used for its sightlines and for fishing by members of the neighborhood at Pulaski Park, and by converting the riverfront space at Richmond Station to green space the public would get the longest uninterrupted river access since Penn Treaty Park downriver. While the land would remain private, treating river viewsheds as a public good is ideal for the Port Richmond and Bridesburg neighborhoods.

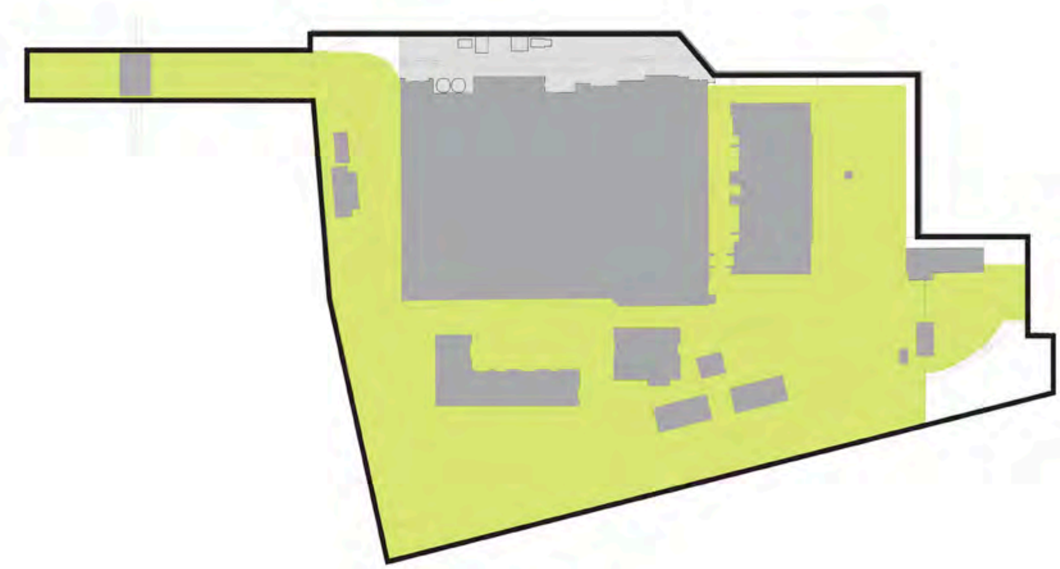
Figure 10.4.2 - Past (blue), present (purple), and future (yellow) shorelines of the Delaware River

Image 10.4.2 - Pulaski Park , A. Lukes, Site Visit (2016)

10.4 Resiliency Efforts







10.4.2 Movement on Site

Increased interest in the riverfront in the neighborhood is important, and can be paired with the environmental resiliency plans of holding water on site during periods of stress. Even when there is not a stress on the water levels, the site will be reserved for public access. This will result in a massive change to how the site is interpreted and the intensity of user interaction around a structure that will be undergoing rehabilitation at the time. Due to this, the safety of all users must be ensured, and specific route planning will need to be adopted. Hazards such as friable asbestos and other chemicals need to be avoided for health and legal reasons, but directing patrons away from any property that will remain under Exelon's control is crucial, as privacy is one of Exelon's primary concerns with any access to the site.[5] It is proposed that all access to the site is limited to areas in the open and areas with hazardous materials or fall hazards are viewed from afar until remediation can occur. Priority areas from the start will be river access and the northwest open space that will be best used for well-attended events. Tour space inside the facilities will require scaffolding, and safety precautions such as hard hats will be required. Over time, these restrictions will be reduced once the underlying issues are resolved.

1. Grever, Meghan, Lydie Miller, and Anthony Trivelli. "Pulaski Park: Once Forgotten, Now Found." Philadelphia Neighborhoods. April 20, 2009.
2. Tidwell, Marshall, and Haley Van Wagenen. Richmond Station. University of Pennsylvania, 2011. 19.
3. Masny, Walt. Operational History of Richmond Station. Private Correspondence. Received by Email September 2016. 32.
4. Grever, Meghan, Lydie Miller, and Anthony Trivelli. "Pulaski Park: Once Forgotten, Now Found." Philadelphia Neighborhoods. April 20, 2009.
5. Masny, Walt. Operational History of Richmond Station. Private Correspondence. Received by Email September 2016. 115.

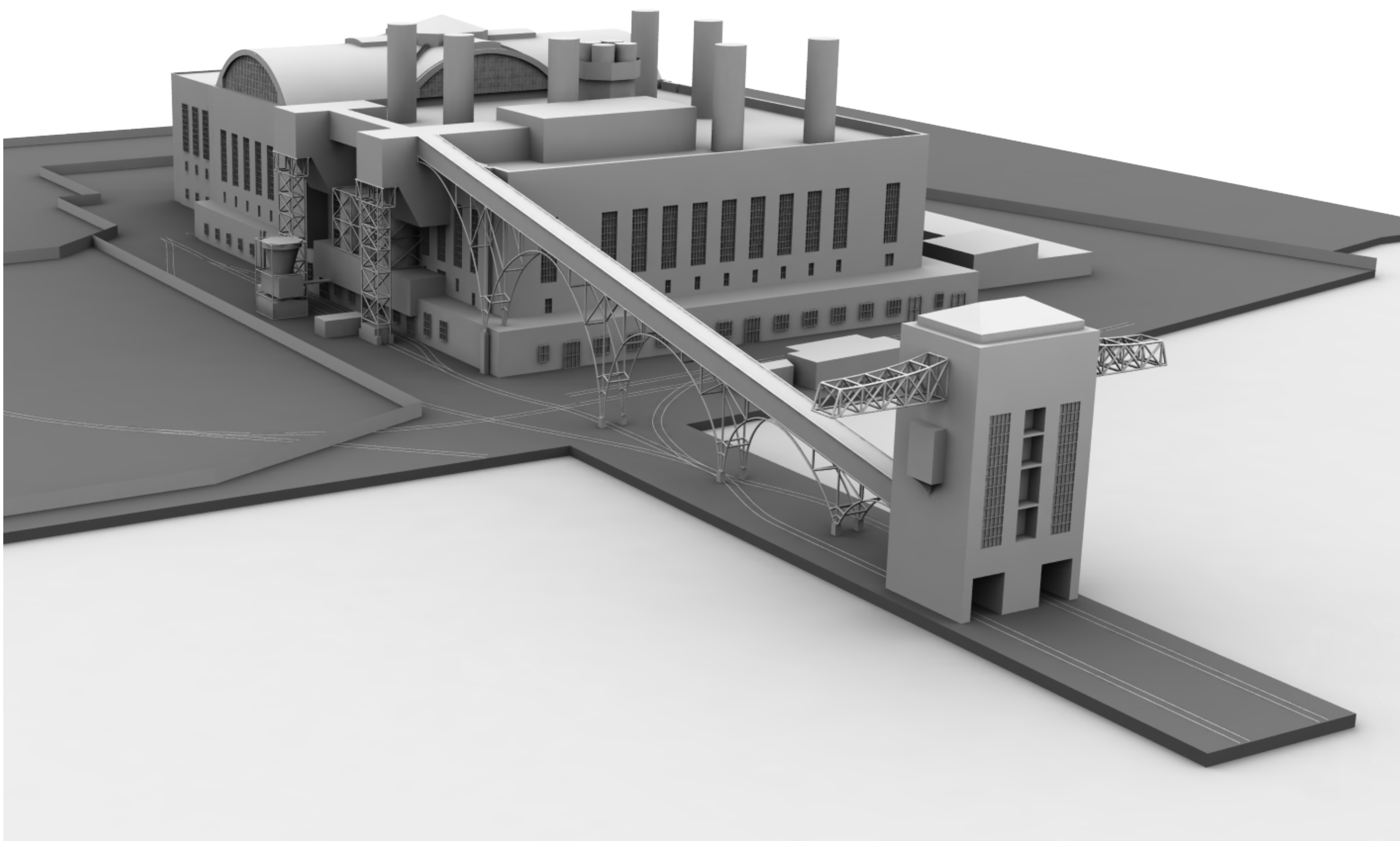
Figure 10.4.3 - Public access maps of Richmond Station through remediation


DANGER
RETIRED
EQUIPMENT
AUTHORIZED
PERSONNEL
ONLY

10.5 - Scenario Visualizations & Use

The following section explores the possible outcomes of preservation plan scenario one in a visual manner. Predicated that an NGO, developer, or a newly-formed corporate entity is interested in pursuing the purchase or long-term lease of the Richmond Power Station.[1] As stated previously, this vision would involve an owner or developer who would promote green energy by way of a preservation-inspired design approach to this historic place. Each phase of this development plan is by no means strict nor static. Instead, this phasing should be seen as a reiterative process, whereby the plan will be revisited and revised based on a multitude of factors such as the health of the buildings, tenancy, and the economy. The following breaks down the visualizations into the scenario phasing as previously mentioned in the preservation approach, section 9.

Image 10.5.1 - Machine Shop Doors, Group Site Visit, Emily Gruendel
Image 10.5.2 - Site Model, Peter Hiller & Emily Gruendel



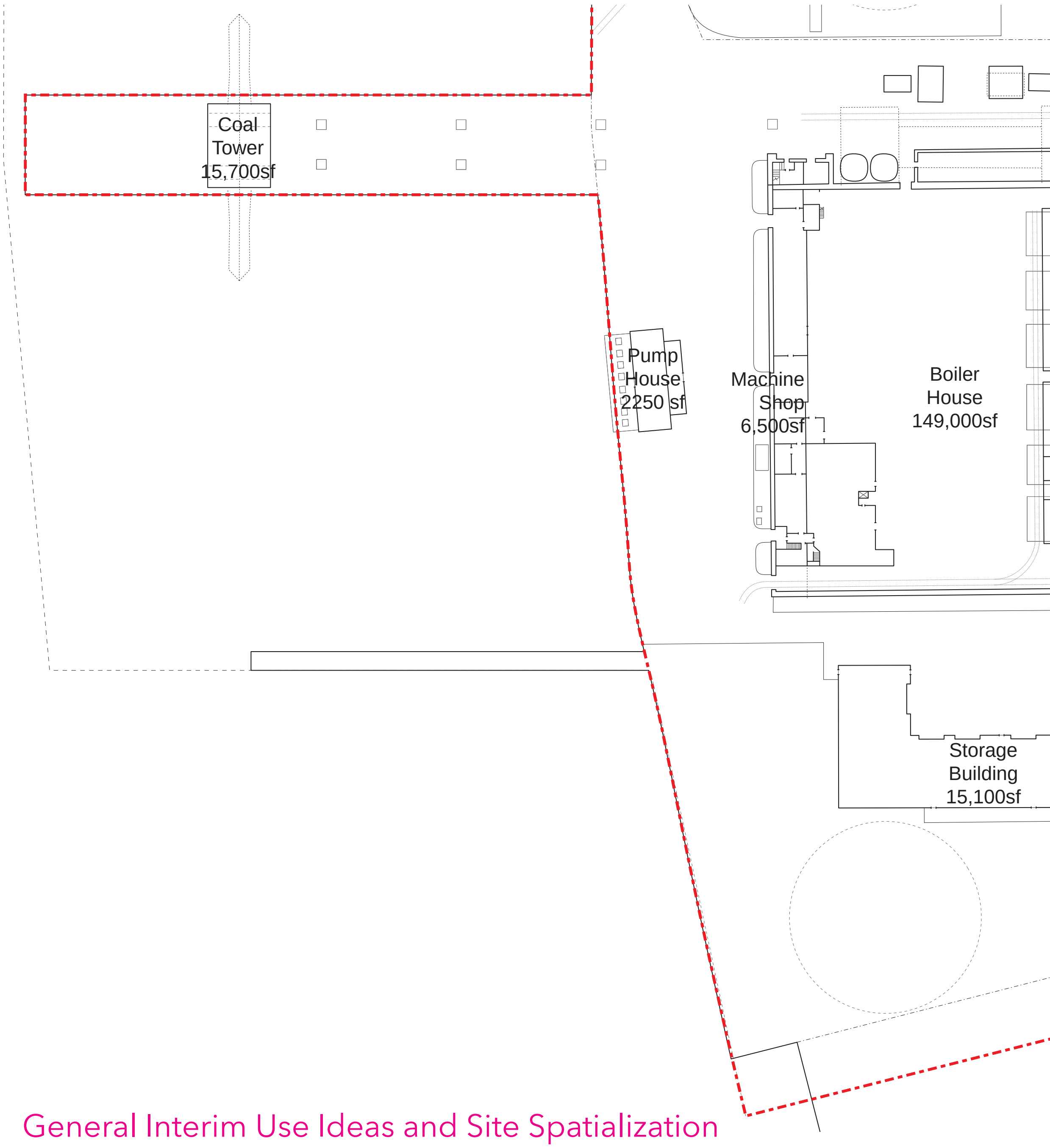
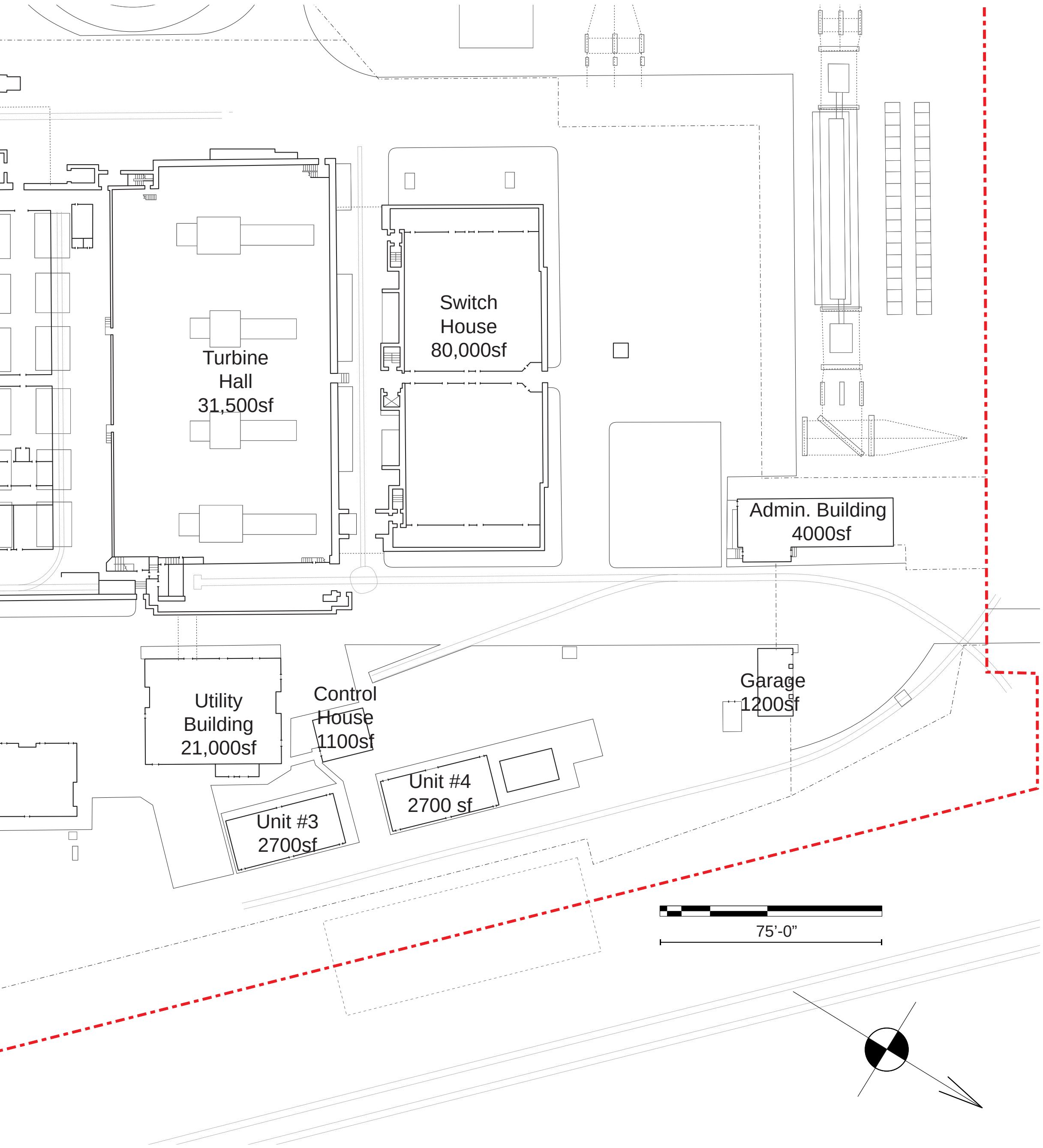


Image 10.5.3 - Site Metrics, Emily Gruendel & Evan Oxland

General Interim Use Ideas and Site Spatialization

Image 10.5.2depicts the approximate square footage of the historic core. While a plethora of options exist for interim and long term uses for this site, the following is a list of the more feasible options as per this study:

Switch House: Maker spaces, Light industrial tenancy such as server farm, vertical farms, offices or green research space. Site industrial archaeology tours.
Turbine Hall: Event space for cafe, dinners, galas, & dancing. Site industrial archaeology tours.
Boiler House: Office, maker, or light industrial spaces adaptively reusing the maximum amount of original boiler fabric, and site industrial archaeology tours.



Conveyor: Site industrial archaeology tour path.
Pump House: Site industrial archaeology tours.
Coal Tower: Water recreation, cafe, and site industrial archaeology tours.
Storage Building: Maker or light industrial space like a brewery.
Utility Building: 1st floor light industrial or maker space, 2nd floor offices.
Control House: Service building for seasonal bar or cafe.
Machine Shop: Storage, maker space, or light industrial spaces
Parking Lot Spaces: 170 Spaces available, Flea market, Cirque du Soleil
Unit #3&4: Industrial archaeology tours, mothball, or demolition.
Northeast Landscape: Skating rink in winter & seating for movies projected on the northeast elevation of the boiler house. Site for architectural pavilion festivals.

Phase One: Control Bar Beer Garden

The above image depicts the exterior of the Turbine Hall, Switch House, Connecting Volume, and part of the Control House. Looking southward, this photograph begins to show the vast scale and expanse of some of the spaces between the historic core and the auxiliary buildings to the northeast. Presently, none of the aforementioned structures are in operation by Exelon. In phase one of the preservation approach, spaces such as this would be rather quick and easy to fix-up and insert pop-up styled events and uses, such as a beer garden. Image 10.5.5 visualizes just that.

After doing a quick sweep of the exterior of the site and fixing up any outstanding hazards, an open-air beer garden and cafe might be easily inserted into the site

during the warm summer months. Catering to the local Port Richmond residents and local industrial workers from nearby corporation, this beer garden would be an idyllic space to sit back, relax, and enjoy the beauty of historic Richmond Power Station. While the remediation of the control house would need to hold off until phase two, a successful pop-up bar would establish a proof of concept for future, larger endeavours, such as the restoration and renovation of the Turbine Hall and Boiler House.

Image 10.5.4 - Exterior of Control House and Turbine Hall, Emily Gruendel
Image 10.5.5 - Control Bar, Emily Gruendel

Phase One: Night Life at the Station

The above image looks northwest along the boiler house and towards the 1950's Utility Building which housed office space and employee locker rooms until the late 1990's. This paved area of the site was once teeming with the activity of a busy power station, but now is lost in a desolate limbo of disuse and misfortune. What this site needs is to be enlivened again with people and events that bring it back to its former, monumental glory; the 'most handsome power station' part two.

To do so, phase one of the preservation plan should not only address fixing up the hazards around the exterior of the site, but it should also attempt to relight the exterior as was done historically. These architectural lighting features can

be paired with other light or power themed events throughout the year, such as annual holiday lighting festivals, light projection shows, and even hosting weekly movie nights during the summer hours. Events like the Luminato festival at the Hearn Power Station in Toronto are good precedents for such events.[2] Image 10.5.7 depicts one such event, featuring architectural lighting along the Turbine Hall facade and a movie projection alongside the Boiler House. Small landscaping initiatives may need to be implemented in areas such as these, replacing the worn asphalt and concrete roadways with green space.

Image 10.5.6 - Boiler House North Elevation, Emily Gruendel
Image 10.5.7 - Movie Nights at the Station Emily Gruendel

Phase One: Parking Lot Fexibility

Image 10.5.8 - Parking Lot Flea Markets, Emily Gruendel
Image 10.5.9 - Northwest parking lot, Emily Gruendel

While phase one of the preservation approach will necessitate the reconfiguration of the entry sequence to the site along with the creation of more clear parking spaces for visitors, the pre-existing parking lot and paved surfaces offer a unique opportunity to capitalize on the large expanse of spaces at the Richmond Power station. Image 10.5.9 depicts the northwest parking lot located between the Switch House and the Exelon Substation. This area is perfect for pop-up events such as a flea market (see Image 10.5.8), farmers market, or car show. Temporarily renting out spaces like this at the station would begin to garner attention and support from local residents and the greater Philadelphian population in addition to supporting some smaller preservation-based initiatives with the revenue gained. Such events would need to be hosted on the weekends and may necessitate increased security presence and off-site parking or shuttle opportunities.

Phase Two: Interim Protective Tour Scaffolding

As mentioned earlier, phase two of the preservation plan would involve expanding site tours to parts of the interior of the Richmond Power Station. However, since remediation and renovation work for areas like the Turbine Hall will not have been undertaken by this phase, it will be critical to install safety rails and scaffolding to protect visitors from any risk of falling debris. Image 10.5.11 depicts what this phase would look like in the Turbine Hall. Any such safety additions to the interior of the space would be minimarlly invasive and removable when the time comes that full restoration efforts are undertaken. These historic site tours could also be conducted in collaboration with outside organisations like Hidden City.[3]

During this phase, additional pop-ups may need to be considered for spaces

such as the Turbine Hall. Therefore the most basic remediation efforts, such as the removal of hanging hazardous roof parts, will need to be undertaken. Consideration shuold be given to installing a temporary roof covering, such as a tarp, to prevent the infiltration of water to the space. During later phases of this prservation plan this venue could be used for dinners, galas, and fundraising opportunities for other projects. Spaces inside the Turbine Hall might also be reconfigured and rented for office or corporate uses.

Image 10.5.10 - Northeast end of the Turbine Hall, Peter Hiller
Image 10.5.11 - Interim Protective Tour Scaffolding

Phase Two: Vertical and Server Farms

Image 10.5.12 depicts one of the rooms in the Switch House as it is today. Due to high levels of trespassing, the interior of the historic core has seen a lot of deterioration and looting in the past few years. However, phase two of the preservation plan aims to address the deterioration of spaces like the Switch House where minimal remediation and renovation efforts will be needed to produce large, rentable spaces for industrial or corporate developments and usage.

Given the existing spatiality of the SwitchHouse in combination with the industrial zoning of the site, this area may bode well as a server farm. Requiring massive amounts of energy with the by-product of heat, server farms should help to reinforce the health of the building envelope, following it's proper sealing from moisture and potential vandals.[4] The advent of a server farm in the Switch House offers a very creative and interesting opportunity. Due to the amount of heat that

theses types of uses tend to generate, server farms may pair well with vertical farming operations.[5] Image 10.5.13 depicts what this type of pairing might look like in the Switch House. Other types of uses for the switch house might include office space and industrial makers spaces, both of which would provide revenue in the form of rent.

Image 10.5.12 - Switch House, Evan Oxland
Image 10.5.13 - Vertical and Server Farms, Evan Oxland

Phase Two: Connecting the Waterfront

Phase two efforts, as stated previously, would involve the remediation of the Machine Shop, located on the Delaware River Front side of the Boiler House. The machine shop, as visible in Image 10.5.14, is in a degree of disrepair, with numerous broken panes of glass. However, most of the issues with the Machine Shop are aesthetic and can be fairly quickly fixed. These types of spaces on the ground floor and so close to the waterway would be ideal rental spaces for craft workers, makers, design-builders, or recreation rental activities, as mentioned in section 9 of this report. [6]

The area in front of the Machine Shop could also be landscaped and developed in order to tie into larger city-based initiatives such as the Delaware River Waterfront

Trail and green-way expansion efforts. Remediation may be necessary in this area as well. Therefore the use of more passive clean-up efforts, like the planting of sunflowers to absorb harmful chemicals, could be employed to both beautify and help conditions. Areas to the south of the site, where Exelon has retained full control, could be uses also for green energy initiatives such as solar or wind farming. Image 10.5.15 depicts what this area on the Delaware River front of the site might look like if such aforementioned efforts are employed.

Image 10.5.14 - Delaware Waterfront, Emily Gruendel
Image 10.5.15 - Waterfront Park with Remediation, Green Energy, and Recreation, Emily Gruendel

Phase Two: Winter Visits to the Station

On the northeast end of the site, beyond the 1990's storage building, Richmond Power Station maintains a large expanse of property that is currently undeveloped. While this area could be used at any time of the year for large-scaled events, this report has deduced that it is important to keep this area of the site relatively clear of structures. This way the view-shed of the station from the Betsy Ross Bridge may continue to be preserved. Activities that could be employed here that require little effort on the part of the third party entity could include the creation of a winter-time ice skating rink with a temporary heating pavilion with skate rentals. Image 10.5.17 depicts just this. This idea is follows a similar concept to that of Millennium Park in Chicago, where summertime restaurants and bars make way for winter-time lighting and skating activities for the whole family.

The pavilion, located towards the waterfront, could become an annual student-based design-build competition for local schools. Designs could be oriented towards using recyclable materials, the creative use of light, and the pavilion's interpretation of historic site.

Image 10.5.16 - Northeast Landscape, Emily Gruendel
Image 10.5.17 - Ice Rink and Pavilion, Emily Gruendel

Phase Three: Pier Park Recreation Initiatives

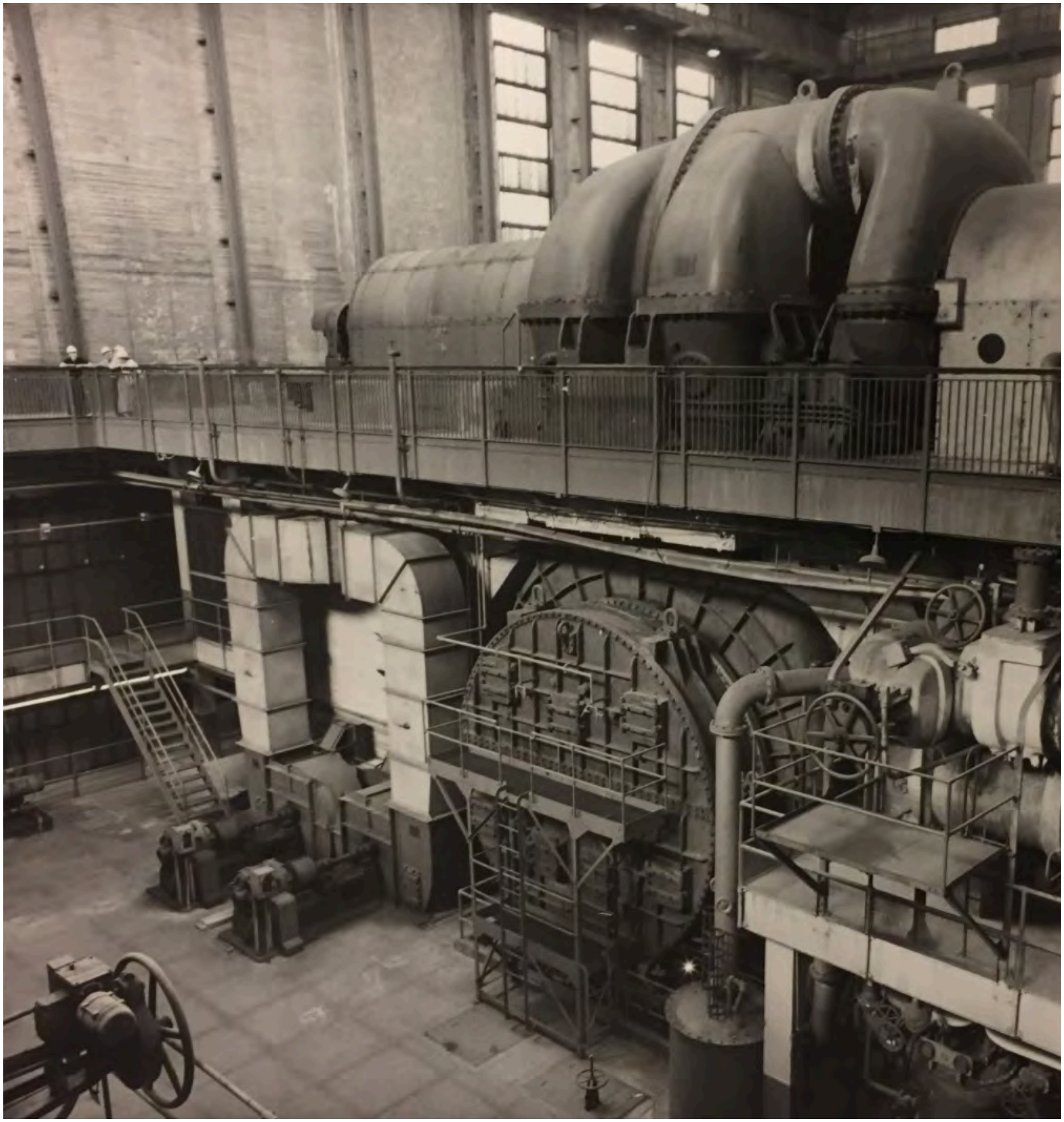
Image 10.5.18 - Coal Tower and Pier, Emily Gruendel
Image 10.5.19 - Pier Recreation, Emily Gruendel

The third phase of the preservation plan would involve further expanding renovations of the pier and coal tower for more water-based activities. Activities like canoeing, boating, and kayaking could all be easily incorporated at the base of the coal tower with rental and retail spaces. Bungee jumping from the Coal Tower scaffolding could occur during the day, while the end of the pier could function a small cafe or host pop-up dining experiences. The interior of the Coal Tower, when addressed during the fourth phase of the preservation plan, may become highly sought after space for recreation companies, tour companies, or water taxi services.

Maintaining enough of the original fabric of t the Pier and Coal Tower will be important for interpretation purposes of the site. However, it may be necessary to remove select machinery or fixtures, such as the deteriorating guard house at the base of the pier to allow for snack stands, landscaping, and other pier-based activities. The Coal Conveyor will most likely have to remain as an aesthetic fixture, though given the proper assessments, remediation, and retrofitting, it may serve as an interesting skyway bridge between the Boiler House and the Coal Tower.

Phase Three: Turbine Hall

Image 10.5.20-
Condensor perforation
& courtyard
interconnection,
Evan Oxland



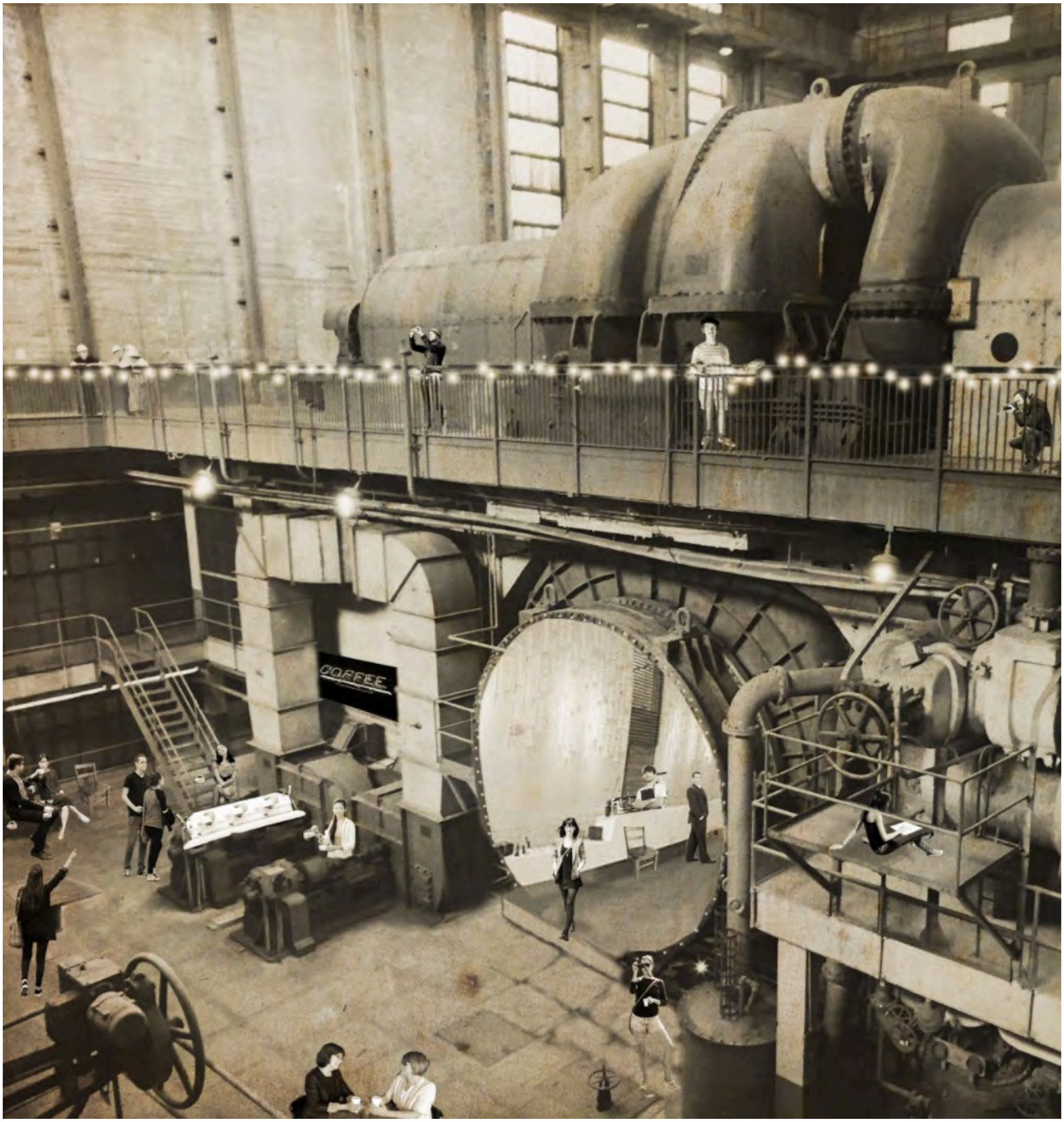
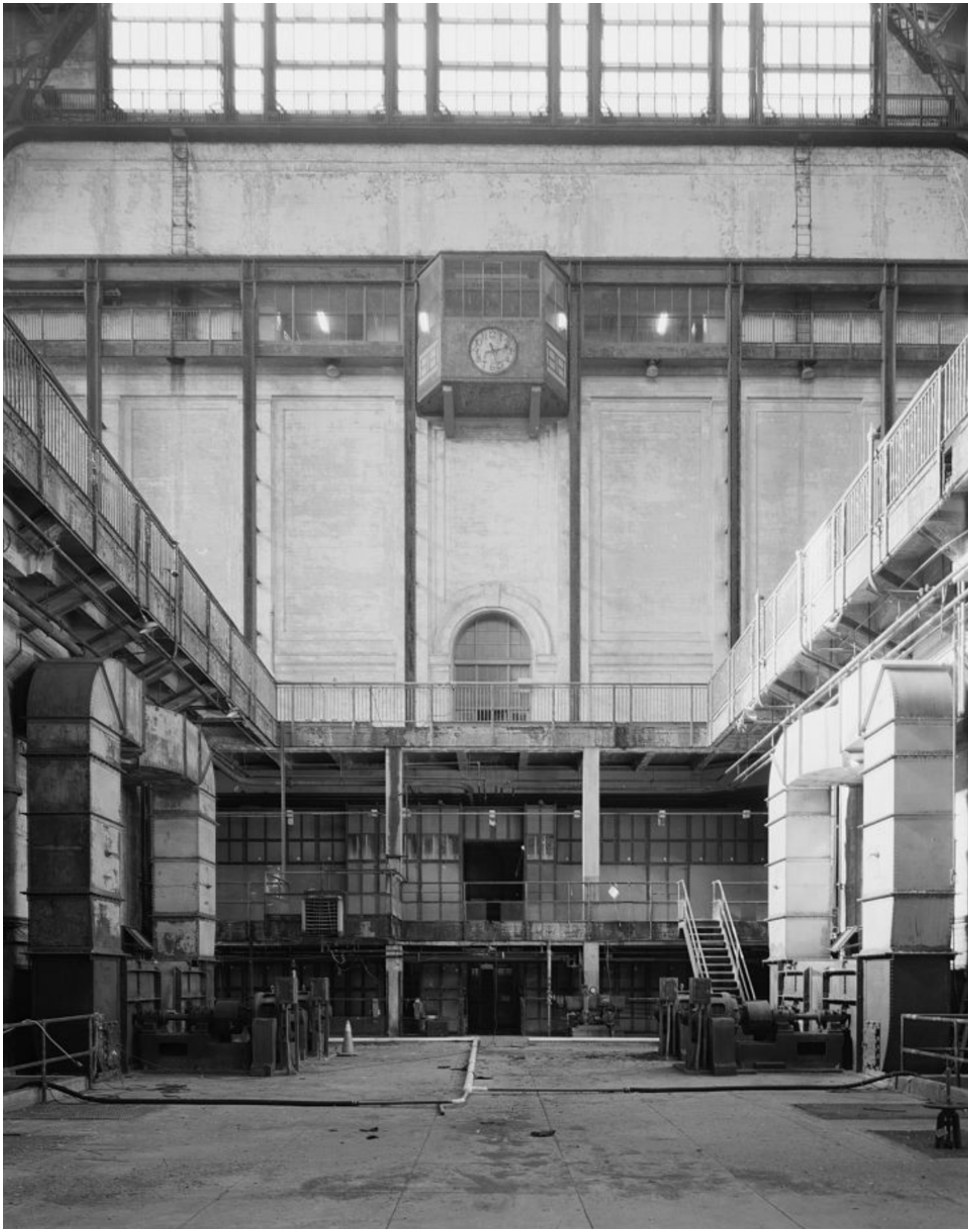


Image 10.5.21 - Cafe and interpretive machinery tours interconnecting useable space, Evan Oxland

Phase Three: Turbine Hall

Image 10.5.22- Central machinery courtyard in Turbine Hall
Peter Hiller



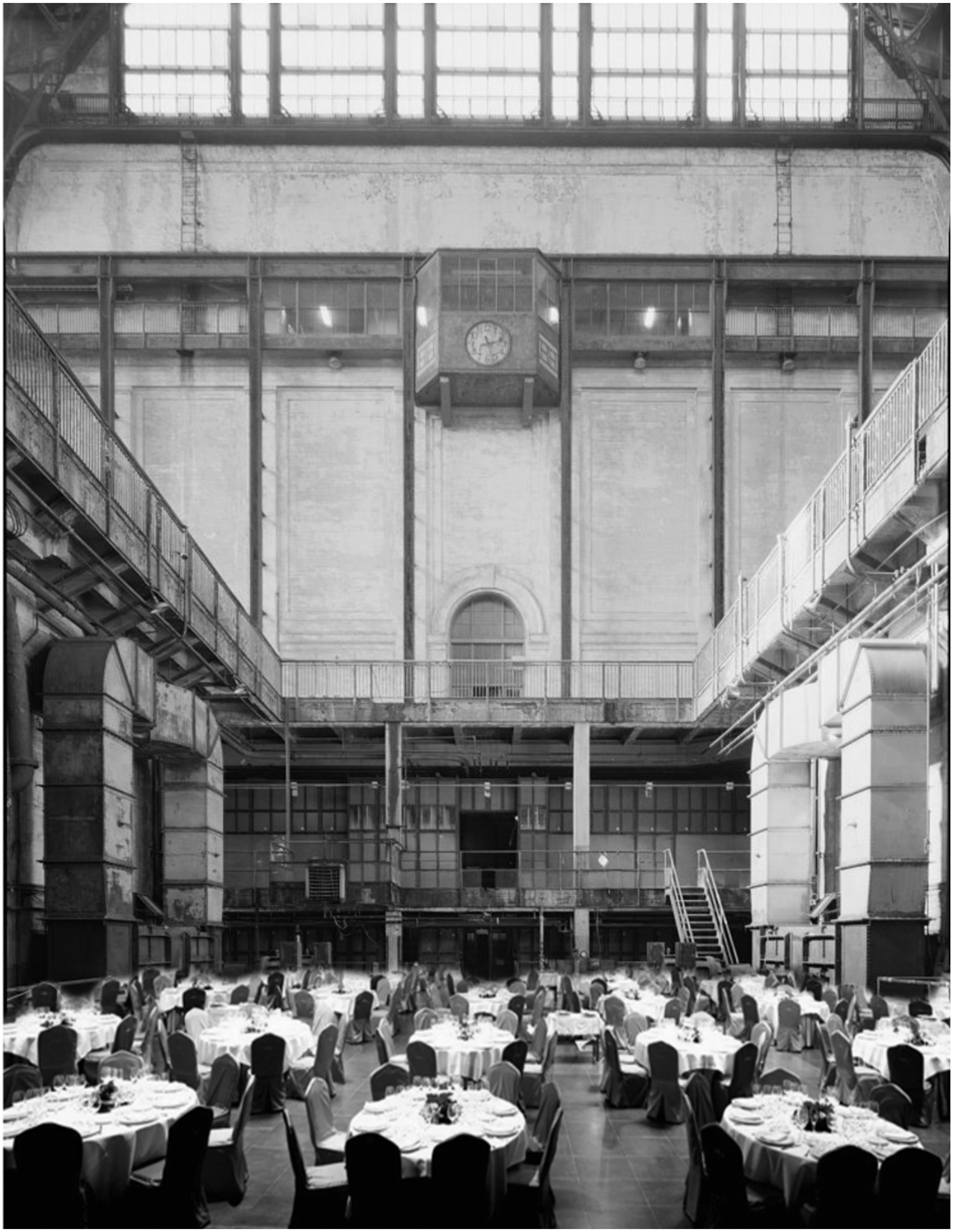


Image 10.5.23 - Imagining the turbine hall as a space for a formal dinner. Peter Hiller

Phase Four & Five

Phase Four: (Years 16-25)

This phase will see the monumental task of remediating, stabilizing, and activating the Boiler House. After all of these principle buildings are stabilized and in use, demolition of auxiliary buildings will be considered for the Rotary Frequency Converters C & D, the 1990s era Storage Building, and auxiliary mechanical machinery on the south side Boiler House exterior. Decisions will be based on material integrity and opportunity to make profitable use of the northeastern space. Other selected demolition will be considered for the Turbine Hall, removing machinery from the courtyards to make more room for greater use.

1. In the Boiler House, the spaces will be compartmentalized to allow for offices and workspaces. Useable office, maker or research space will be created by maximizing retention of historic boilers. Organization of these re-adaptations will reinterpret and retain the rhythm and scale of original boilers. Glass can be installed on top of the pipes allowing for use of space above from which stair access and new catwalk floors allow for views into a perforated glazed Turbine Hall. Two rows of boilers will be preserved for interpretation and tours on the southwest side of the building.

2. During this period decisions will need to be made whether or not to adaptively reuse the Rotary Frequency Converters C & D and the 1990s era storage building. The converters are in very poor condition, and regular flooding occurs. Most of the volume is taken up by incredibly large machinery. The building envelope is corroding and and its coatings have failed. These, along with the 1990s era storage building, take up a large amount of space and constrain growth and movement around the site. Depending on the future viability of the site, and what sort of developments are options that could help preserve the rest of the site, demolition should be considered.

Phase Five: (Years 26-30)

All buildings have been remediated, stabilized, and are being actively reused. Continued maintenance will be necessary for continued building use. A reevaluation of building and material performance over the past thirty years should then inform a sustainable preventative maintenance program to ensure financial health and safe tenancy.

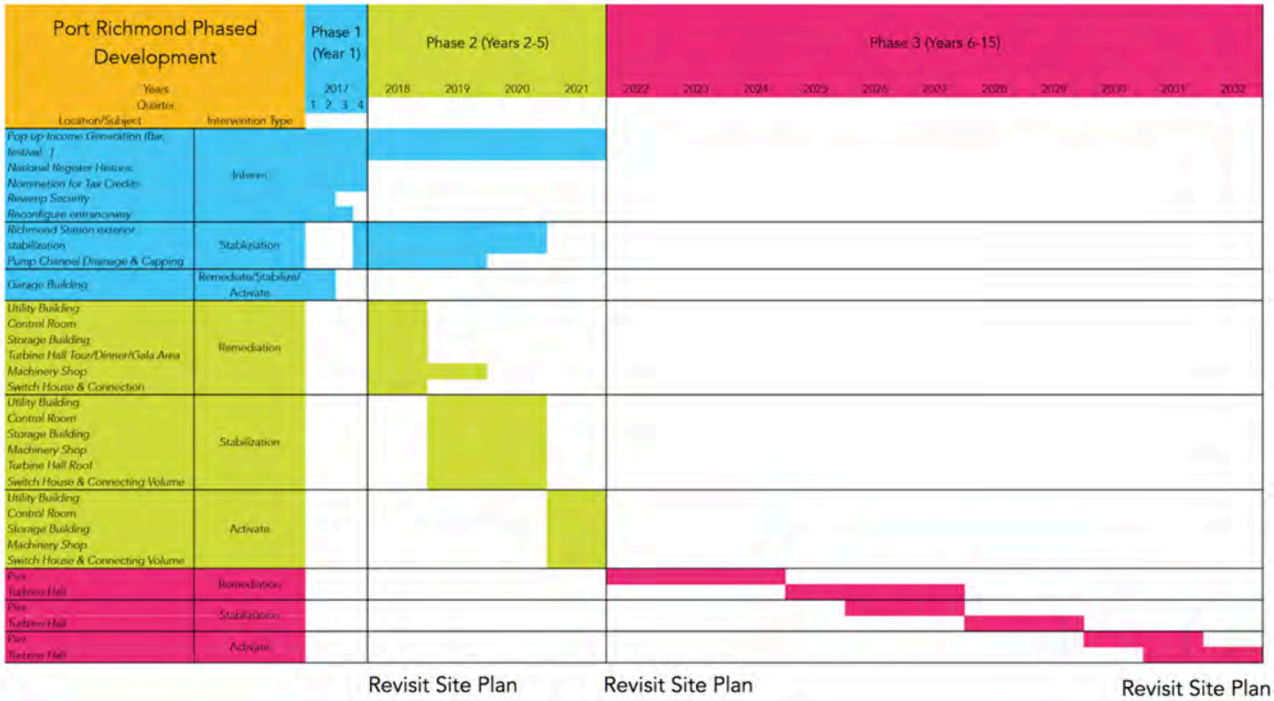
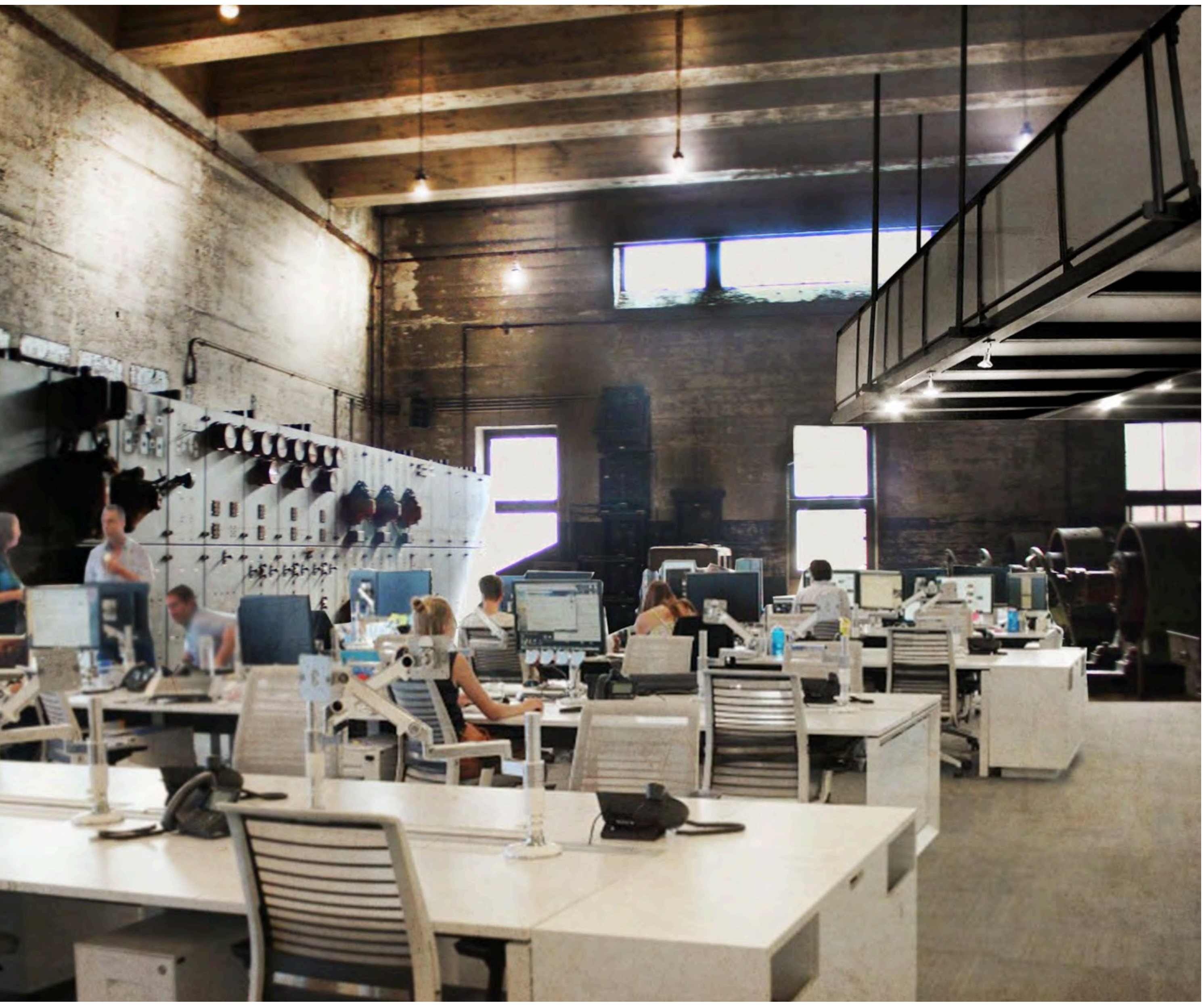


Image 10.5.24 - Schedule of Phased Development, Evan Oxland

Phase Four: Switch House

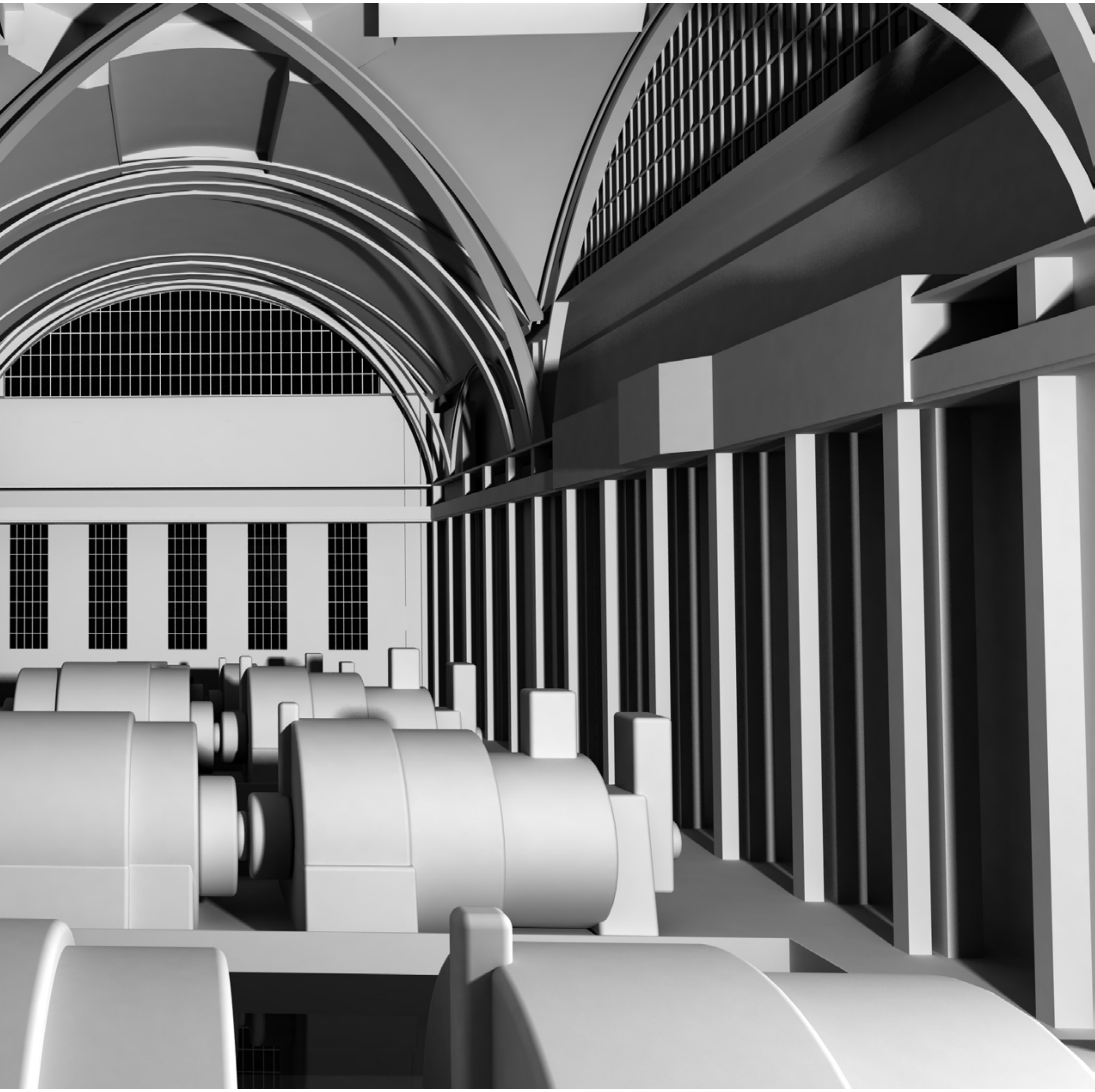
Image 10.5.25- Switch House, Peter Hiller

Image 10.5.26 - Adaptive reuse of the switch house as an office space with a suspended mezzanine level, Peter Hiller



Phase Four: Turbine Hall

Image 10.5.27-
Turbine Hall Adaptation, Taking advantage of the space between the colonnade and the wall that separates the turbine hall and the boiler house, by filling it in with multiple levels, increasing usable area. Peter Hiller



Phase Four: Turbine Hall

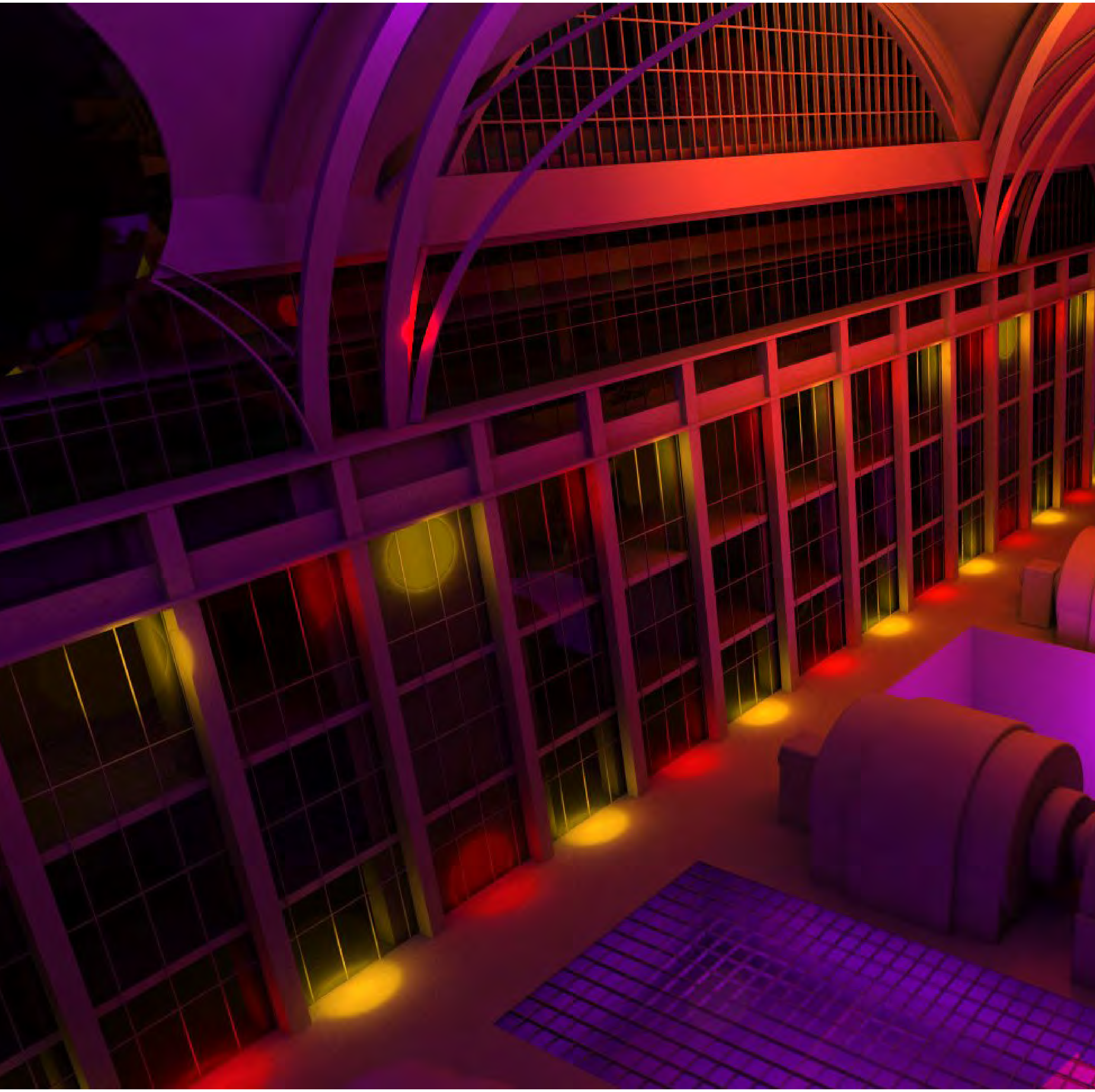


Image 10.5.28-
Turbine Hall at night. Installation of a glass floor over a few of these courtyards to maximize the useable area, while still allowing visibility to the machinery below as well as between the two spaces. This also shows how much lighting can transform a space in a way that is completely reversible; the original, spherical, bronze chandelier reinterpreted as a disco ball. Peter Hiller

Phase Four: Turbine Hall

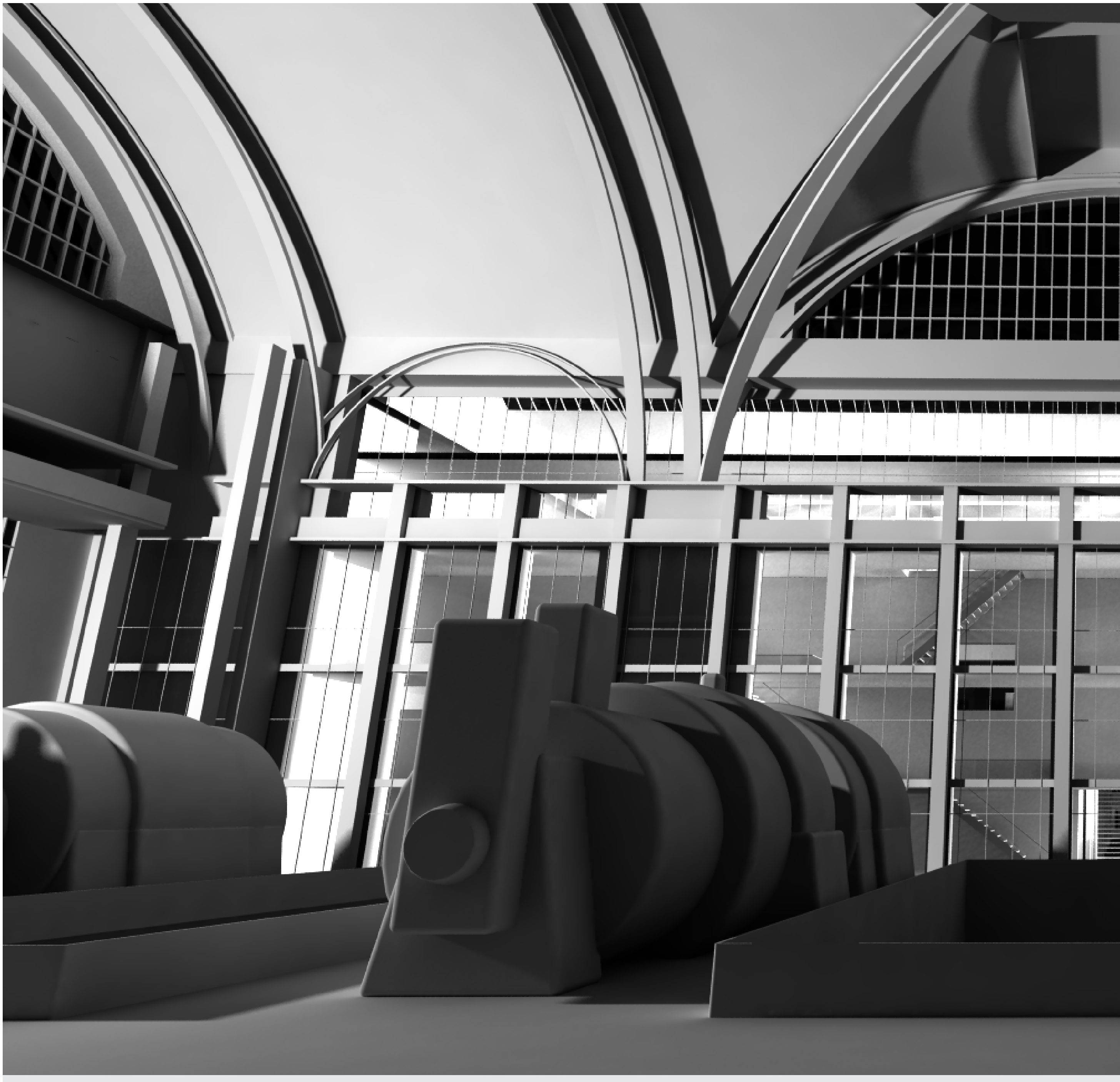
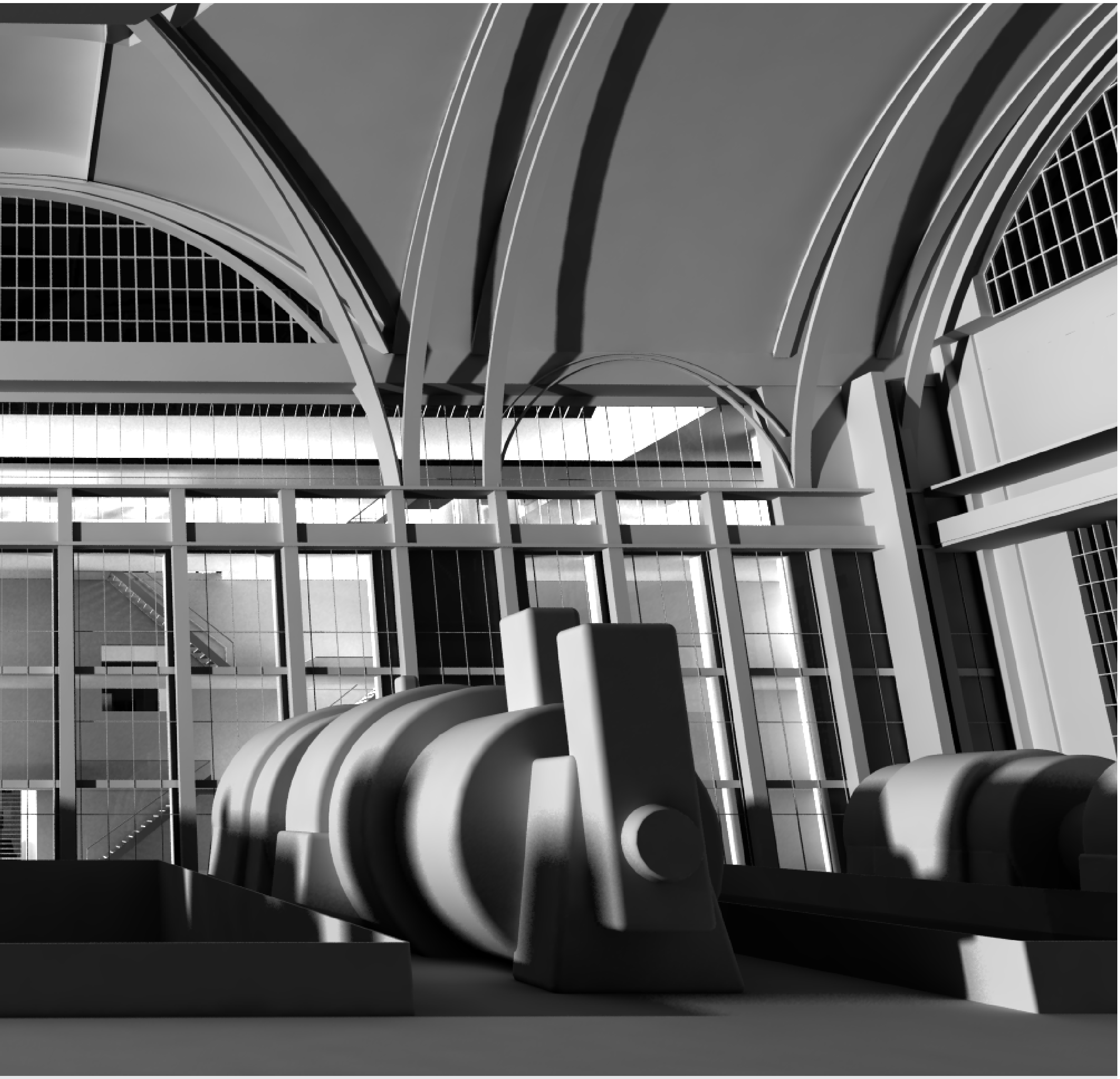


Image 10.5.29-
Glazed intervention connecting the Turbine Hall and the Boiler House, making full use of the opportunities that the experience that the Turbine Hall offers, without necessarily restoring the hall. Peter Hiller



Phase Four: Boiler House

Image 10.5.30-
Adaptation of the boiler house, which takes advantage of the skylights above and maintains the feeling that the existing stairways and catwalks provide, while opening them up to the space below to allow natural light to penetrate down to the ground floor. Peter Hiller

Phase Four: Boiler House

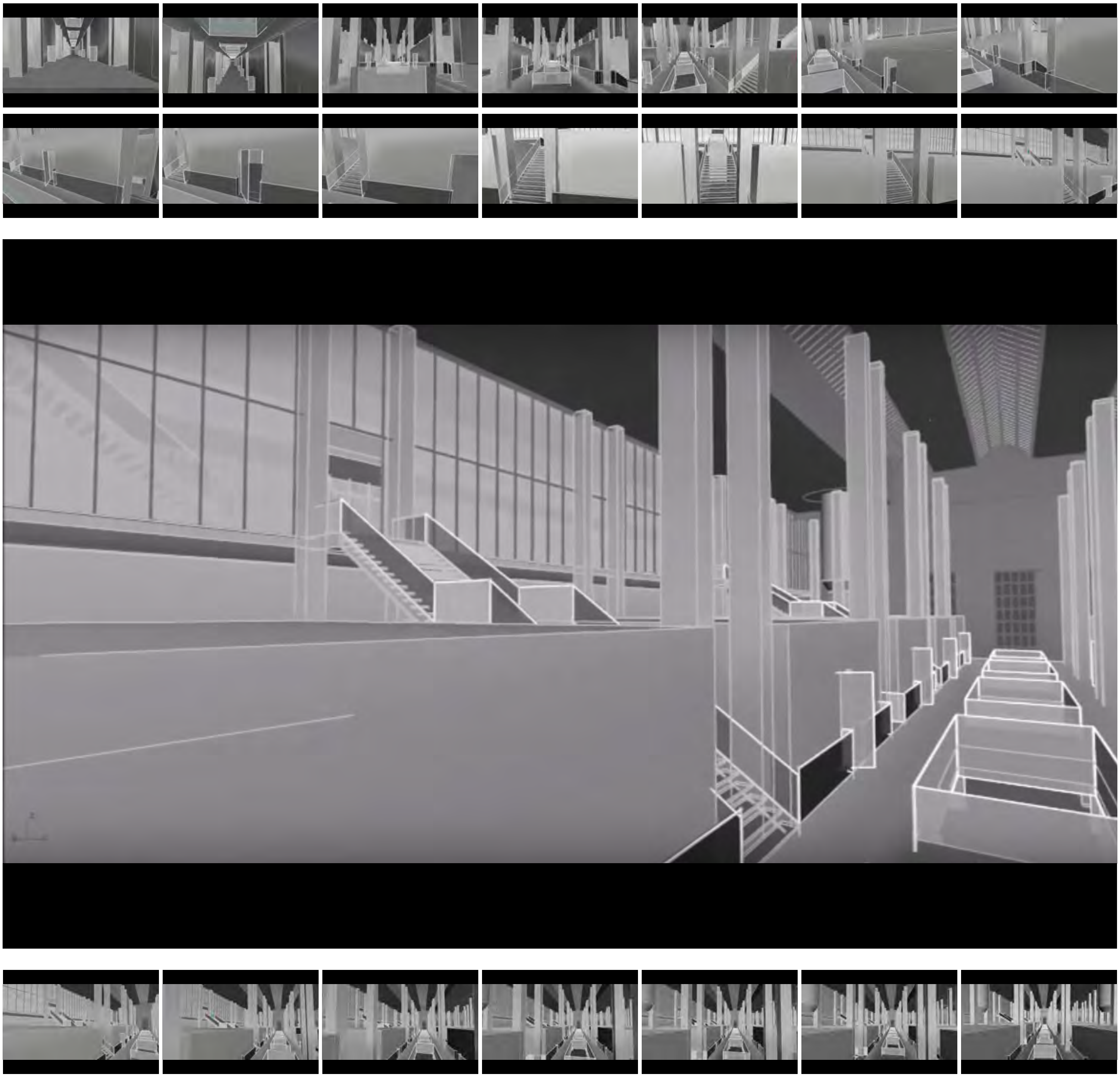
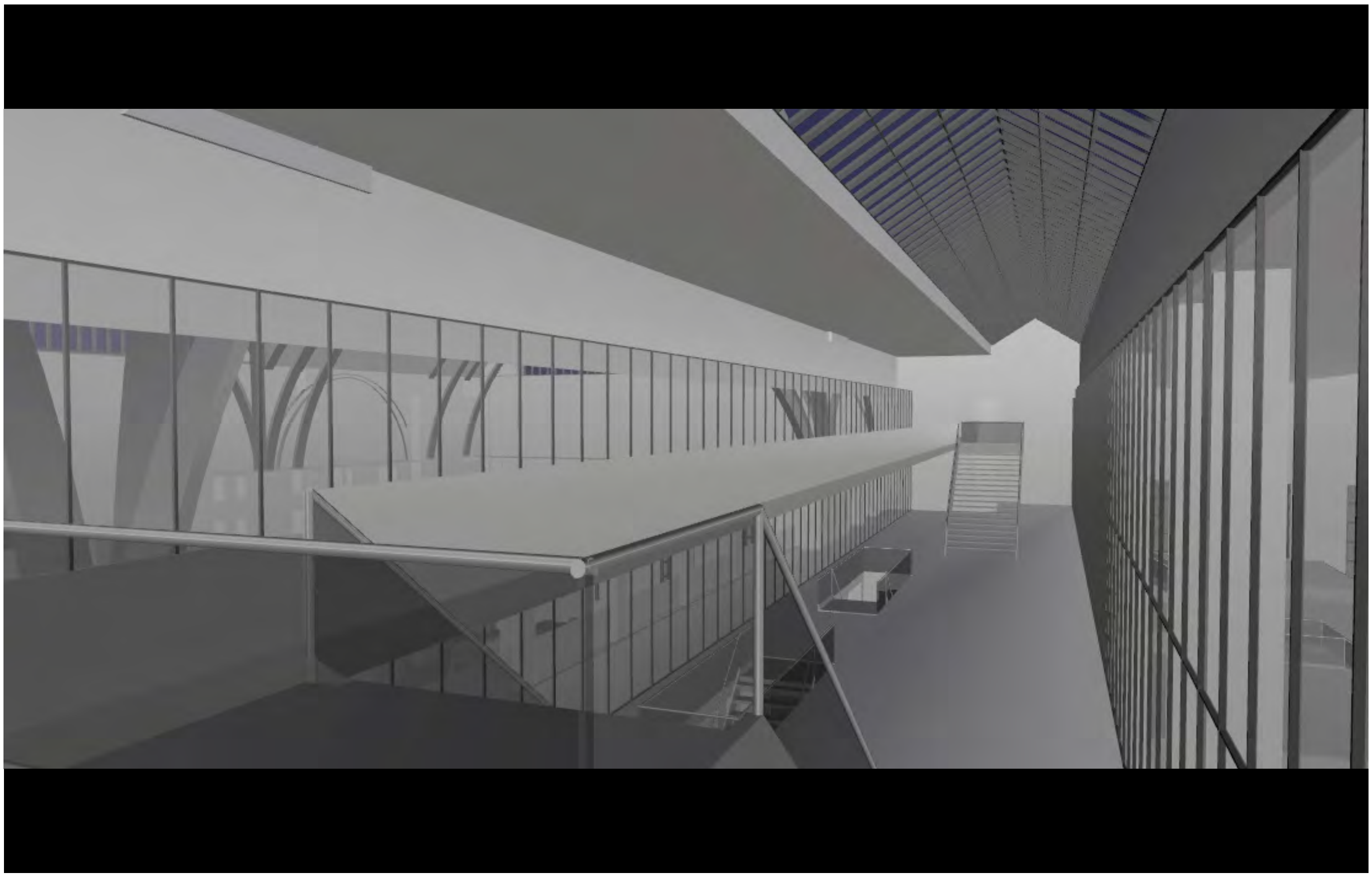
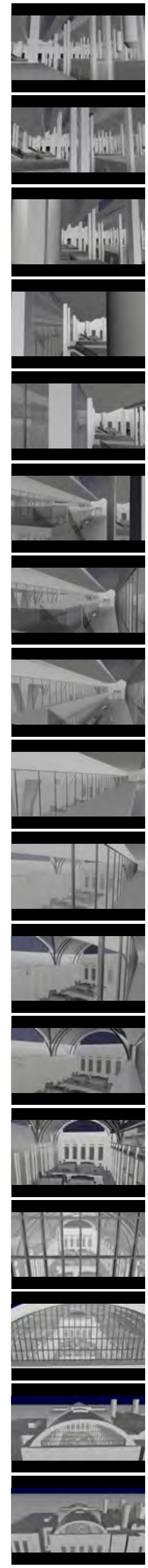


Image 10.5.31 -
Frames from an animation video presenting a proposal that actually utilizes the fabric of the boilers themselves, each of which is transformed into two-story labs, artist studios, makerspaces, a light industry incubator etc, by cutting through the two-foot thick brick walls to create doorways and openings, and inserting walkable floors within.
https://youtu.be/ODjxmau2X3Q

Image 10.5.32 -
Frames from an animation video that shows how the transformed boilers in the boiler house connect up to the office space that looks out into the boiler house on its right, and the turbine hall to the left. The new space takes andvantage of the skylights above and the views to the expansive spaces on either side, including the turbine hall; whether or not is is fully restored, the turbine hall still offers a spectacle from this proposed new vantage point.
https://youtu.be/fU_DzjfjErY





1. This is likely an attractive option to current owner Exelon, for instance, PECO's former Chester Station sold only for a dollar as way of both enabling a positive building-use and eliminating a liability on a corporate portfolio.
2. Luminato. Hearn Generating Station. Accessed Online 1 December 2016 at: https://luminatofestival.com/the-hearn
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APPENDIX A: Comparables Matrix

Case Study	Past Use	Size	Era	Location	Historic Designatior	Accessibility
BATTERSEA POWER STATION LONDON in United Kingdom	X		X	X	X	?
BETHLEHEM STEEL CORPORATION in Bethlehem, Pennsylvania				X		
CHESTER WATERSIDE STATION in Chester, Pennsylvania	X	X		X	X	X
CHERNOBYL NUCLEAR POWER PLANT in Prypiat, Ukraine					?	
EASTERN STATE PENITENTIARY in Philadelphia, Pennsylvania		?			X	
FINGER WHARF OR WOOLLOOMOOLOO in Sydney, Australia				X	?	X
GEORGETOWN STEAM PLANT in Seattle	X		X		X	
HEARN GENERATING STATION in Ontario, Canada	X				?	
IP POWER PLANT in New Dehli, India						
JOLIET CORRECTIONAL CENTER in Joliet, Illinois					?	
LANDSCHARFTSPARK DUISBURG-NORD in Duisburg-Meiderich	X			X		
MILL CITY MUSEUM in Minneapolis, Minnesota				X	X	
MISSION ROAD POWER PLANT in San Antonio, Texas						
MUNICIPAL SERVICE BUILDING POWER PLANT in St. Louis, Mis	X		X			
OTTAWA STREET STATION in Lansing, Michigan	X			X	NO*	X
PENN INNOVATION CENTER in Philadelphia, Pennsylvania					?	
SEAHOLM POWER PLANT in Austin. Texas	X			X	NO*	X
SEARS, ROEBUCK AND COMPANY in Chicago (1905)					X	
STATION B in Sacramento, California	X			X	X	?
STATION L POWER PLANT in Oregon (1908)	X	X		X		
TATE MODERN in London	X			X		
TEJO POWER STATION in Lisbon, Portugal	X			X	X	
THE SHED (HUDSON YARDS) in Manhattan, New York City						X
WUNDERLAND KALKAR in Germany (1985)		?		X	?	

y	tainable appro:	Grittiness	Cinematic Appeal	New Construction	City Involvement	Toxic Site	Instutional Support	Plant Equipment
			X	X				?
		X		X	X	X		X
				X	X	X		
	X	X	X		X	X		X
		X	X					X
				X				
		X						X
		X	X	X				
	X							
	?		X	?	X		X	
	?	?				X		
				X				X
	X							
	X							
	X			X				
	X			X			X	?
	X				X	X	X	?
				X				
	X			X				
	X				X			
	X							
					X			X
	?			X	X			
			?	X		NO		X

Richmond Generating Power Station Conditi		
Group Element	**Individual Element**	**Current Condition/ Problem**
Shell: Exterior Enclosure	Wall system: Poured-in-place Concrete	Spall, exposed rebar, cracking Efflorescence
	Exterior windows	Broken panes
	Roofing	Missing panels, Corrosion of supporting framework, missing membrane coating
	Rebar	Exposed, corrosion
	Insulation and Vapor Retarder	Non-existant
	Doors	Broken, Missing
Interiors	Flooring	Flooding
	Structural walls: poured in place concrete	Spall, cracking, exposed rebar
	Railings	Metal corroded, unstable
	Stair Construction	Do not meet code
	HVAC Systems and Equipment	Non-existant
Substructure: Foundations	Slab foundation	Unknown
	Grading	

on Assessment and Repair Recommendations

	Location in RS	Type of damage (weathering or vandalism)	Priority
,	Coal Tower, Boiler House, Turbine Hall, Switch House	Weathering	Low
		Vandalism	High
g	Turbine Hall	Weathering	High
		Weathering	Medium
	Coal Tower, Boiler House, Turbine Hall, Switch House	N/A	Low
	Boiler House, Turbine Hall, Switch House	Vandalism	High
	Turbine Hall, Boiler House	Weathering	High
	Turbine Hall, Boiler House	Weathering	Low
	Boiler House, Turbine Hall, Switch House	Weathering	High
	Coal Tower, Boiler House, Turbine Hall, Switch House	N/A	Medium
	Coal Tower, Boiler House, Turbine Hall, Switch House	N/A	Low
		N/A	Low
		N/A	Low

Richmond Generating Power Station Condit		
Group Element	**Individual Element**	**Current Condition/ Prob**
Shell: Exterior Enclosure	Wall system: Poured-in-place Concrete	Spall, exposed rebar
		Cracking
		Efflorescence
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	Stair Construction	Do not meet code
	HVAC Systems and Equipment	Non-existant
Substructure: Foundations	Slab foundation	Unknown
	Grading	

ion Assessment and Repair Recommendations			
lem	Immediate	Short Term	Long Term
	Remove surface spalls on brackets.	Coat exposed rebar areas with corrosion inhibitor. Patch areas.	Repoint jacked masonry cracks. Some areas might need reconstruction of the masonry wall.
	Monitor cracks.	Monitor cracks.	Seal cracks to prevent any additional moisture intake.
	N/A	Testing mockup samples required.	Depending on testing, a chemical method or a poultice may be used.
	Should be sealed immediately in order to make the space weather tight.	Once space is ready for activation, windows can be repaired or restored	N/A
ng	Removing Zonatile	Tarp or other inexpensive enclousure material	Installation of glass panel system to mimick original tiles; keep existing steel grid.
	N/A	Should be installed in selected areas to be reused.	N/A
	N/A	Once space is ready for activation, windows can be repaired or restored	N/A
	Find source and block		Grading of site
ar	Remove surface spalls on brackets.	Coat exposed rebar areas with corrosion inhibitor. Patch areas.	Repoint jacked masonry cracks. Some areas might need reconstruction of the masonry wall.
	N/A	Testing: Metallographic examination of the corroded metal (examination of corroded metallic fragments) Testing mockup samples required as well.	Cleaning and rinsing metal with a dilute solution of mild detergant in water first, extract any salt contaminants in the metal surface and perform any metal repairs needed.
	N/A	N/A	Update stair construction to meet code.
	N/A	N/A	Consider thermal impact on building before installation.

Definitions and Terminology

Interim: Temporary uses necessary to support the initial development of the site. Such interventions can be policy-based initiatives or ephemeral pop-up events.

Remediation: Involves either the removal or encapsulation of hazardous materials like fibrous asbestos or failing lead paint.

Stabilization: Involves removing, repairing, replacing, or shoring failed or incipient failures of building structural elements. Approach will be as light handed, prosaic, or pragmatic as possible, both in the interest to maintain maximum historic fabric and because of the realities of cost.

Activation: Following space remediation and stabilization as necessary, a given building, site, or room will be put to use.

Selective Removal: A considered design decision to remove historic elements in order to facilitate greater site use and profit for further site stabilization and activation. Only considered in Phase 4 after the development plan has been reconsidered and revised

Demolition: In Phase 4, after a few reiterations of the development plan, demolition could be considered for some auxiliary buildings insofar that it facilitates the larger vision of the development including preservation and activation of Richmond's most significant spaces.

Sustainable Maintenance: Future planning, such as a sustainable maintenance plan, would be in the final phase, assuming that the broader goal of the development has been fulfilled while maintaining an element of multi-use/ change. At this stage the development should be financially self-sufficient & sustainable.

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