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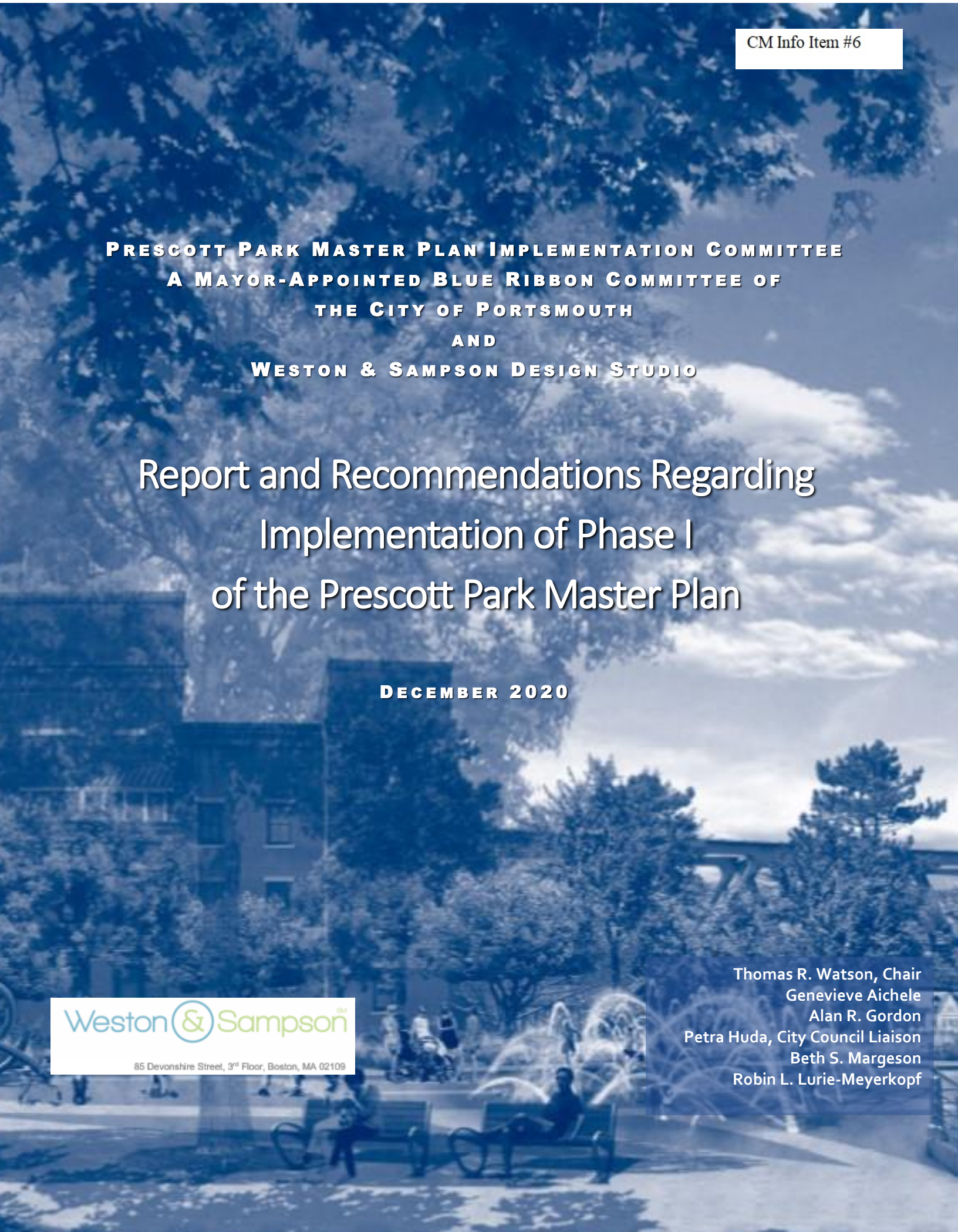

PRESCOTT PARK MASTER PLAN IMPLEMENTATION COMMITTEE
A MAYOR-APPOINTED BLUE RIBBON COMMITTEE OF
THE CITY OF PORTSMOUTH
AND
WESTON & SAMPSON DESIGN STUDIO

Report and Recommendations Regarding Implementation of Phase I of the Prescott Park Master Plan

DECEMBER 2020

Weston & Sampson
85 Devonshire Street, 3rd Floor, Boston, MA 02109

Thomas R. Watson, Chair
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Introduction

In January 2017, the Mayor's Blue Ribbon Committee for a Prescott Park Master Plan, working with Weston & Sampson Design Studio, presented to the Portsmouth City Council, "A Plan for Prescott Park." This Plan was the culmination of a year-long process of studying the history of the Park, examining its structures and natural features and, of greatest import, discerning its importance to the citizens of Portsmouth and surrounding communities and their vision for its future, through a robust program of public engagement. The end result was a comprehensive plan for the re-design of Prescott Park to ensure that it will continue to serve as a central gathering place for the community for the balance of this century.

The Master Plan included preliminary projections of probable costs to implement to Plan and recommended that the Plan be developed in five phases over a period of time as financial resources allow. The Plan also recognized that further environmental and engineering studies were required before final designs could be adopted and construction begun. The Master Plan was unanimously approved by the City Council on February 6, 2017.

In 2019, the Department of Public Works, working with Weston & Sampson, conducted a number of studies regarding the exposure of the Park to flooding and other adverse effects of climate change. The results suggest that the threat to the Park is much greater than that anticipated by the Blue Ribbon Committee in 2016 and 2017 and indicate that modifications to the design of the Park and the proposed phasing are advisable.

Committee Process

In May, 2020, Mayor Becksted appointed the Prescott Park Master Plan Implementation Committee to review these developments and make recommendations to the Council on how best to commence the implementation of the Master Plan. The Committee, again working with Weston & Sampson Design Studio, the Deputy City Manager, Nancy Colbert Puff, City Engineer, Peter Rice, of the Department of Public Works, and Project Manager, Joe Almeida, held several meetings to review the new climate related evidence and to review and consider several alternative designs and financial information. The Committee also held four public sessions at different times of the day specifically designed to answer questions and solicit opinions from the community. On December 9, the team presented the implementation plan in a work session to the Historic District Commission to gain further input on the Phase 1 scope.

Recommended Order of Tasks

The Prescott Park Master Plan Implementation Committee and Weston & Sampson are pleased to present our recommendations for Phase 1 Implementation of the Prescott Park Master Plan. Our recommendation is based on the enabling engineering work as well as months of feedback from and coordination with City staff, the Mayor's Blue-Ribbon Committee, and the public at large. The scope of work included in this summary is foundational not only to improvements

proposed for this geographic area of the park but for the overall implementation strategy of the Master Plan. In other words, they should be completed first in the larger order of operations.

During the process of developing these recommendations, we identified a number of aspects of the 2017 Master Plan that require updates. These include:

- increased specificity of the necessary improvements to create a resilient park;
- a site change for the relocation of the maintenance facility;
- re-assessment of the functionality of the Shaw Warehouse;
- a site change in the proposed relocation of the performing arts stage; and
- re-ordering the phases of the Master Plan implementation.

Phase 1 is divided into discernable tasks that can be considered separately but must be implemented sequentially relative to one another.

Task A: SEAWALL

Estimated Task Cost $1.2M

The seawall within the proximity of the Phase 1 limit of work will be carefully evaluated for current condition as well as life expectancy. It is likely that a combination of treatments will be required. The detailed design and permitting process will be undertaken and construction documents will be created. Some places will need to be rebuilt completely; others will require restoration. In areas where the seawall is lower than Design Flood Elevation (DFE) we will add to the seawall to raise the top of wall elevation. All the utility pipes that outlet through the seawall will be evaluated for condition and be retrofit with backflow prevention devices to block seawater from entering the stormwater system.

Task B: WATER STREET STORMWATER INFRASTRUCTURE

Estimated Task Cost $1.6M

Currently, Water Street is the flood pathway for stormwater moving from the neighboring upland areas through the park, to the river. In this task of work, we will design and permit improvements along Water Street to accommodate some of that stormwater and reduce above ground flooding. Specifically, the work will improve stormwater pipes in Marcy Street and adding a below-grade culvert within the Water Street right-of-way.

Task C: RAISE AND RELOCATE SHAW WAREHOUSE

Estimated Task Cost $550K

As discovered through the resilient engineering models, the Shaw Warehouse is extremely vulnerable to continued and increasing inundation by both stormwater and seawater from the river. It currently sits at the lowest point within the park. As an update to the 2017 Master Plan, in order to protect this historic asset, our proposal includes raising the building and moving it closer to Marcy Street in order to "retreat" from the impending flood waters. The Lean-To and

the Garage are not in a good state of repair and will not survive a relocation; our proposal is to remove them completely. The design and permitting of this task will be completed in coordination with the appropriate historic agencies. The conceptual movement of the Shaw Warehouse, in turn, affects the initial proposal, found in the Master Plan, to relocate the performance stage and its facilities to an angle between the Shaw and the Player's Ring. We propose to move the stage back (south) to align centrally with the proposed Performance Lawn and along the "rail" adjacent to the Shaw. The exact location of the stage and its interconnection with the Shaw and other facilities is reserved for further consideration and evaluation of options available to minimize the spread and impact of back stage activity.

Task D: RELOCATE MAINTENANCE FACILITY

Estimated Task Cost $500K

Currently, the maintenance operations are based within the first floor of the Shaw Warehouse, the Lean-To addition, and the Garage addition. With the Lean-To and the Garage unsuitable for raising and relocation, they are proposed for removal. The 2017 Master Plan proposed that the maintenance facility be relocated to Mechanic Street. We propose that the Master Plan be modified to provide that the maintenance facility move to a more centralized location, the region at the entrance to Four Tree Island, which will allow its resources to be deployed at both Peirce Island and Prescott Park.

Task E: REPLACE ELECTRICAL SERVICE

Estimated Task Cost $350K

The existing electrical system has multiple points of entry into the park and a wide-ranging state of repair from fair to poor. A consolidated, singular point of service with a new transformer is proposed to be designed, permitted, and implemented through this task. Future phases of work will be able to build off this mainline through additional zones of service across the park. In addition to the updated electrical service, this task would include the regrading of the Performance Lawn. The region where the existing stage presently resides will be regraded to temporarily hold excessive stormwater during extreme tide and weather events. Reforming the surface will provide preferential flood pathways that will flood resilient regions and prevent flooding at the Shaw or other vulnerable structures.

TOTAL PHASE 1 ESTIMATED COST $4.2M

Schedule and Next Steps

The tasks summarized above comprise a proposed 'order of operations" for the Phase 1 implementation and will be presented to the City Council for approval as updates to the 2017 Master Plan. If the City Council approves of the updates and the order of tasks, Weston & Sampson will begin the construction document drawings in winter 2020/2021. It is projected that they will be completed in time for the Phase 1 improvements to be placed out to bid in late spring/early summer 2021. Construction could proceed as early as fall 2021, after the conclusion

of the Arts Festival season and other summer events. To ensure transparent communication throughout the development process for the public, there will be on site signage and continuous updates through electronic newsletters.

The implementation of the Master Plan is divided into phases to allow the public to continually enjoy the park while specified regions become revitalized. Future phases in the near term include increasing stormwater holding capacity underground and beginning to develop the new Formal Garden in anticipation of the existing Formal Garden nearing its structural and vegetative life expectancy.

APPENDIX A: STORMWATER REPORT

85 Devonshire Street, 3rd Floor, Boston, MA 02109
Tel: 617.412.4480

MEMORANDUM

TO: City of Portsmouth, NH

FROM: Cheri Ruane, FASLA, Weston & Sampson
Julie Eaton, PE, Weston & Sampson
Indrani Ghosh, PhD, Weston & Sampson
Andrew Walker, PH, CFM, Weston & Sampson

DATE: December 29th, 2020

SUBJECT: Analyses of current and future flood risks at Prescott Park, Portsmouth, NH

Introduction

The Prescott Park Master Plan Implementation Project includes evaluating potential present and future climate threats at Prescott Park (the Park). As part of the project, the Weston & Sampson team evaluated coastal flood risk from sea level rise and storm surge, as well as inland flood risk due to and extreme precipitation at the Park. The results of our analyses are summarized in this memorandum. Additional details on the methodology and approach are provided in the technical reports attached to this memorandum. We propose to use the results of these analyses to inform design choices at Prescott Park to increase climate resilience.

Site Description

Prescott Park is a 10-acre waterfront park located along the tidally influenced Piscataqua River. The Park is bounded between two bridges: Memorial Bridge on the north and Pierce Island Bridge on the south with nearly 1150 ft. waterfront edge. It hosts two important historic structures to the City of Portsmouth: the Shaw building and the Sheafe Warehouses. Based on the goals of the project and the scale of existing flooding, Weston & Sampson team evaluated areas outside the Park for flood risk, including Puddle Dock Pond, Strawbery Banke Parking Lot, and Marcy Street between Mechanic Street and Court Street.

Climate Scenarios

Present and future flood risks were evaluated for the Park using several scenarios for coastal and inland flooding, which are listed in Table 1. The future planning horizons that were considered are 2050 and 2100. The 2050 planning horizon was selected since it corresponds to the time frame of the likely useful life of the Park programming. The 2100 planning horizon was selected to evaluate longer term climate impacts at the Park. Two recurrence intervals were selected: the 10-yr storm (or 10% annual chance of occurring) and the 100-yr storm (or the 1% annual chance of occurring)

Table 1. Summary of climate scenarios developed for Prescott Park

Climate Parameter	Flood Risk	Planning Horizons	Recurrence Intervals	Data Source
Extreme Precipitation	Inland Flooding	• Present • 2050 • 2100	• 2-yr • 5-yr • 10-yr • 25-yr • 100-yr	Climate change projections for Portsmouth by Dr. Cameron Wake as part of NHDES publication on New Hampshire Coastal Flood Risk Summary Part 1: Science, released September 3rd, 2019
Sea Level Rise and Storm Surge	Coastal Flooding	• Present • 2050 • 2100	• 10-yr • 100-yr	NH Coastal Flood Risk Summary Report, STAP 2019

Rainfall depths associated with the 24-hour duration design storms of different recurrence intervals (2-, 5-, 10-, 25- and 100-year) for Portsmouth were determined for both present and future climate scenarios as listed in Table 1. The design storms' rainfall depths under present climate conditions (baseline) were derived from the NOAA Atlas 14 Point Precipitation Frequency Estimates (NOAA 14). Design storms' rainfall depths under future climate conditions were calculated as a percent increase over these baseline values. The percent increase for each design storm was determined using a statistical analysis of annual maximum daily precipitation depths from an ensemble of global climate models (GCMs), which were part of the New Hampshire Coastal Flood Risk Summary Part 1: Science document. The design storm rainfall depths for present, 2050 (using a 20-year averaging period from 2040-2059) and 2100 (using a 20-year averaging period from 2080-2099) are summarized in Figure 1. The inland stormwater flood risks at the Park and surrounding areas were evaluated using a hydrologic and hydraulic (H&H) model of the City's existing stormwater system in and upgradient of Prescott Park. Additional details on the model results for inland flood risks at the Park are presented in the technical appendix titled "Summary of Stormwater Modeling" authored by Weston Sampson team.

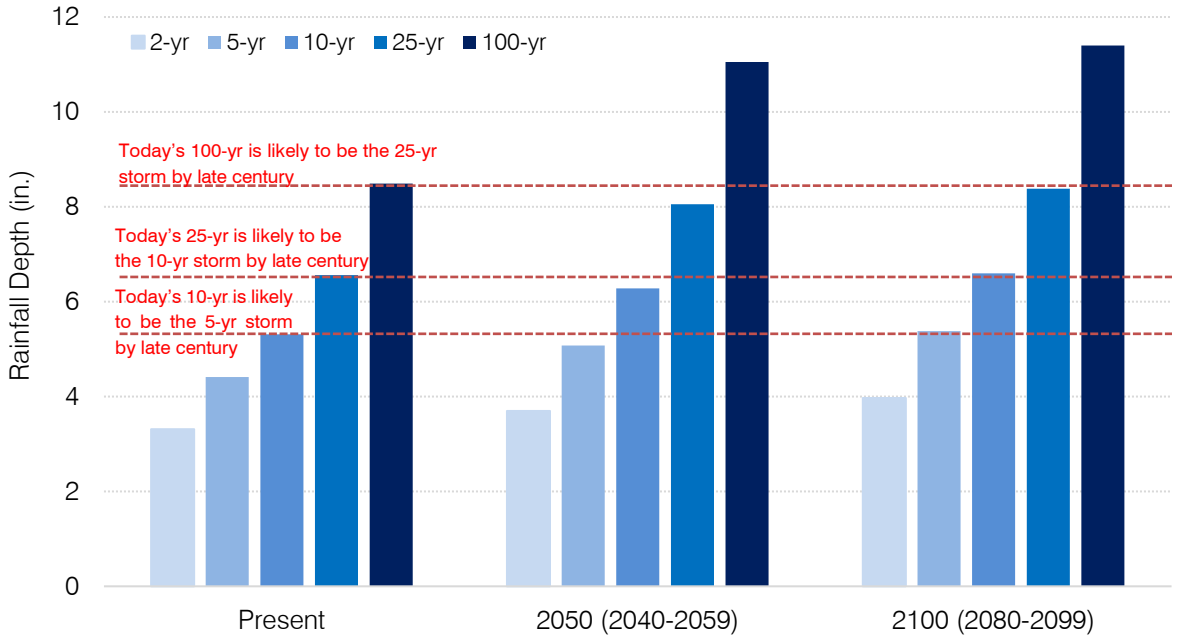


Figure 1. Stormwater flooding impacts due to changes in extreme rainfall events

Sea Level Rise (SLR) scenarios for costal flood risk analysis are based on the New Hampshire Coastal Flood Risk Summary Part 1: Science document[1], which was published by New Hampshire Coastal Flood Risk Science and Technical Advisory Panel (STAP) Steering Committee and the New Hampshire Department of Environmental Services (NHDES) in September 2019. The storm surge depths at the Park were determined from the North Atlantic Coastal Comprehensive Coastal Study (NACCS) modeling effort that was conducted by the US Army Corps of Engineers (USACE) in 2015. The coastal flood risks at the Park and surrounding area in downtown Portsmouth were evaluated under a variety of SLR and storm surge scenarios using a bathtub modeling approach and inputs from the NACCS model. Additional details on the model inputs and scenarios are presented in the technical appendix titled "Coastal modeling at Prescott Park, NH 19-P-206014" authored by the RPS Group as part of the Weston Sampson team for this project.

[1] Wake, C., Knott, J., Lippmann, T., Stampone, M., Ballestero, T., Bjerklie, D., Burakowski, E., Glidden, S., Hosseini-Shakib, I., Jacobs, J. (2019). New Hampshire Coastal Flood Risk Summary – Part I: Science. Prepared for the New Hampshire Coastal Flood Risk Science and Technical Advisory Panel. Report published by the University of New Hampshire, Durham, NH. (https://scholars.unh.edu/cgi/viewcontent.cgi?article=1209&context=ersc)

Inland Flood Risk Summary

The inland stormwater flood risks at the Park and surrounding areas were evaluated using a hydrologic and hydraulic model, developed in with the popular stormwater modeling software, PC-SWMM. This H&H model included sub-basins representative of the park grounds as well as the City streets and neighborhoods upgradient of the park. The model also included the City's existing stormwater system and a representation of the dynamic tidal conditions downstream in the Piscataqua River. The H&H model was used to simulate the 25-year 24-hour design storm under present, 2050 and 2100 scenarios. The 25-year storm (4% annual change of occurring) was selected as the focus for this evaluation as it represents a reasonable target for managing stormwater runoff in an urban setting. The rainfall depths associated with the 25-year event under the three climate scenarios identified above are presented in Table 3.

Table 3. Summary of inland rainfall depths modeled for Prescott Park

Planning Horizon	Design Storm	Rainfall Depth
Present Day	25-year, 24-hour	6.56 inches
2050	25-year, 24-hour	8.05 inches
2100	25-year, 24-hour	8.38 inches

Present Day Inland Flood Risk: For the present day 25-year, 24-hour design storm, approximately 67% of flooding occurs upgradient of Prescott Park in the Strawbery Bank area (Puddle Dock Pond and Strawbery Banke Parking Lot), with an additional 16% occurring on Marcy Street at the Park's upgradient edge. Only 17% of the flooding occurs within the Park itself, which primarily originates from the Park's dry wells.

2050 Planning Horizon Inland Flood Risk: A similar trend is observed for the 2050 25-year, 24-hour design storm (8.05 inches), where approximately 62% of flooding occurs in the Strawbery Bank area, 24% on Marcy Street, and only 14% originates from the dry wells in Prescott Park. However, it is likely that surcharging on Puddle Lane and Marcy Street may cause overland flow downgradient towards the Park.

2100 Planning Horizon Inland Flood Risk: By late 21st century (2090-2100), the pattern of flooding for the 25-year, 24-hour storm is expected to change significantly as sea level rise impacts the tidally influenced Piscataqua River, which in turn propagates back into the low-lying drainage systems in the Park through their respective outfalls. This projected change causes surcharging at drainage manholes and associated catch basins in the Park. For this scenario, 60% of the flooding originates in the Park itself, compared to 29% in the Strawbery Banke area and 11% on Marcy Street.

Proposed Improvements to Reduce Inland Flood Risks

To reduce the stormwater flooding impacts from Prescott Park dry wells under the present day and mid-century climate scenarios and to reduce the significant flooding increase everywhere in the study area

under the late-century climate scenario, Weston & Sampson evaluated a range of stormwater infrastructure improvement projects that could be developed within Prescott Park to reduce the impacts of inland flooding. These proposed improvements are visualized in Figure 2 and include the following:

1. All existing outfalls will get tide gates to prevent backflow during high tide.
2. The existing 24-in. storm drain through the Great Lawn area will be upsized to 36 in.
3. Above ground storage will be incorporated into the grading of proposed Great Lawn area improvements.
4. A 12-in. storm drain will be installed down the length of Water Street to convey overflows from existing Marcy Street storm drains and to capture any roadway flooding on Marcy Street.
5. Approximately 0.146 MG of underground storage chambers will be installed beneath a portion of the Liberty Lawn area. An outlet with valves will allow captured runoff to be drained to the proposed 12-in. storm drain beneath Water Street, after a storm event has passed.

Figure 2. Proposed stormwater infrastructure improvements at Prescott Park

A complete discussion of these and several smaller recommended projects is included in the Summary of Stormwater Modeling memorandum attached to this document. The series of recommended projects identified in that memorandum are expected to eliminate inland flooding in Prescott Park and on Marcy and Water Streets during the 25-year, 24-hour design storm under the present climate. Inland flooding would also be nearly eliminated in these areas during the corresponding event under a mid-century climate scenario. Under the late-century scenario, inland flooding would be expected in Prescott Park as well as Marcy and Water Streets during the 25-year, 24-hour storm event, however, flood volumes would be significantly reduced (e.g. by 97% in Prescott Park). The attached Summary of Stormwater Modeling memorandum describes these expected benefits in greater detail.

Coastal Flood Risk Summary

The coastal flood modeling for Prescott Park and the surrounding areas were conducted for a variety of SLR and storm surge scenarios.

Table 2. Summary of coastal flood elevations evaluated for Prescott Park

Planning Horizon	Sea Level Rise	Recurrence Interval	Water Surface Elevation*
Present Day	0 ft.	10-yr	8.6 ft.
		100-yr	10.2 ft.
2050	2 ft.	10-yr	10.6 ft.
		100-yr	12.2 ft.
2100	5.3 ft.	10-yr	13.9 ft.
		100-yr	15.5 ft.

* All elevations are in NAVD88 datum

Present Day Coastal Flood Risk: The modeling results demonstrated that with the present day 10-year storm, flooding is expected to occur in the northern/central portions of Prescott Park including areas inland of the "T" Pier and Prescott Pier including the Whale Area, Open Lawn B, the Railway Headhouse, the Shaw Warehouse, and portions of Open Lawn C. For the present day 100-year storm, flooding is expected to occur in most of the Park, except small sections of Open Lawn A Stage, the Formal Entry/Hovey fountain, the concession/restroom location, and portions of the Formal Garden

2050 Planning Horizon Coastal Flood Risk: The modeling results demonstrated that by 2050, for the 10-year and 100-year storms, progressively larger areas of the Park are likely to be flooded with only the northwest corner of the North Parking Lot and Entry/Fountain Area remaining unaffected.

2100 Planning Horizon Coastal Flood Risk: The modeling results demonstrated that by 2100, for the 100-yr storm, the entire Park has the potential to become inundated. Higher elevations on Four Tree Island prevent the Island from becoming fully inundated as quickly as other areas of Prescott Park. However, the Island is likely to be fully inundated by 2100 for the 10-year storm.

In addition to evaluating flood extents and depths at the Park, flood pathways to the Park were also identified by incrementally analyzing flood elevations between different scenarios. This analysis showed that the Park first floods in the Prescott Pier area at an elevation of 7 ft-NAVD 88. Between flood elevations of 9 and 10 ft-NAVD88, most of the Park becomes flooded. At 9 ft-NAVD88, portions of the pedestrian causeway that connects Pierce Island and Four Tree Island begins to flood, restricting access to the Park. At flood elevations of 12 ft-NAVD88, the entire Park (excluding Four Tree Island) is flooded, and at flood elevation 13 ft-NAVD88, Four Tree Island is completely inundated. Additional details on the modeling methodology, results and flood maps for the different scenarios are included in the technical appendix titled "Coastal modeling at Prescott Park, NH 19-P-206014" authored by the RPS Group as part of the Weston Sampson team for this project.

ATTACHMENTS:

- Summary of Stormwater Modeling (Weston & Sampson)
- Coastal modeling at Prescott Park, NH 19-P-206014 Report (RPS Group) (Available upon request)

MEMORANDUM

TO: Cheri Ruane, FASLA, Weston & Sampson

FROM: Andrew Walker, PH, CFM, Weston & Sampson

DATE: December 29th, 2020

SUBJECT: Summary of Stormwater Modeling

Weston & Sampson evaluated the magnitude and locations of inland flooding caused by rainfall-induced runoff that surcharges the current stormwater system in and upgradient of Prescott Park. Inland flooding is shown to occur in four primary areas, which are depicted in Figure 1.

1. Prescott Park – Overflow of dry wells and surcharging of manholes and catch basins within the park.
2. Marcy Street – Surcharging of manholes and catch basins on Marcy Street between Mechanic Street and Court Street.
3. Puddle Dock Pond – Surcharging of manholes and catch basins upgradient of Puddle Dock Pond, namely along Court Street, Washington Street, and Puddle Lane.
4. Strawbery Banke (SB) Parking Lot – Surcharging of manholes and catch basins upgradient of the Strawbery Banke parking lot, namely along Hancock Street and Marcy Street, south of Mechanic Street.

Figure 1: Schematic of Existing Stormwater Infrastructure in and Upgradient of Prescott Park

Given the goals of the project and the scale of existing flooding, our analyses of inland flooding – locations, magnitudes, and potential solutions – focuses on the 25-year storm even. To ensure those designs remain useful throughout their design life, we evaluated inland flooding under three climate conditions – baseline, 2050, and 2090. Climate scenarios were defined through design rainfall depths and by dynamic tidal conditions that incorporate potential sea level rise.

Existing Conditions

Based on the three climate scenarios defined in this manner – baseline, 2050, and 2090 – Weston & Sampson developed a hydrologic and hydraulic (H&H) model of the City's existing stormwater system in and upgradient of Prescott Park. Model simulations of existing conditions are summarized in Tables 1 and 2. To better understand which areas are experiencing the most inland flooding, Table 1 presents flood magnitudes, expected from the 25-year event, as a percentage of total flooding during each of the three climate scenarios:

Table 1: Relative Magnitude of Flooding by Area and Climate Scenario (Existing Conditions)

Flooding Area	% of Total Flooding by Climate Scenario		
	Baseline	*2050*	*2090*
Prescott Park	17%	14%	60%
Marcy Street	16%	24%	11%
Puddle Duck Pond	33%	33%	24%
Strawbery Banke Parking	34%	29%	5%
Total	100%	100%	100%

Under baseline climate conditions, approximately 67% of flooding occurs upgradient of Prescott Park in the Strawbery Bank area (Puddle Dock Pond and Parking Lot), with an additional 16% occurring on Marcy Street at the Park's upgradient edge. Only 17% of flooding during the baseline climate scenario occurs within Prescott Park itself, originating from the park's dry wells. The dry wells flood because they simply were not designed to contain storms as large as the 25-year event and they have no downstream discharge point.

This trend remains quite similar under the 2050 climate scenario, as well, with 62% of flooding occurring in the Strawbery Bank area, 24% on Marcy Street, and only 14% originating from the dry wells in Prescott Park. That is not to say that Prescott Park will not suffer the impact of much of the flooding originating upgradient; it is entirely possible that surcharging on Puddle Lane and Marcy Street will flow overland downgradient towards the Park, particularly to the Water Street area, which bisects the park.

The pattern of flooding is expected to change significantly during the late 21st century as sea level rises more significantly and many of the smaller outfalls and drain systems in the park begin to backwater as a result, causing surcharging from their associated manholes and catch basins. That process, which is evident in Table 2 as well, is the driving force behind the dramatic shift in flooding distribution, with 60% of total flooding occurring within the park while 11% occurs on Marcy Street and 29% occurs in the Strawbery Banke area.

Table 2 summarizes the expected magnitude of flood volumes, in millions of gallons (MG), that are expected to be generated during the 25-year event and how those volumes may change under future climate scenarios.

Table 2: Total Flooding and % Increase over Baseline Climate by Area (Existing Conditions)

Flooding Area	Flooding by Climate Scenario				
	Baseline	2050		2090	
	Volume (MG)	*Volume (MG)*	Δ (%)	*Volume (MG)*	Δ (%)
Prescott Park	0.295	0.376	27%	9.582	3148%
Marcy Street	0.279	0.662	137%	1.713	514%
Puddle Dock Pond	0.580	0.914	58%	3.767	549%
Strawbery Banke Parking	0.578	0.796	38%	0.858	48%
Total	1.732	2.748	59%	15.920	819%

Under the baseline climate scenario, a total of 1.732 MG of flooding is anticipated during the 25-year rain event, of which 0.574 MG is expected on City property in Prescott Park and Marcy Street. Under the 2050 climate scenario, total flooding is expected to increase by 59% while flooding on City property is simulated to increase by 81%. As noted above, flooding is expected to increase dramatically under the 2090 climate scenario, 819% over existing conditions in fact, due to sea level rise backwatering the existing stormwater system and surcharging from the lowest manholes and catch basins. Again, the most extreme increases are anticipated on City property where an increase of 1,868% is expected. While Prescott Park is likely to experience the most dramatic increase in flooding, due primarily to sea level rise, all four areas are expected to experience significant increases in flooding volumes due to sea level rise and the more intense rainfall expected by the end of the 21st century.

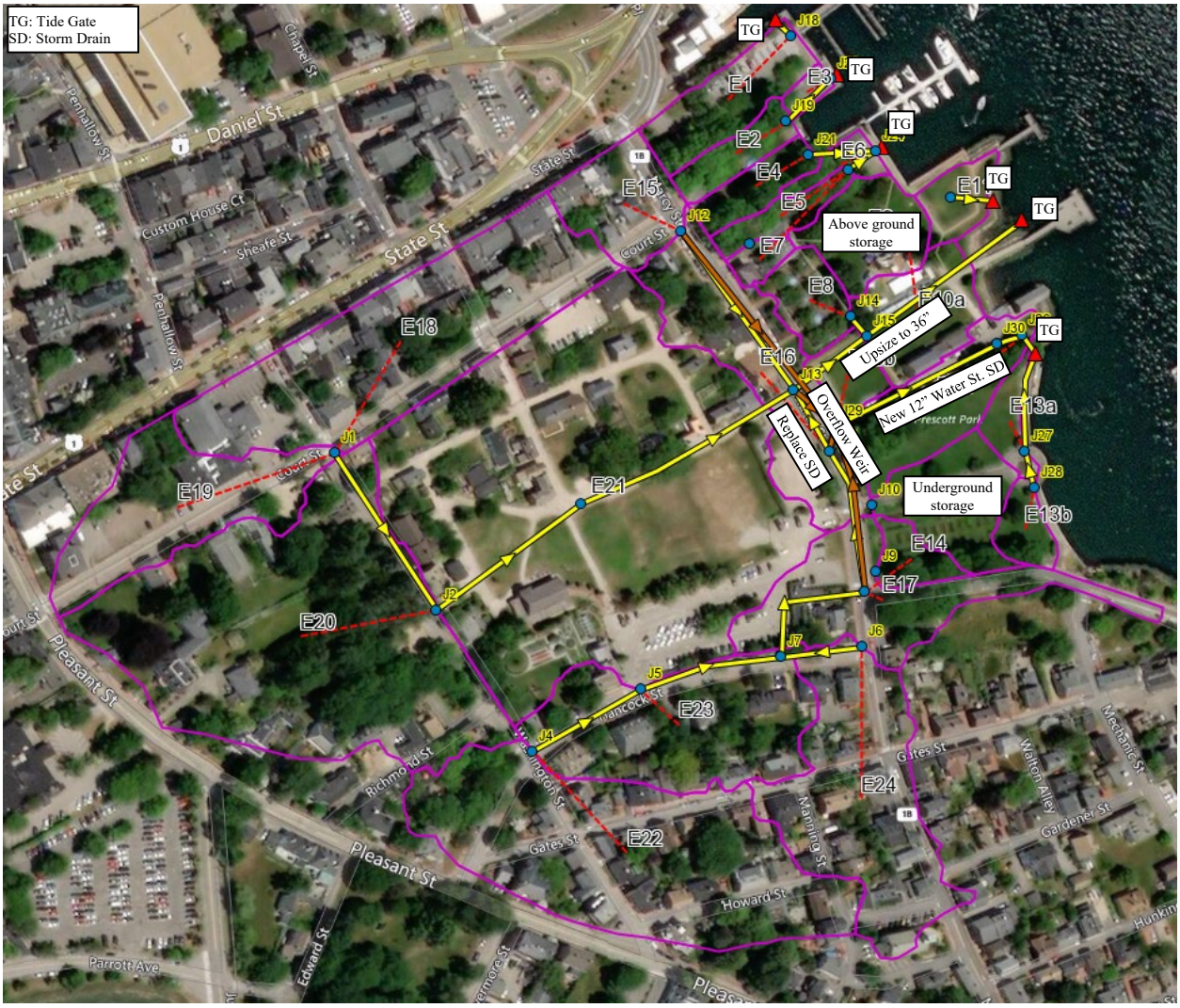
Proposed Conditions

To address the uncontrolled flooding from Prescott Park dry wells under the baseline and 2050 climate scenarios and the dramatic increases to flooding everywhere in the study area under the 2090 climate scenario, Weston & Sampson has evaluated a range of stormwater infrastructure projects that can be developed within Prescott Park to reduce the impacts of inland flooding. Based on simulations of the H&H model, we recommend the following stormwater-related projects:

1. All existing outfalls will get tide gates to prevent backflow during high tide.
2. The existing 24-in. storm drain through the Great Lawn area will be upsized to 36 in.
3. Approximately 0.337 MG of above ground storage will be incorporated into the grading of proposed Great Lawn area improvements. A valved outlet will allow captured runoff to be drained to the proposed 36-in. storm drain that runs beneath the Great Lawn area, after a storm event has passed.
4. A broken 12-in. storm drain in Marcy Street, between Fish Pond Lane and Water Street will be replaced in kind.
5. A 12-in. storm drain will be installed down the length of Water Street.
6. Inflow to this proposed Water Street storm drain will be via overflow weir from the storm drains on Marcy St.

7. Catch basins will be added as needed near the Marcy Street-Water Street intersection to capture any roadway flooding, discharging it to the proposed Water Street storm drain.
8. The Water Street storm drain will be discharge through an existing outfall located near the end of the straight. The outfall will likely need to be lowered and upsized to accommodate the additional runoff.
9. Two existing dry wells located northeast of the Liberty Lawn area will be discharged via new 6-in. drains to the outfall at the end of Water Street.
10. Approximately 0.146 MG of underground storage chambers will be installed beneath a portion of the Liberty Lawn area. A valved outlet will allow captured runoff to be drained to the proposed 12-in. storm drain beneath Water Street, after a storm event has passed.

Figure 2: Schematic of Existing Stormwater Infrastructure in and Upgradient of Prescott Park



These Prescott Park Improvements are expected to significantly reduce flood volumes originating in the park. Tables 3-5 identify the simulated flood volume totals by area and the percent reduction from existing conditions for baseline, 2050, and 2090 climate scenarios, respectively.

Table 3: Proposed Conditions Improvements under Baseline Climate Scenario

Flooding Area	Existing Conditions	Proposed Conditions	
	Flooding (MG)	*Flooding (MG)*	*% Reduction*
Prescott Park	0.295	0.000	100%
Marcy & Water St.	0.279	0.000	100%
Puddle Dock Pond	0.580	0.194	67%
Strawbery Banke Parking	0.578	0.561	3%
Total	1.732	0.755	56%

Table 4: Proposed Conditions Improvements under 2050 Climate Scenario

Flooding Area	Existing Conditions	Proposed Conditions	
	Flooding (MG)	*Flooding (MG)*	*% Reduction*
Prescott Park	0.376	0.000	100%
Marcy & Water St.	0.662	0.068	90%
Puddle Dock Pond	0.914	0.581	36%
Strawbery Banke Parking	0.796	0.788	1%
Total	2.748	1.437	48%

Table 5: Proposed Conditions Improvements under 2090 Climate Scenario

Flooding Area	Existing Conditions	Proposed Conditions	
	Flooding (MG)	*Flooding (MG)*	*% Reduction*
Prescott Park	9.582	0.306	97%
Marcy & Water St.	1.713	1.038	39%
Puddle Dock Pond	3.767	1.741	54%
Strawbery Banke Parking	0.858	0.867	-1%*
Total	15.920	3.952	75%

**Negative value indicating increased flooding under proposed conditions is within the "white noise" associated with the H&H model.*

As shown in Table 3, the proposed improvements are expected to make an immediate impact on inland flooding. Under baseline climate conditions, the 25-year rainfall event is no longer expected to produce any uncontrolled flooding in Prescott Park or within the Marcy Street and Water Street roadways, a marked improvement to the 0.574 MG of flooding anticipated with the existing infrastructure. The Puddle Dock Pond area is also expected to experience a notable reduction, approximately 67%, in flooding.

The improvements to City property, namely Prescott Park, Marcy and Water Streets, are also expected to remain relatively dry during the 25-year event under the 2050 climate scenario, with Prescott Park experiencing no uncontrolled flooding and the roadways experiencing only 0.068 MG, a 90% reduction. Reductions in flooding upgradient in the Puddle Dock Pond area of Strawbery Banke are significant as well, approximately 36%, although they are reduced from those anticipated under baseline climate conditions.

The proposed stormwater improvement projects would also produce a significant reduction in uncontrolled flooding under the 2090 climate scenario. Flooding in Prescott Park itself would be reduced by approximately 97%, while flooding in Marcy and Water Streets would be reduced by 39%, although more than 1 MG of flooding is still expected in those roadways during the 25-year event under a late century climate scenario. The Puddle Duck Pond area is also expected to experience a significant reduction, approximately 54%. Counterintuitively, the H&H model indicates that the Strawbery Banke area will experience slightly more uncontrolled flooding under the proposed conditions. This result is very likely explained by the uncertainty of hydraulic models, that 1% increase in flooding is within the error bounds or the "white noise" of the model.

While the stormwater improvement projects identified above were shown, through the H&H model, to significantly improve flooding in the project area, a number of other projects or concepts were considered as well that were ultimately deemed infeasible or were found to offer no significant benefit. Some of those projects include:

- Additional underground storage chambers within Prescott Park were ultimately rejected due to the high water table, particularly under future climate scenarios. The Liberty Lawn area has some of the highest grades available and so short chambers were retained in that area. Elsewhere, underground chambers would be excessively difficult to drain post-event.
- Preliminary model simulations indicated that there may be a potential benefit to developing underground storage beneath the grassy field in the Puddle Dock Pond and beneath the Strawbery Banke parking lot. However, we did not include those projects in our recommended stormwater improvements as they are outside the project area and would require intense landowner collaboration.
- Additional reductions in the impervious surface area of sub-basins. Greater impervious surface area tends to increase peak runoff rates and total runoff volumes. The impervious surface areas of sub-basins within Prescott Park represent Weston & Sampson's best attempt to balance the need to reduce flooding but also to maintain and improve enjoyment of the park and its facilities. Consideration of reducing impervious surface areas outside the park was not considered given the scope of the project.
- Upsizing of the storm drains beneath Marcy Street was evaluated. However, the benefits of that improvement were minor at best.
- Regrading Water Street to support preferential surface flow down the roadway towards Portsmouth Harbor during large storm events was considered. This concept was ultimately rejected due to plans to elevate much of Water Street and the existing buildings that sit along its edge. Instead, this concept was replaced with the installation of a 12-in. storm drain project that was incorporated into our recommended proposed conditions.

In summation, the stormwater improvement projects identified above will immediately and significantly reduce uncontrolled flooding in Prescott Park and on Marcy and Water Streets during flood events up to and including the 25-year storm event, and likely beyond. Significant benefits are expected to continue under mid- and late-century climate scenarios as well.

APPENDIX B: HDC PRESENTATION, INCLUDING PHASE 1 SUMMARY

City of Portsmouth, NH

PRESCOTT PARK MASTER PLAN

PROPOSED PHASE 1 IMPLEMENTATION

Historic District Commission Meeting

December 9th, 2020

Weston & Sampson

PROJECT TEAM

City of Portsmouth
Nancy Colbert Puff
Deputy City Manager

Peter Rice
Director of Public Works

Joe Almeida
Facilities Manager

Blue Ribbon Committee
Genevieve Aichele
Alan Gordon
Councilor Petra Huda
Beth Margeson
Robin Lurie-Meyerkopf
Tom Watson

Weston & Sampson
Landscape Architecture
Resiliency
Utility Infrastructure

Touloukian Touloukian Inc.
Architecture

Consultants
Leslie Chiu & Seaghan McKay
Outdoor Performing Arts
Production
United Stage & Rigging
Stage Mechanics

AGENDA

HISTORICAL BUILDING ANALYSIS
REVIEW OF THE SHAW WAREHOUSE

CLIMATE RESILIENCY STRATEGY
ENABLING ENGINEERING RESEARCH

PROPOSED MASTERPLAN UPDATES
PROPOSED UPDATES: 2017 & 2020

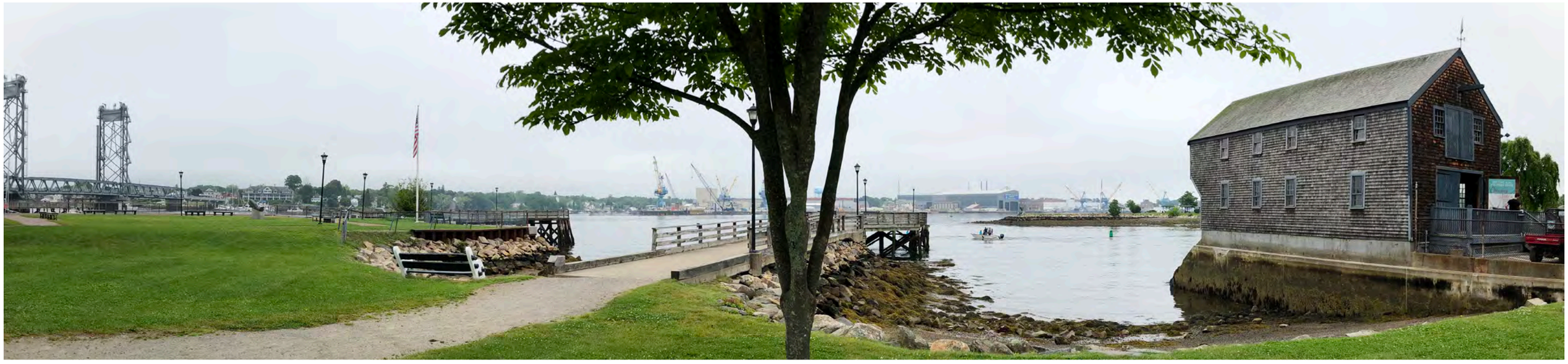
PRESCOTT PARK PROJECT UPDATES
PROJECT SCHEDULE
PROPOSED PHASE 1 IMPLEMENTATION
COST SUMMARY

OPEN DISCUSSION

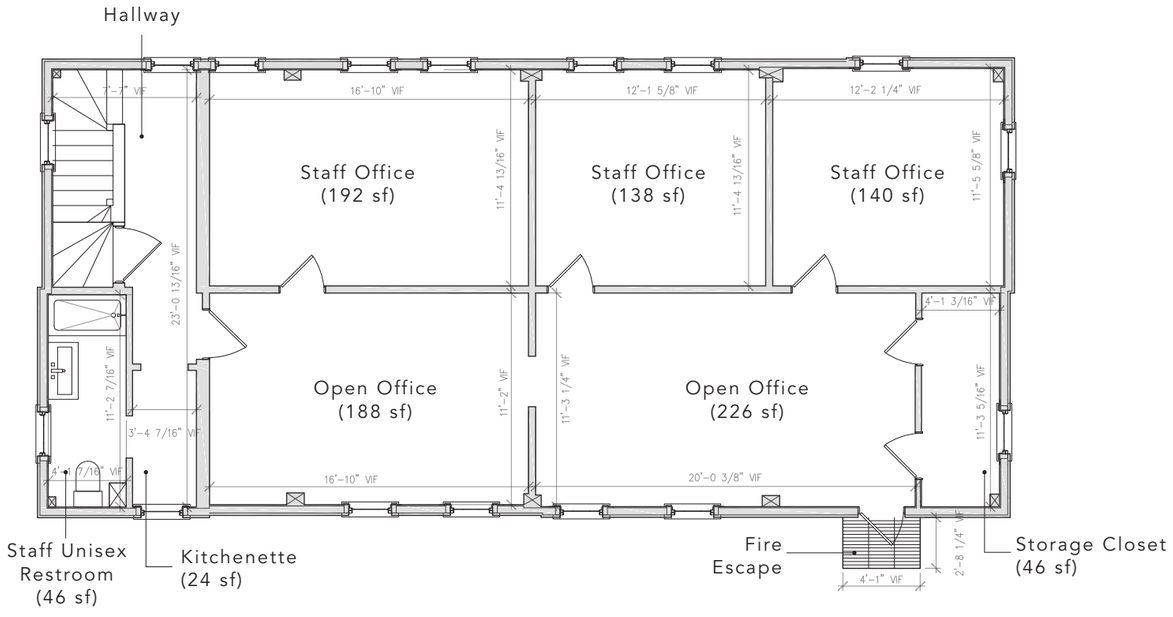
HISTORICAL BUILDING ANALYSIS


1
Sheafe Warehouse
2
3
4
Garage Addition
Lean-To
Shaw Warehouse

View looking west

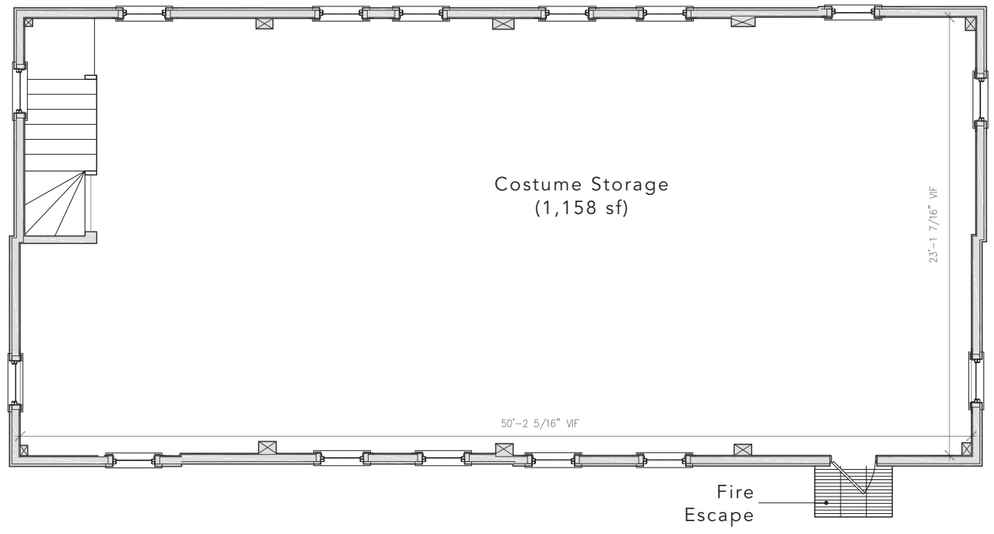


View looking south



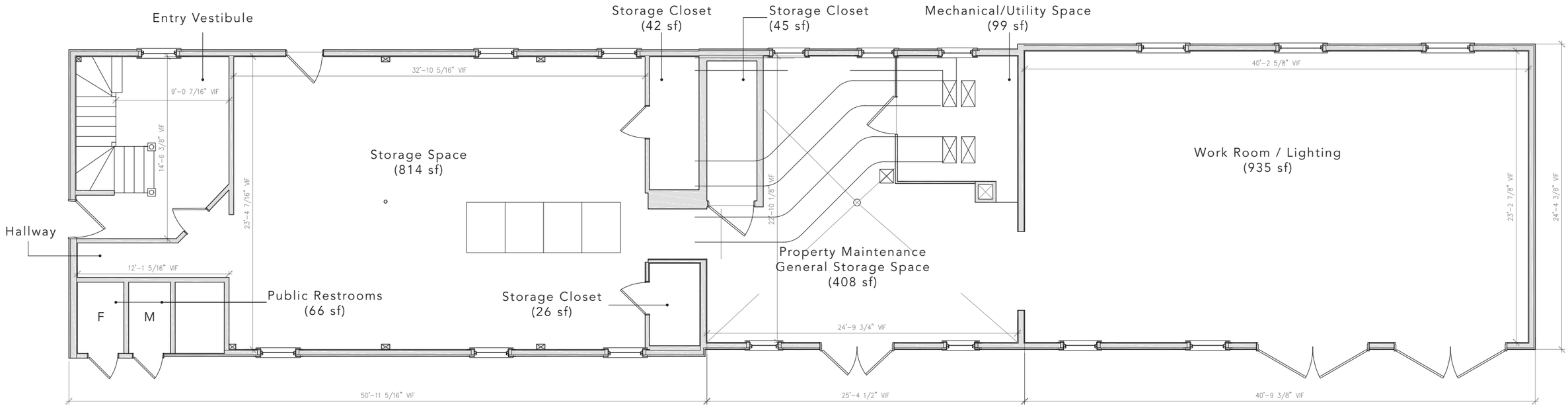
Existing Second Floor Plan

NTS



Existing Third Floor Plan

NTS



Existing First Floor Plan

NTS

Existing Shaw Building Floor Plans

The Shaw Warehouse (circa. 1806-1813)

West Elevation - Entrance to building

North Elevation

South Elevation - View towards pubic restrooms and parking zone

South Elevation - Emergency egress stair and connection to Lean-To addition


SHEAFE
WAREHOUSE
MUSEUM
FOLK ART
FREE
WED-SUN
DELTA

Shaw 2nd Floor - View of open office space looking towards storage closet doors

Shaw 2nd Floor - View of open office looking towards emergency egress exit


ITEM ASSORTED COLOR SWORDS
WITH 30 LEDS
ITEM ASSORTED COLOR PLAY
SWORDS WITH 30 LEDS
COLOR SWORDS
HAMMER
COPY

Shaw 1st Floor - Water Heater

Shaw 1st Floor - Electric Panel

Shaw 1st Floor - Steel Support Post


Shaw 1st Floor - HVAC DUCT

The Shaw Warehouse Leanto Addition (circa. 1904)

South Facade

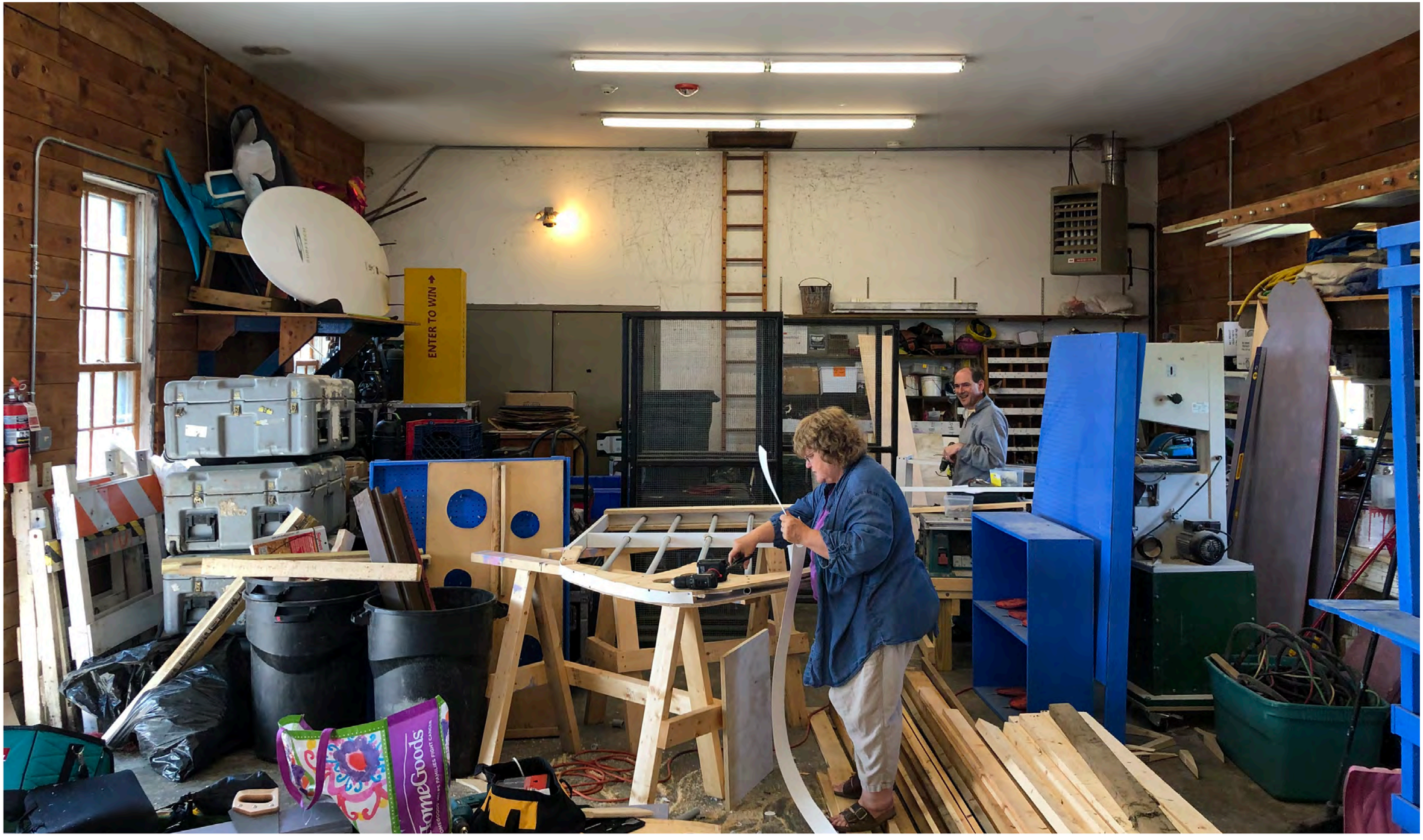
Lean-to - Interior Storage space looking towards door connecting to the Garage addition

Lean-to- Interior Storage Space

The Shaw Warehouse Garage Addition (circa. 1987)

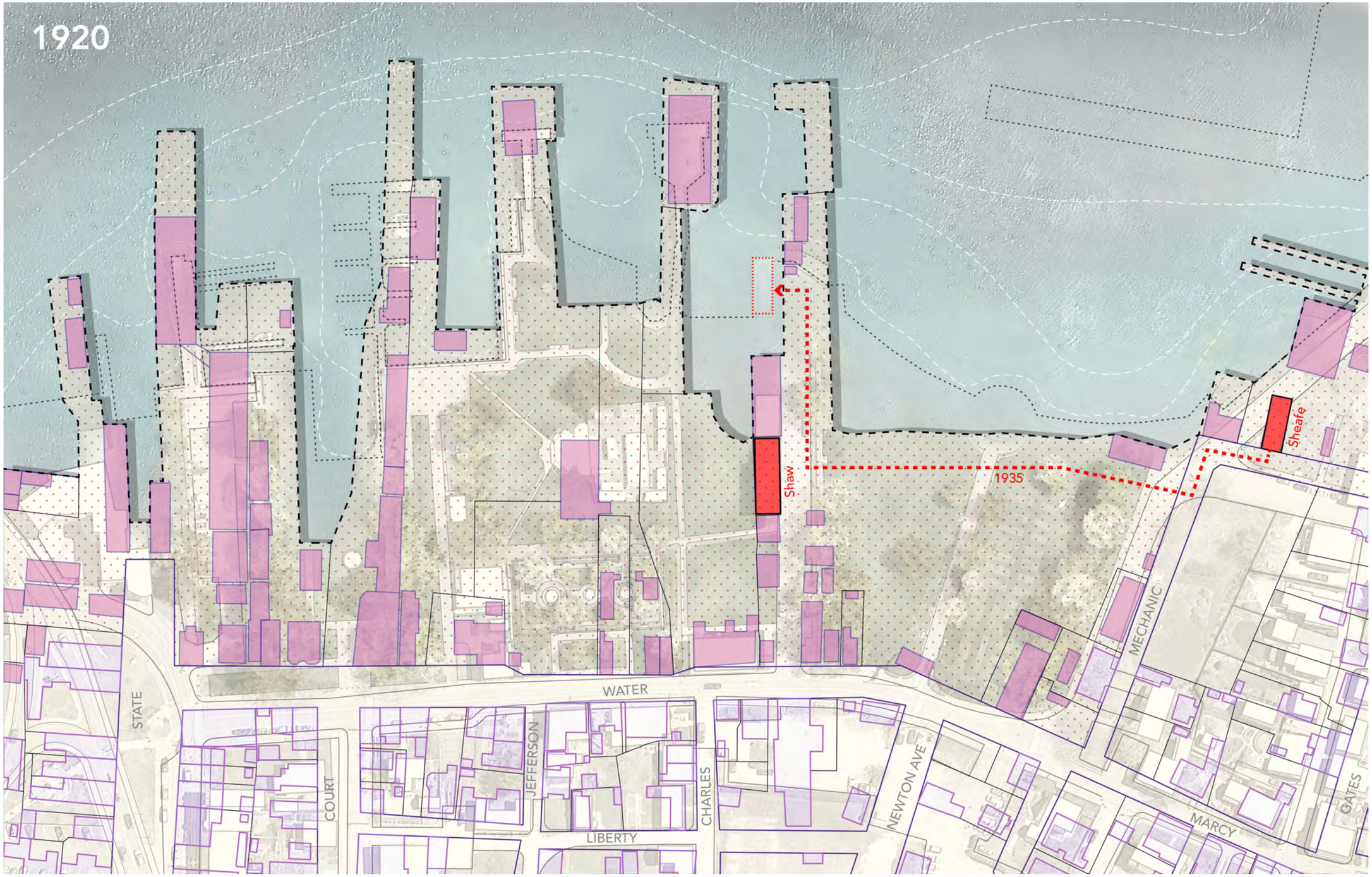
South Facade

South Facade



Garage Addition - Interior stage/ prop workshop and storage


1
Sheafe
Warehouse
2
Shaw
Warehouse
3
Stage
4
Marine Railway
Building

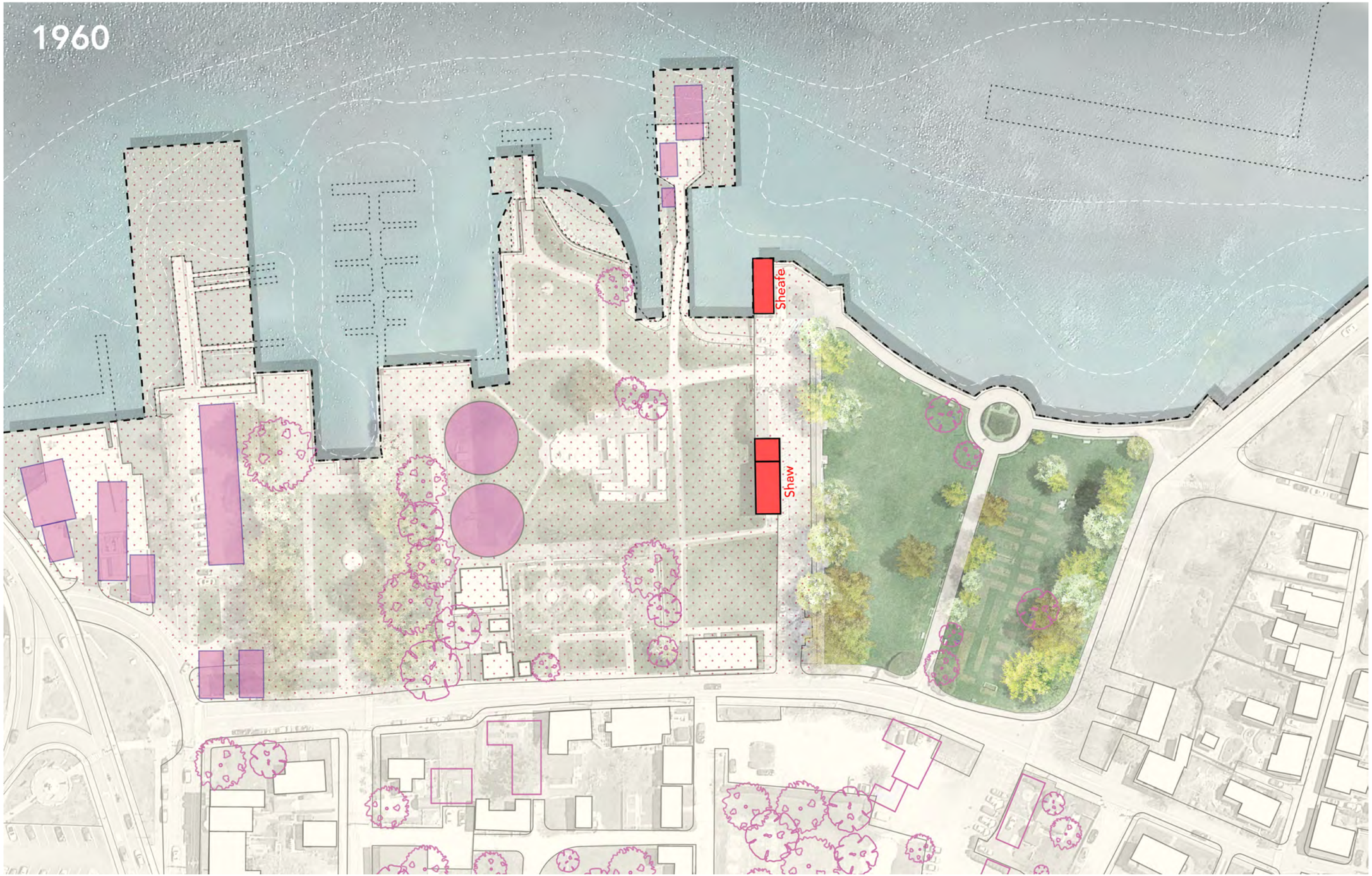

1920
Shaw
1935
Sheafe
MECHANIC
WATER
STATE
COURT
JEFFERSON
CHARLES
NEWTON AVE
LIBERTY
MARCY
GATES

From Brighton's The Prescott Story ©1982; 1920s view courtesy Strawbery Banke Museum

Courtesy of the Portsmouth Athenaeum© 1938 View of Shaw Warehouse and neighboring wharves.

Courtesy of the Portsmouth Athenaeum© 1930 Sheafe Warehouse original location on Mechanic St.

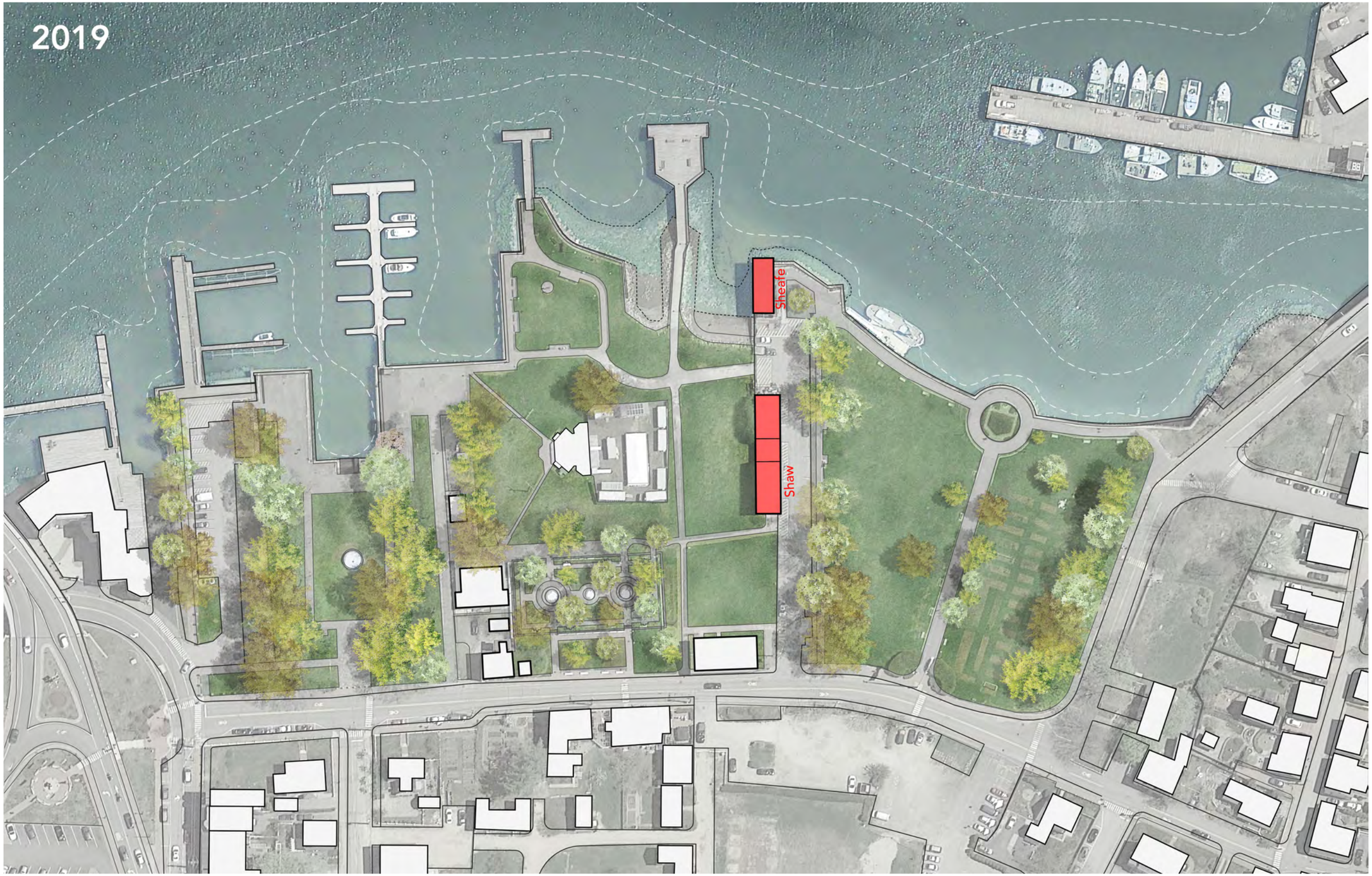
1939 Sheafe Warehouse moving next to Shaw Warehouse in Prescott Park.


1960
Sheafe
Shaw

Courtesy of the Portsmouth Athenaeum© circa 1963 Aerial View.

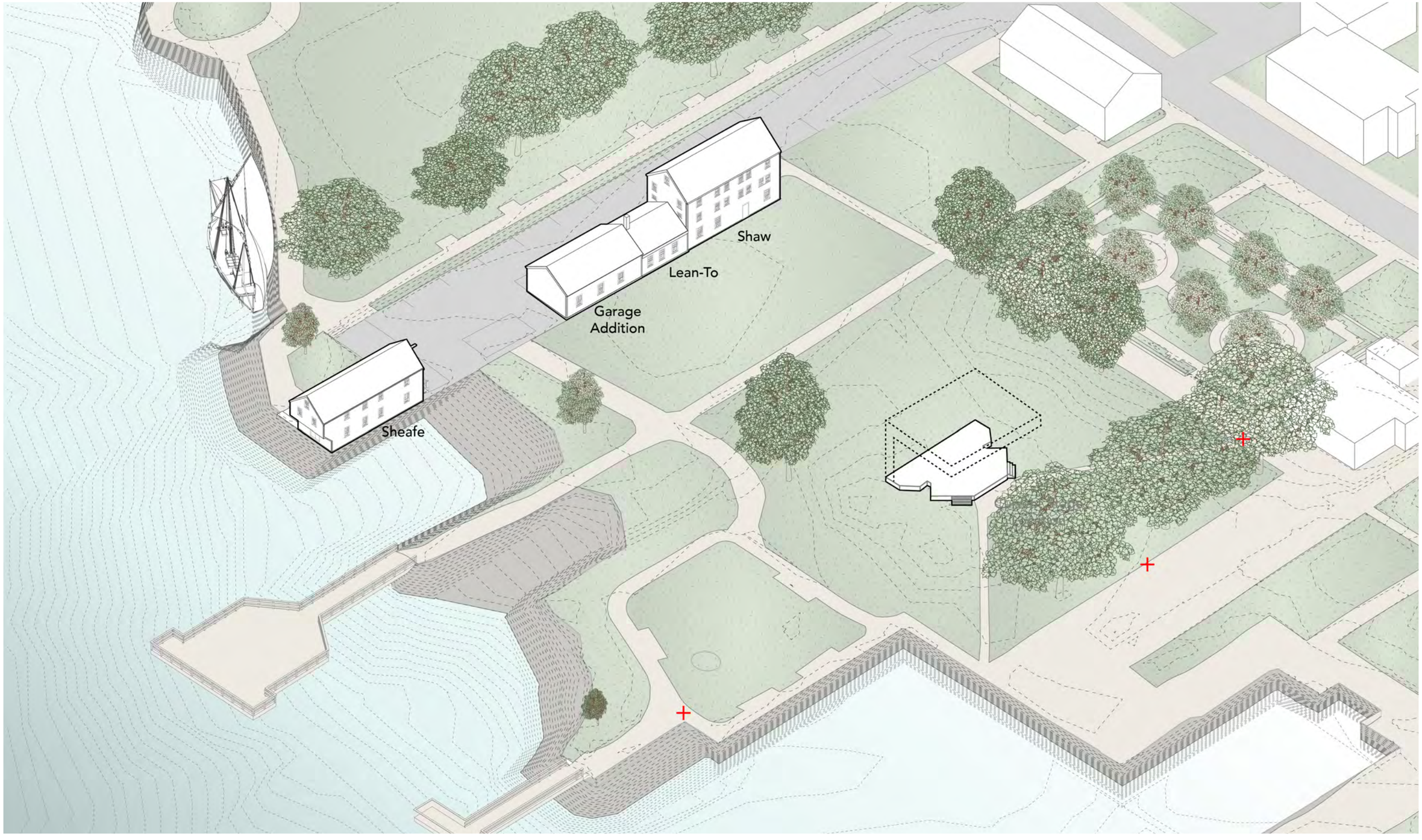

1980
Sheafe
Garage
1987
Shaw

Courtesy of the Portsmouth Athenaeum© 1980 Aerial View.

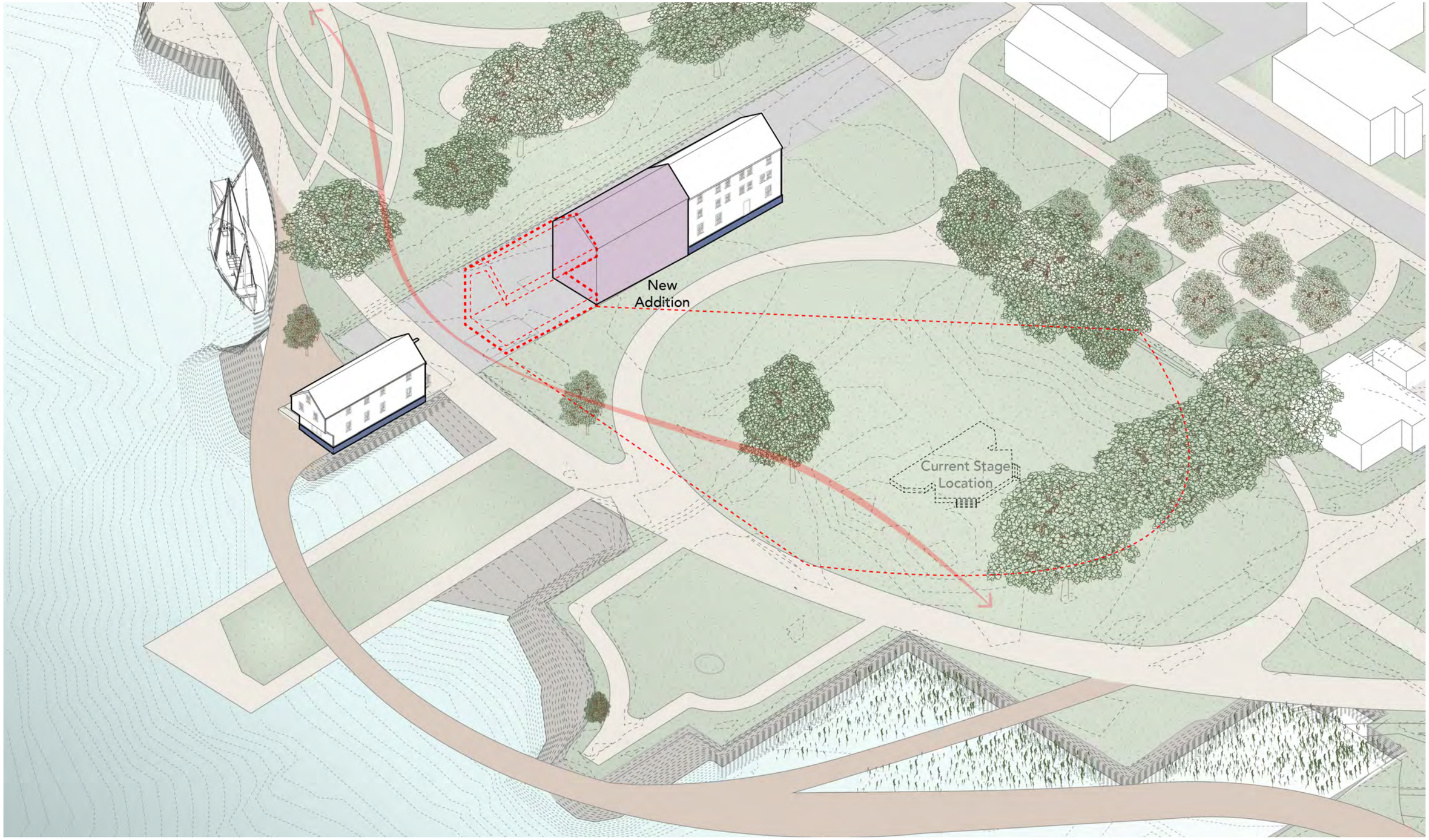

2019
Sheafe
Shaw

2019, Aerial view

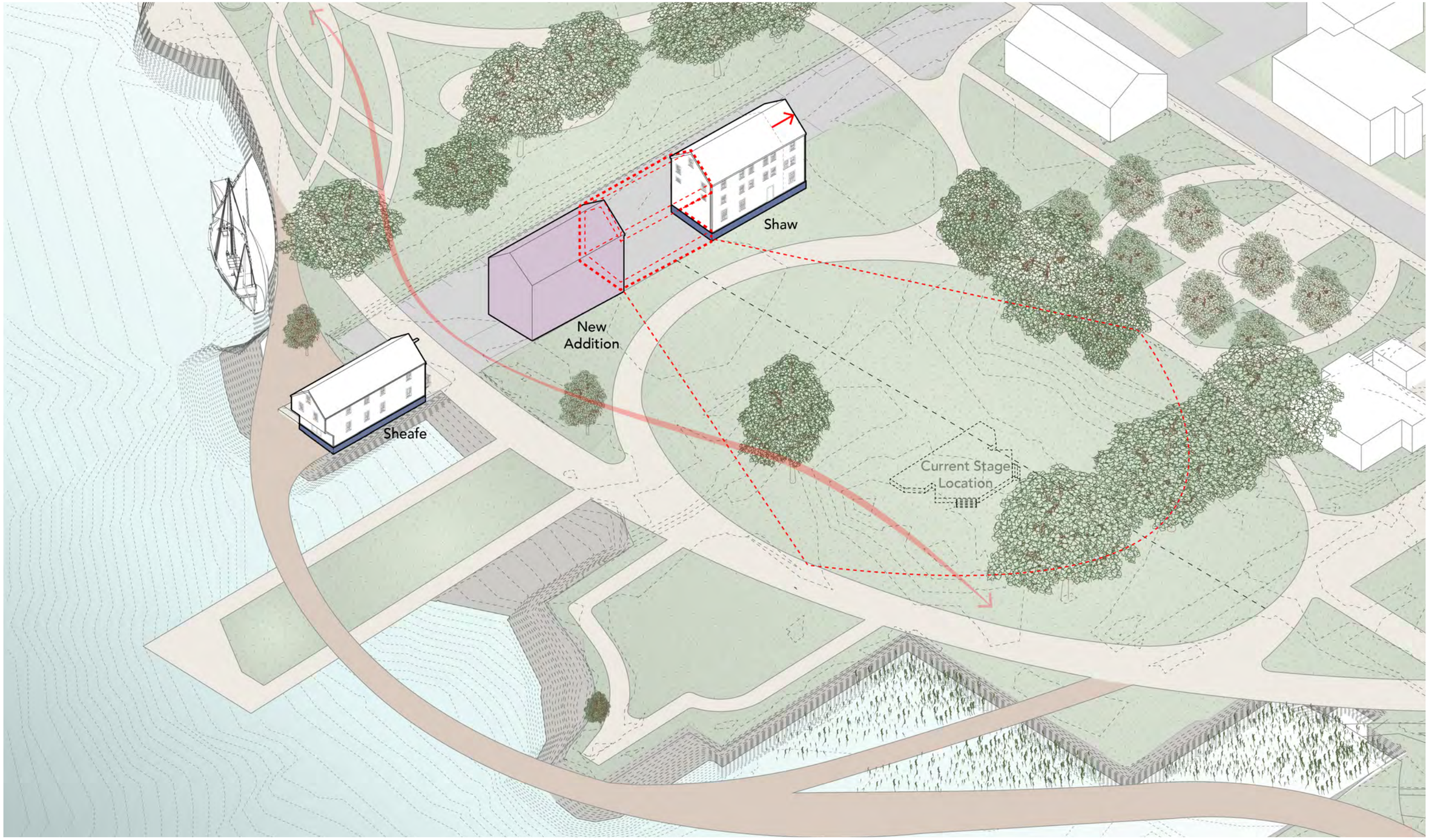
Existing Aerial



Existing



Existing



Existing

CLIMATE RESILIENCY STRATEGY

RESILIENCY STRATEGY DIAGRAM

PROTECT

PROTECT THE PARK
BY IMPROVING SEAWALL
INFRASTRUCTURE, ADDING TIDE GATES,
AND MANAGING ON-SITE STORMWATER

RETREAT

RETREAT FROM SEA LEVEL RISE
BY RAISING & SHIFTING THE SHAW
TO A HIGHER ELEVATION
TOWARDS MARCY STREET

ACCOMMODATE

ACCOMMODATE FOR FLOODING
BY CREATING TEMPORARY ABOVE
GROUND STORMWATER HOLDING
DURING PEAK STORM EVENTS

FLOODING UNDER TODAY'S HIGH TIDE DURING A 100 YEAR STORM

MAX FLOOD ELEVATION:
10.2' NAVD88

Sheafe Warehouse
+/- 10.0'

Shaw Warehouse
+/- 6.2'
+/- 6.5'
+/- 7.9'

The Player's Ring
8.9' - 9.1'

INUNDATION DEPTHS:
- 0 - 0.5 FT.
- 0.5 FT. - 1 FT.
- 1 FT. - 2 FT.
- 2 FT. - 3 FT.
- 3 FT. - 4 FT.
- 5 FT +

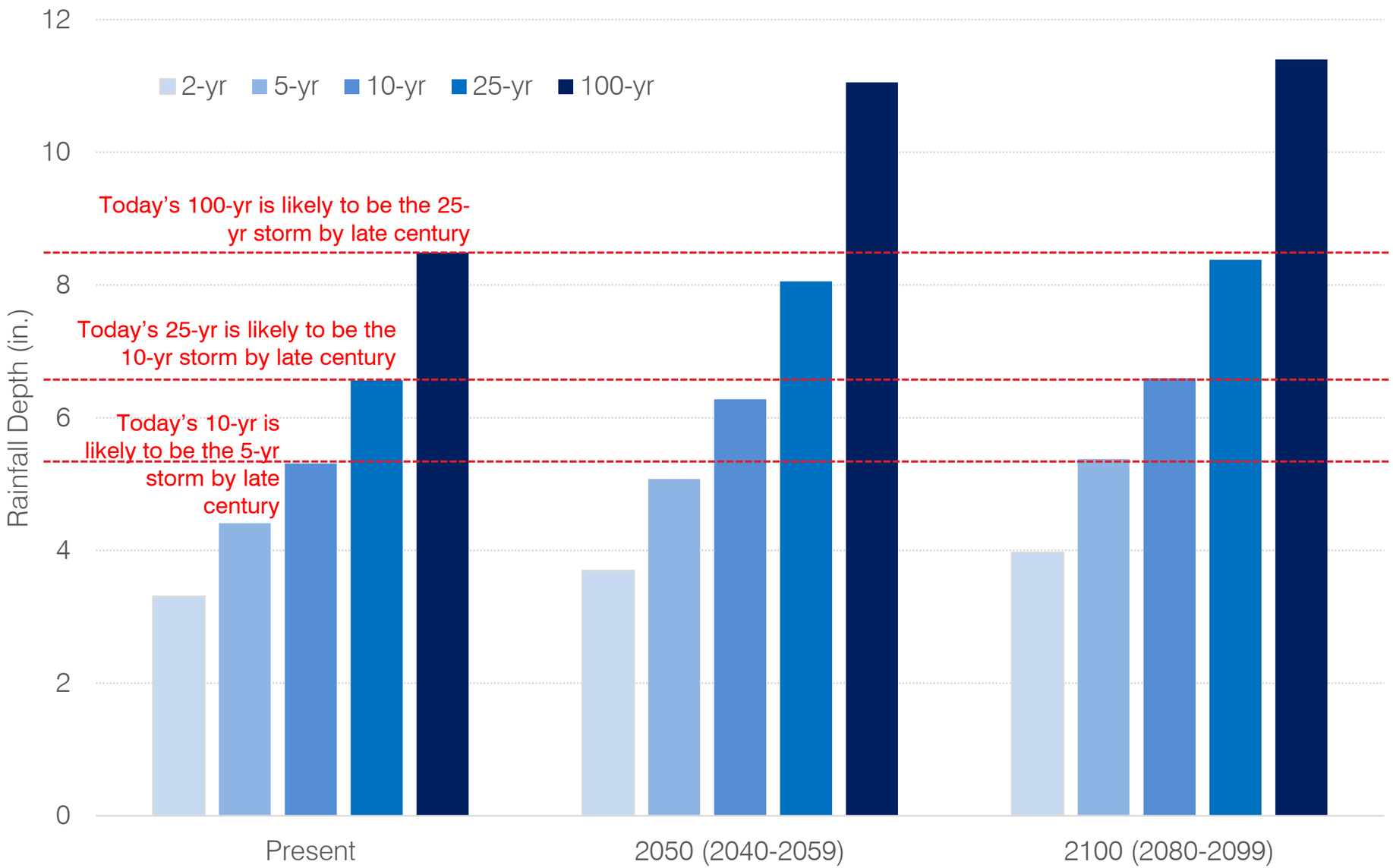
Daniel St
Chapel St
Sheafe St
State St
Atkinson St
Mechanic St
Hancock St
Richmond St
Washington St
Gates St
Manning St
Marcy St
Gardner St
Edward St
Pleasant St
Howard St
Pierce Island Rd

N

300 0 300

Scale In Feet

STORMWATER FLOODING IMPACTS



Source: Climate change projections for Portsmouth by Dr. Cameron Wake as part of NHDES publication on New Hampshire Coastal Flood Risk Summary Part 1: Science, released September 3rd, 2019

STORMWATER STRATEGY

INFLOW TO THE WATER STREET CULVERT WILL BE VIA OVERFLOW WEIR FROM THE STORM DRAINS ON MARCY STREET.

CATCH BASINS WILL BE ADDED AS NEEDED NEAR MARCY STREET - WATER STREET INTERSECTION TO CAPTURE STREET FLOODING.

UNDERGROUND STORAGE

TEMPORARY STORMWATER HOLDING AREA

STORM DRAINS INSTALLED TO CONNECT DRY WELLS TO WATER STREET OUTFALL.

CULVERT INSTALLED ALONG WATER STREET.

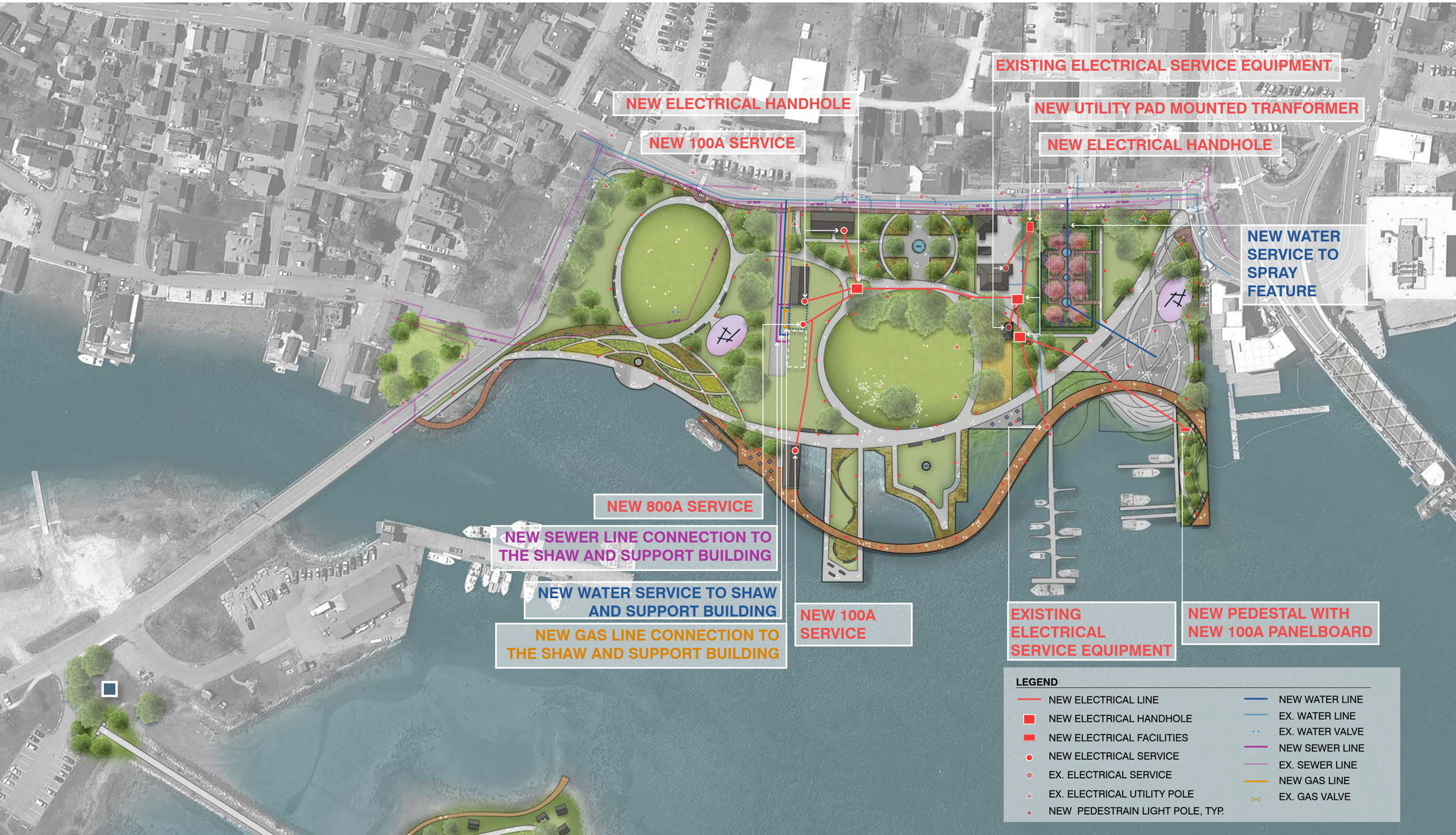
OUTFALL TO BE LOWERED AND UP-SIZED TO ACCOMMODATE ADDITIONAL RUNOFF.

ALL EXISTING OUTFALLS WILL HAVE TIDE GATES IF NOT ALREADY IN PLACE.

Proposed Conditions Improvements under Baseline Climate Scenario

Flooding Area	Existing Conditions	Proposed Conditions	
	Flooding (MG)	Flooding (MG)	% Reduction
Prescott Park	0.295	0.000	100%
Marcy & Water St.	0.279	0.000	100%
Total	0.574	0.00	100%

MEP STRATEGY



PROPOSED
MASTER PLAN UPDATES

BASED ON ENABLING ENGINEERING RESEARCH & HISTORICAL BUILDING ANALYSIS

MASTER PLAN, 2017

PROPOSED UPDATED MASTER PLAN, 2020

PROPOSED UPDATES

2017 MASTER PLAN:	2020 MASTER PLAN:
• Necessary improvements to create a resilient park	• Stabilize and raise existing seawalls; improve and add tide gates • Regrade Performance Lawn to temporarily hold above ground stormwater • Regrade Water Street for preferential inundation pathways
• Relocate maintenance facility to area near Mechanic Street	• Relocate maintenance facility to area near Four Tree Island
• Preserve the Shaw; Consider ground floor for public use	• Raise and relocate the Shaw • 1st floor of the Shaw as a civic space • New addition aside the Shaw to improve accessibility and storage while preserving its historic integrity
• Relocate the stage to create an open and properly graded Performance Lawn	• Relocate the stage to the "*rail*", aligned with the Shaw

PRESCOTT PARK
PROJECT UPDATES

UPDATED PROJECT SCHEDULE

SPRING | SUMMER | FALL | WINTER | SPRING | SUMMER | FALL

2020 | 2021

Performance Stage Feasibility Study

Phase One Build Out Scope

Project Schedule & Phasing Plan

We are here!

Public Engagement Process

Final Design of Phase 1

Preparing Bid Documents

Construction of Phase 1

PHASING PLAN, 2017

UPDATED PROPOSED PHASING PLAN

PROPOSED PHASE 1 IMPLEMENTATION

PROPOSED PHASE 1 SCOPE

1

PROPOSED RELOCATION OF MAINTENANCE FACILITY

1

0 50 100 200FT

PROPOSED PHASE 1 PRIORITIES:

PRIORITIES

- Stabilize and raise existing seawalls and add tide gates to prevent back-flow in extreme high tides and storm events; reduce chain link fence
- Add subsurface stormwater carrying capacity under the Performance Lawn
- Upgrade main electrical service to the site, including transformer
- Regrade Water Street to create preferred future inundation pathways
- Relocate the Maintenance Facility to near Four Tree Island
- Raise and relocate the Shaw; remove Garage and Lean-to
- Improve and relocate the stage facility

CONSIDER FOR PHASE 1 or FUTURE PHASES

- Establish new pathways / pedestrian circulation
- Establish “contract growing” for ornamental trees for the relocated Formal Garden
- Redesign the edge treatment along the waterfront and provide moments for safe water access
- Introduce wayfinding and interpretive signage
- Upgrade tree planting and irrigation

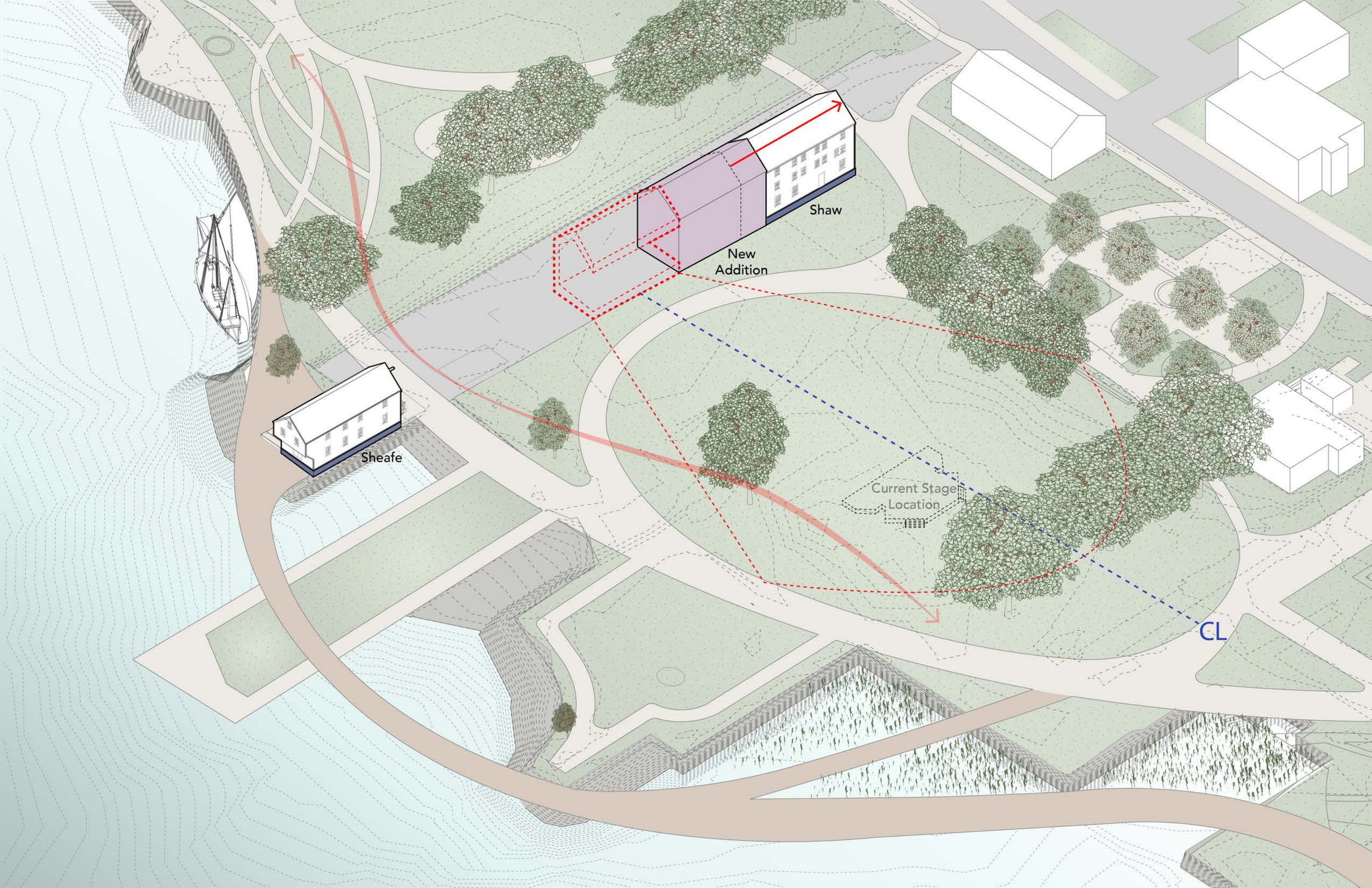
PHASE 1 IMPROVEMENTS SUPPORT:

DESIGN TENETS

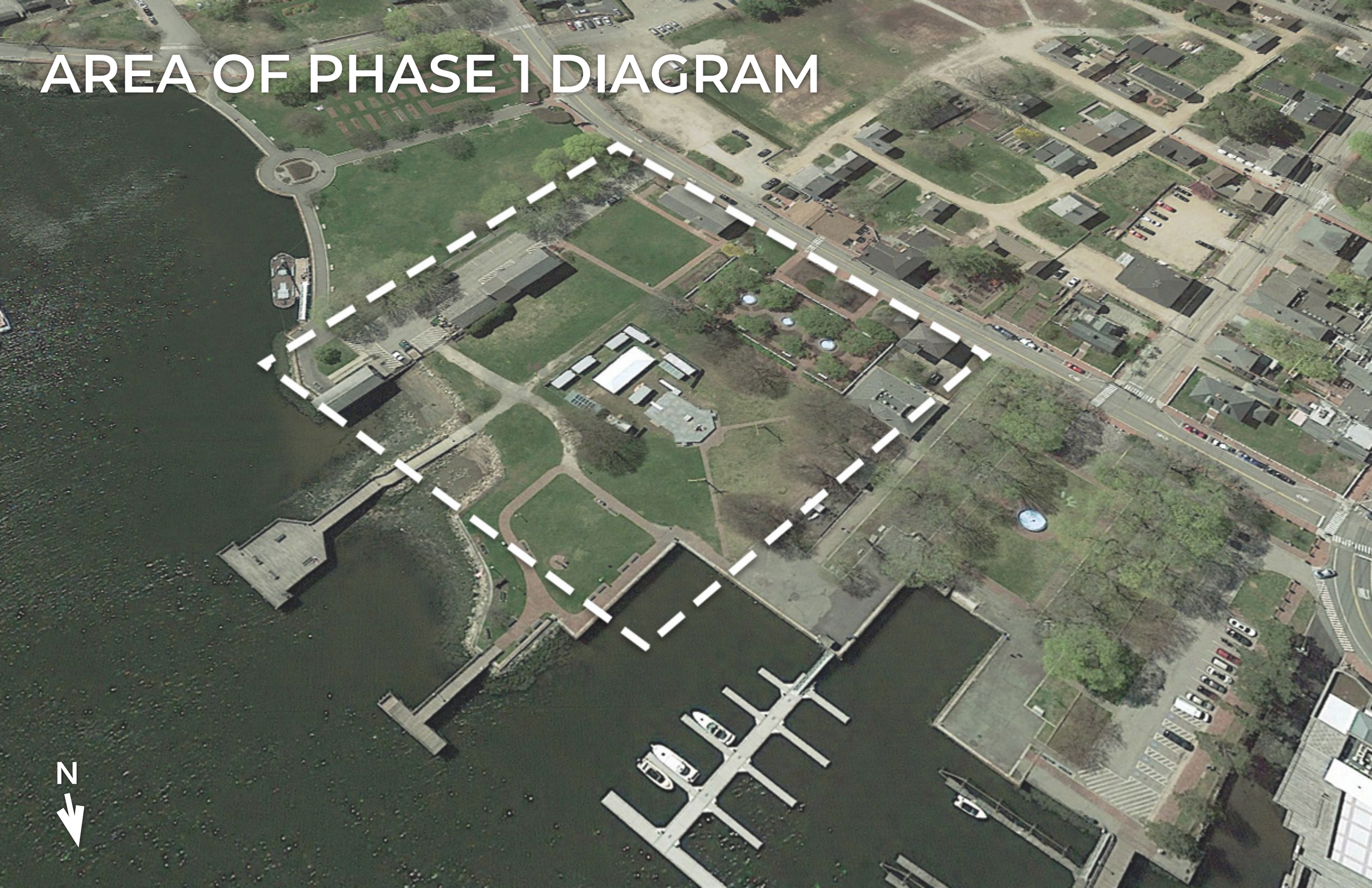
- **Recognize City ownership of the park and its structures**
- **Use “for park and recreational purposes” per the Josie F Prescott Trust**
- **Integrate coastal resilience / adaptation strategies**
- **Maintain and enhance the maritime historical connection**
- **Maintain / increase large open spaces for formal and informal activities**
- **Ensure that parking does not take up precious waterfront park space**
- **Protect and preserve historic resources**
- **Improve integration into the neighborhood**
- **Ensure presence for theater, dance, music, and visual arts**

FUTURE STAGES OF PHASE 1:

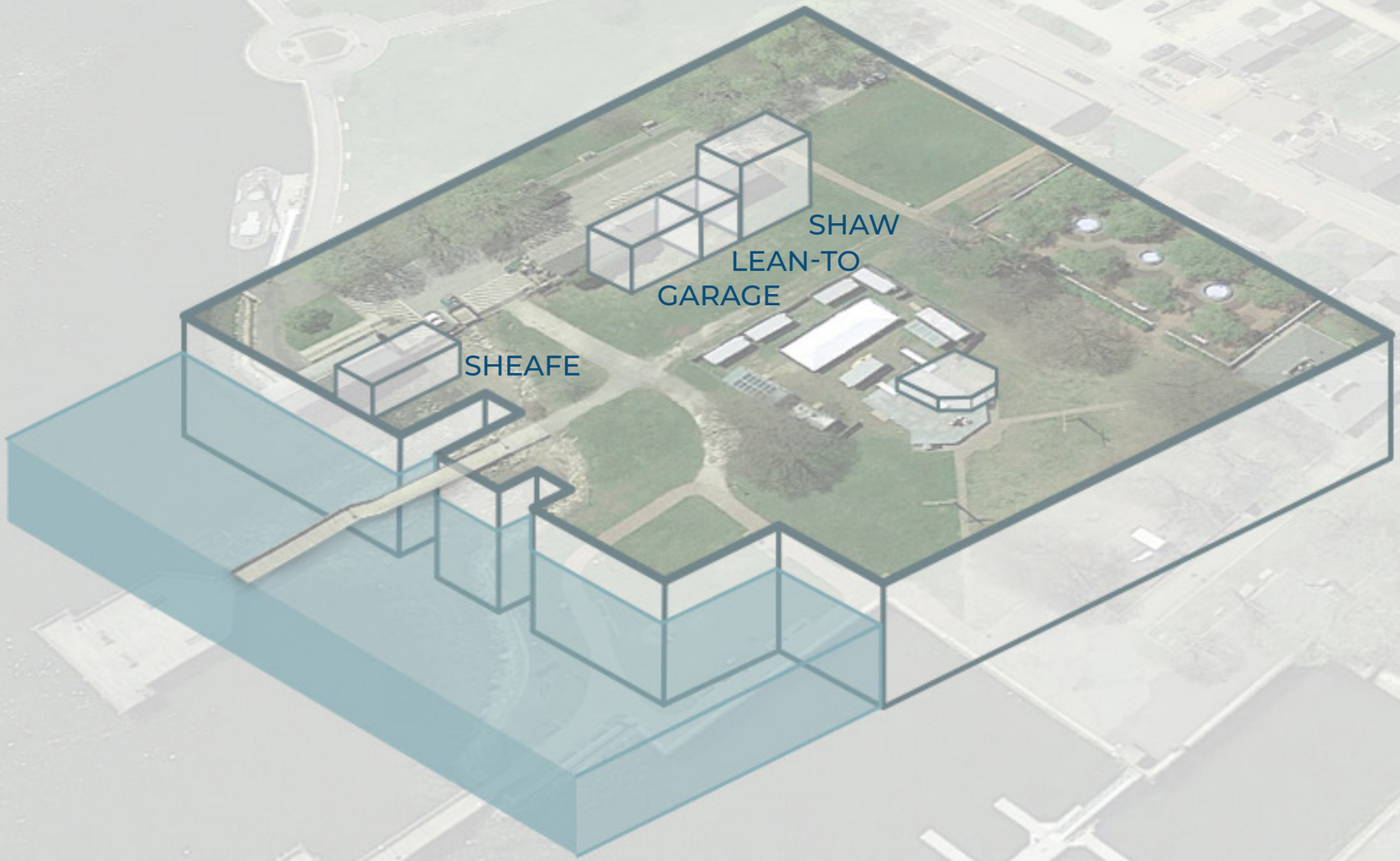
- *Ensure pedestrian through-route accessibility at all times*
- *Maximize waterfront connection*


Shaw
New
Addition
Sheafe
Current Stage
Location
CL

AREA OF PHASE 1 DIAGRAM



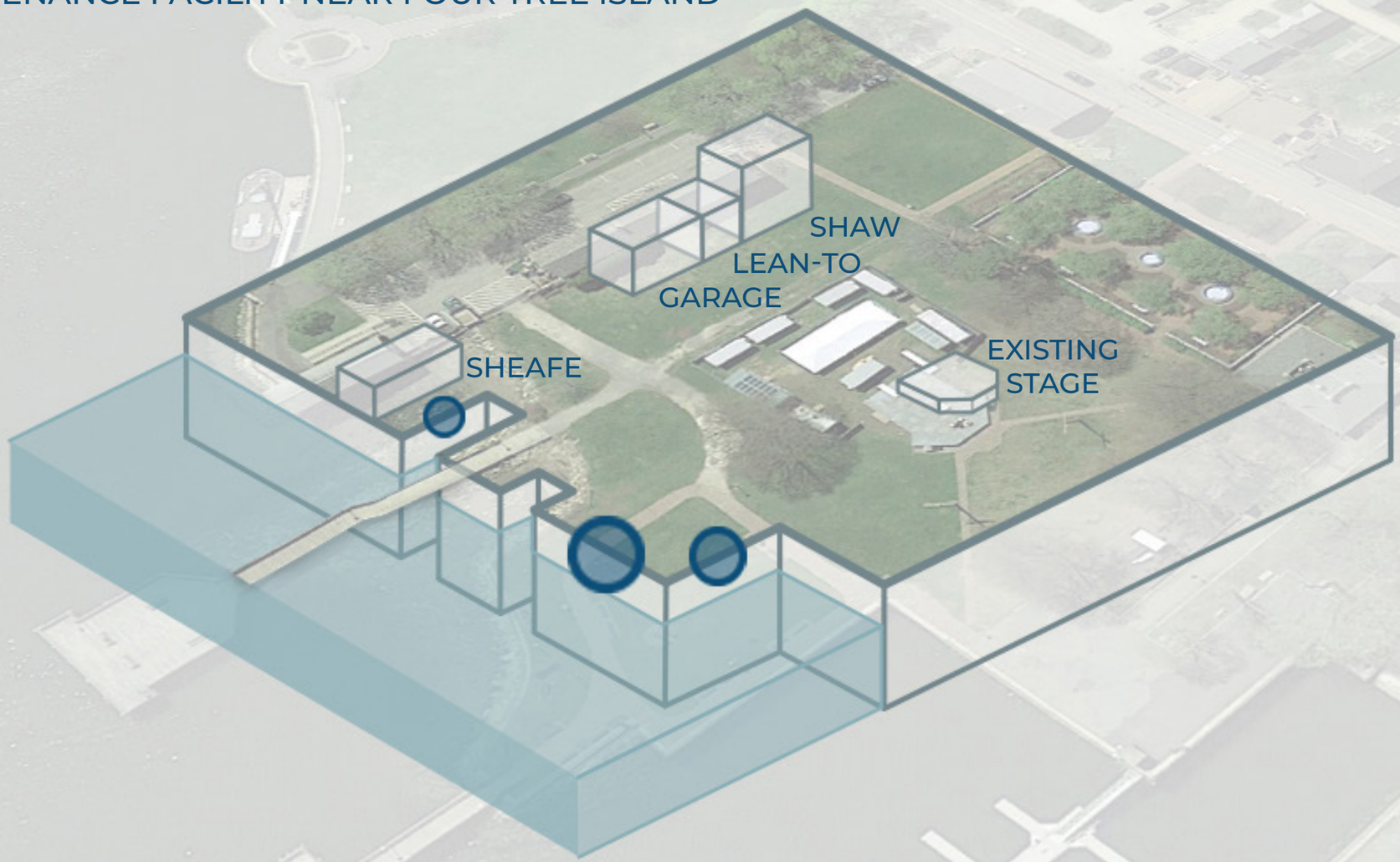
EXISTING CONDITIONS



N

STABILIZE SEAWALLS AND IMPROVE UTILITIES

IMPROVEMENTS/REPAIRS TO VULNERABLE AREAS ALONG SEAWALL
ADDITIONAL COURSE OF GRANITE BLOCKS TO TOP OF SEAWALL
NEW AND RETROFITTED TIDE GATES
RELOCATED MAINTENANCE FACILITY NEAR FOUR TREE ISLAND



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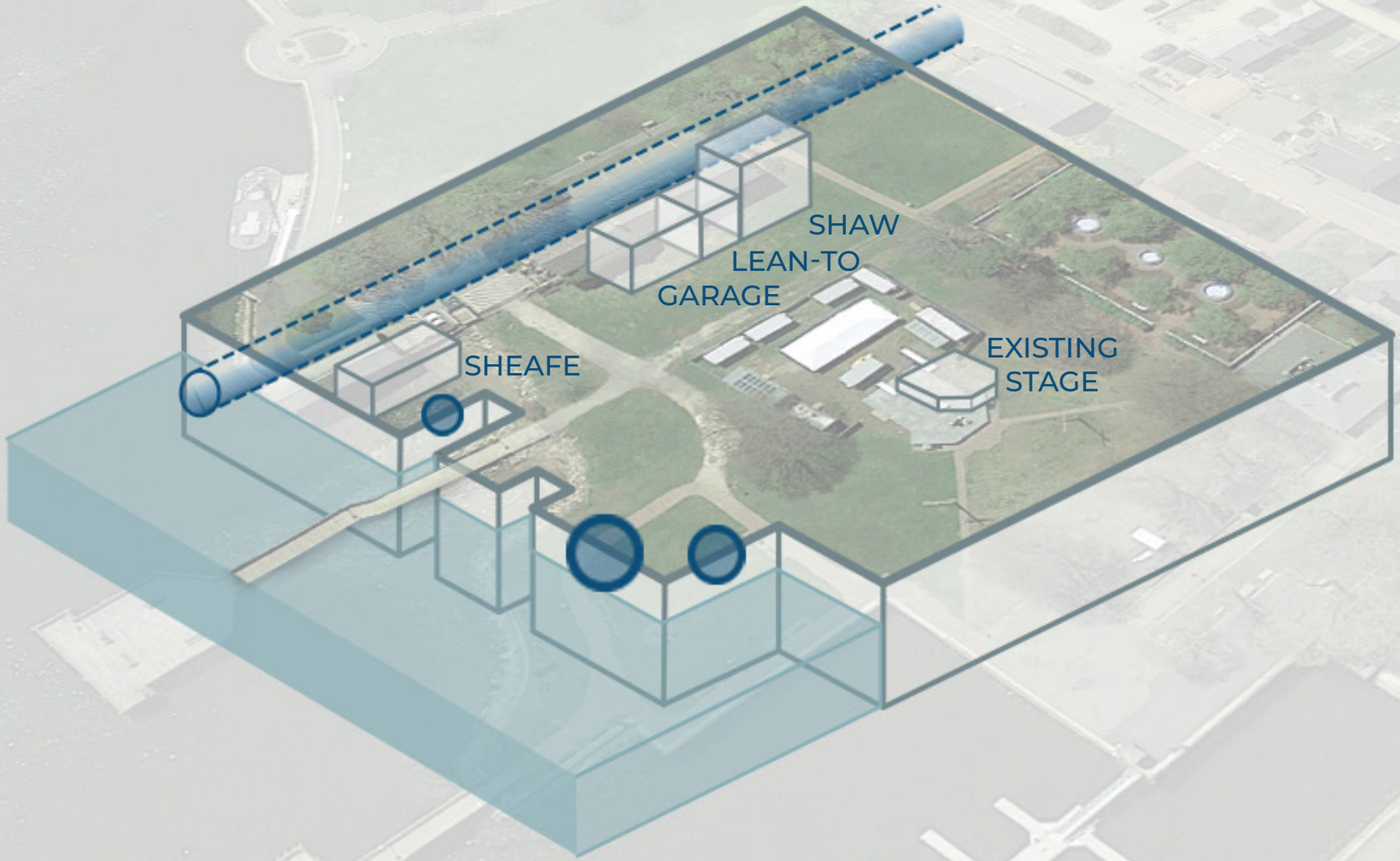
STORMWATER IMPROVEMENTS

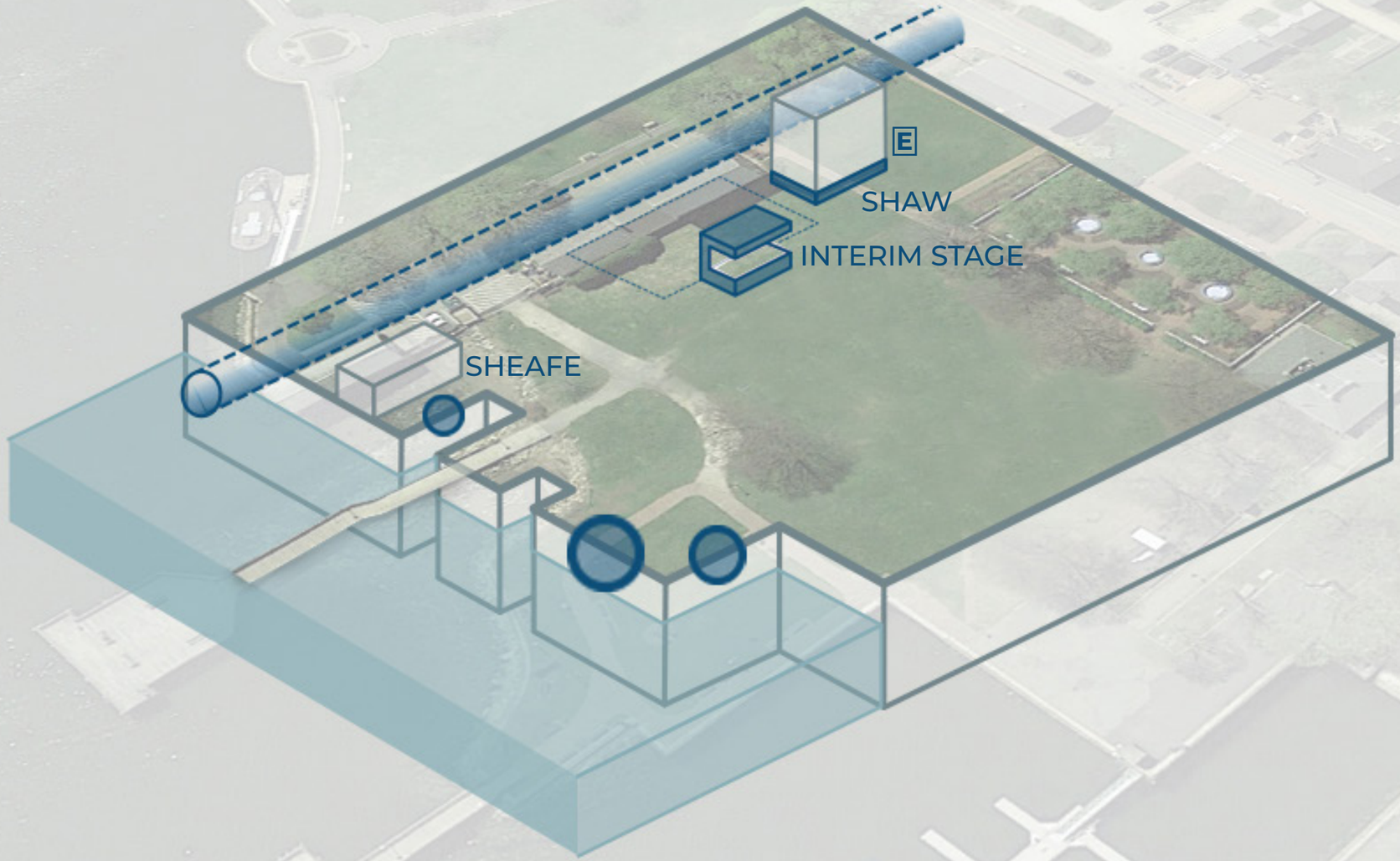
SUBSURFACE STORMWATER MANAGEMENT
INCREASE PIPE DIAMETER ALONG WATER STREET



N

RAISE AND RELOCATE THE SHAW

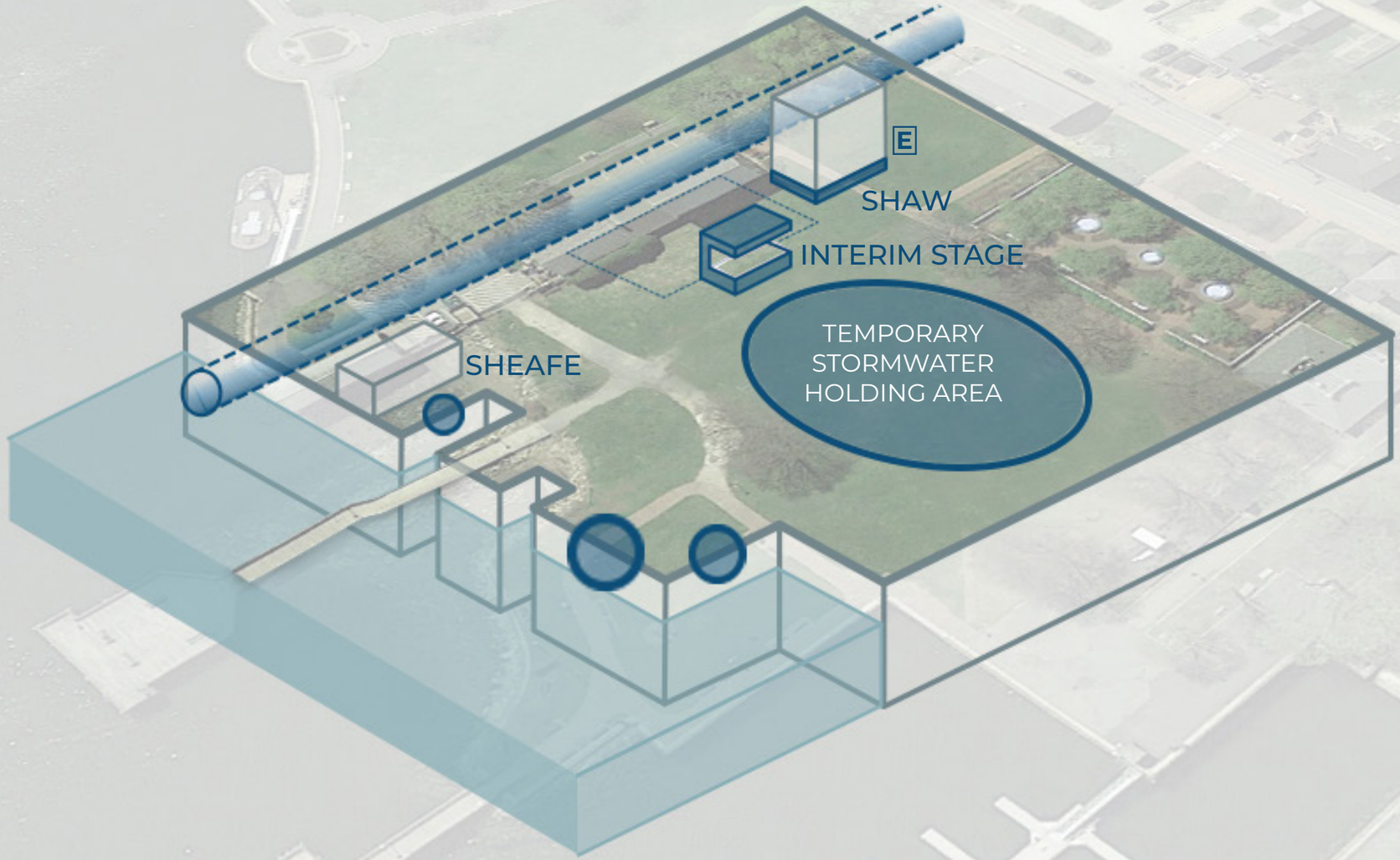
RAISE AND RELOCATE THE SHAW AWAY FROM FREQUENT FLOOD PATHS
IMPROVE ELECTRICAL SERVICES AND ADD NEW TRANSFORMER
REMOVE THE GARAGE, LEAN-TO, AND RELOCATE STAGE



N

REGRADING FOR PREFERENTIAL FLOODING

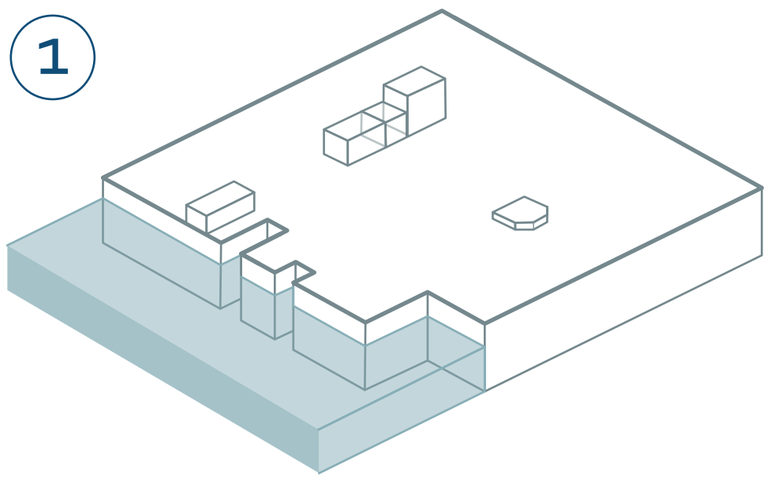
REGRADE THE PERFORMANCE LAWN AND ALONG THE RAIL FOR DESIGNATED FLOOD PATHS
MOVE STAGE TO BE ALONG THE "RAIL LINE" AND CENTER OF PERFORMANCE LAWN



N

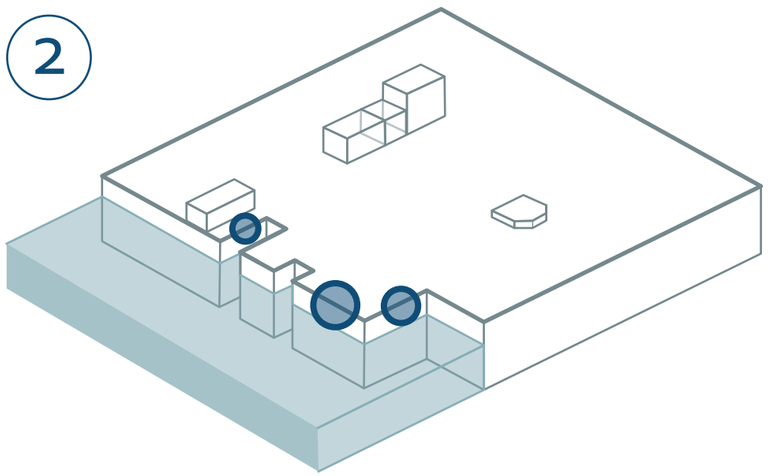
DIAGRAM OF PHASE 1 MOVES

1



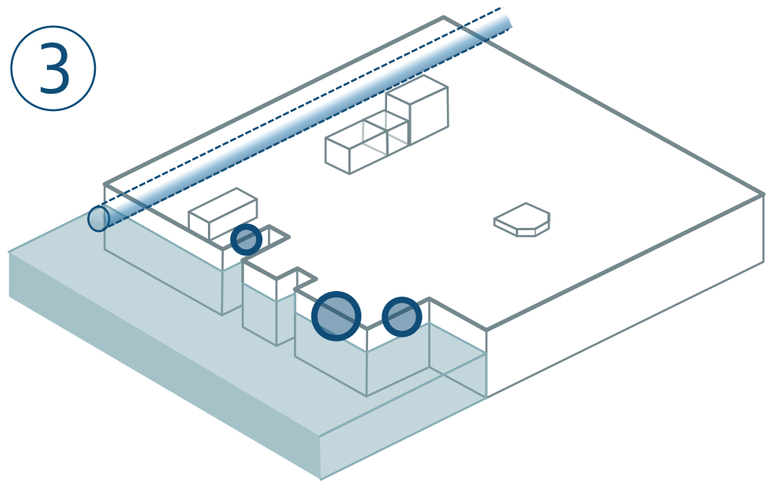
EXISTING CONDITIONS

2



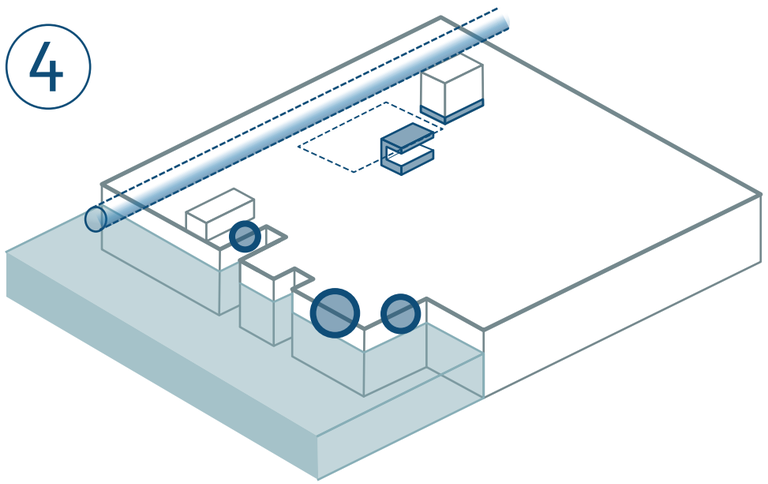
STABILIZE & RAISE SEAWALL, IMPROVE UTILITIES, AND RELOCATED MAINTENANCE FACILITY

3



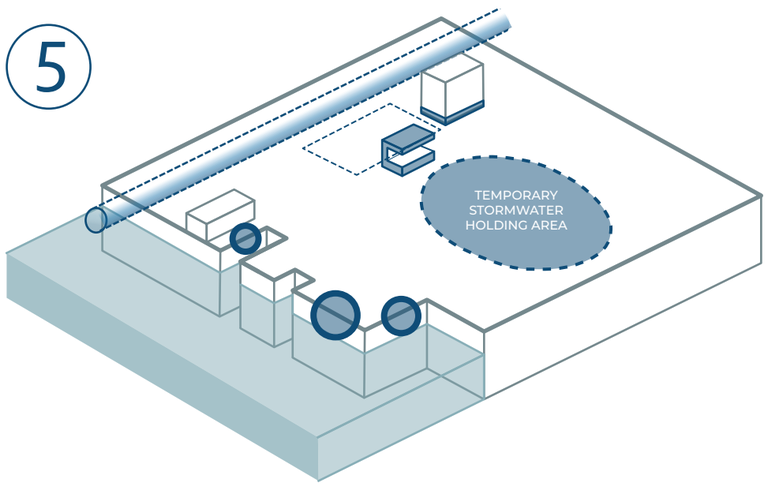
SUBSURFACE STORMWATER MANAGEMENT

4



RAISE & RELOCATE SHAW/ REMOVAL OF GARAGE, LEAN-TO, AND RELOCATE STAGE

5



REGRADE FOR PREFERENTIAL FLOODING

THANK YOU !!

QUESTIONS & COMMENTS?

OPEN DISCUSSION