Disaster Mitigation
Fairmount Water Works
Philadelphia, PA
Fairmount Water Works
Fairmount Water Works | Quick Facts

- Located on the Schuylkill River banks in Philadelphia, PA
- Constructed between 1812-1872
- Operated as municipal water works from 1815-1909
- Designed by Frederick Graff (apprentice to Benjamin Henry Latrobe)
- Philadelphia Register of Historic Places (06/26/1956)
- Fairmount Park HD (02/07/1972)
- National Register of Historic Places, NHL (05/11/1976)
Project Background

- Disaster Planning for Historic Properties Initiative initiated by the Pennsylvania State Historic Preservation Office (PA SHPO)
- Documented nearly 600 resources listed in the National Register of Historic Places and the Philadelphia Register of Historic Places located in Flood Hazard Areas
The Water-Works, which are on a height near the city, are no less ornamental than useful, being tastefully laid out as a public garden, and kept in the best and neatest order.

Charles Dickens, 1942
1799 First municipal water facility built in Centre Square

1812 City buys 5 acres by tallest point near city - Fairmount

1815 Fairmount Water Works opens to supply clean drinking water

1822 Switch from steam engine to water wheel technology / Fairmount Dam Completed

1909 Water works permanently closed due to increased pressure from pollution
Site History | Timeline

1911 Facility reopened as an aquarium

1961 Kelly Natatorium opens in the New Mill House

1962 Aquarium closes

1972 Natatorium closes after Hurricane Agnes flooding

2003 Fairmount Water Works – public/private partnership – opens the Interpretive Center in the Old Mill House
Site History | Resources

1815
ENGINE HOUSE
(1812-1815)

Source: 1979 HAER, LOC.gov
Site History | Resources

Source: 1979 HAER, LOC.gov
Site History | Resources

1978

MILL RACE FILLED IN (1911)

MILL HOUSE REMODELLED
BREAST WHEELS REPLACED
BY TURBINES
(1867–1872)
REMODELED FOR
AQUARIUM IN 1911

Source: 1979 HAER, LOC.gov
Site History | Resources

- Engine House | 1812-1815
- Old Mill House | 1822
- Caretaker’s House | 1822
- Watering Committee Building | 1822
- Gazebo | 1835
- New Mill House | 1858
Site History | Resources

Old Mill House Entrance North | 1871

Old Mill House Entrance South | 1871

Old Mill House Pavilion | 1872

< Esplanade >
Modern Adaptation

- Committed to keeping the doors open to the public
- Space formerly occupied by engines now holds an interpretive center for educating the public on the urban watershed
- Displays, interpretive panels, theater
- Office spaces for FWW
- 2017 Freshwater Mussel Hatchery opened
Site Flooding
Flooding is not a matter of ‘if’, but when and how much.
Garrett Selby, Building Manager
Site Vulnerability

- Situation on the Schuylkill River bank, beneath the Fairmount Dam, makes the NHL a frequent target of flooding.
- The building was designed to flood as part of the operations of a water works facility.
- So flooding happens constantly.
- **Localized v. significant flooding**
- The site has adapted to the reality of living with water.
Site Flooding | Interior Inundation Points
Site Flooding | Modern Example: 2011

May 11, 2011

August 28, 2011 (Irene)

September 8, 2011

Source: Fairmount Water Works Facebook
Site Reuse + Resiliency
The building was modified multiple times as it adapted to new systems over time. It was always meant to be adapted.

Claire Donato, Restoration Architect
Site Reuse + Resiliency

Adapting, Activating, and Managing a Flood Prone Historic Site

**DURABILITY**
Sensitive design and smart use of materials to secure the resource and its function

**SAFETY**
Planning and executing evacuations in case of a flood event

**SUSTAINABILITY**
Fostering a dynamic historic site through future planning
Site Reuse + Resiliency | Durability

- Decision made to allow water to enter and exit as originally intended
- Construction and design decisions to ensure durability

Elevated exhibit floor
Sloped for drainage
Site Reuse + Resiliency | Durability

- Decision made to allow water to enter and exit as originally intended
- Construction and design decisions to ensure durability

Grills over openings
Elevated mechanical systems
Site Reuse + Resiliency | Durability

- Decision made to allow water to enter and exit as originally intended
- Construction and design decisions to ensure durability
Site Reuse + Resiliency | Durability

- Original materials efficient for this property
- New materials introduced follow lessons learned

Old Floors | Stone, Blue Stone
New Floors | Blue Stone

Old Walls | Stone, Brick, Plaster
New Walls | CMU, Coated Plaster
Adaptation required a variance for occupancy

Approved based on understanding of public good...net social benefit with introduction of safety provisions

1. Alarm at lowest door opening
2. Monitor river levels, conducted structural + hydrostatic analyses, collected flood data
3. Ensure means of egress and evacuation plan
Site Reuse + Resiliency | Safety

- 3 Stage Flood Protocol: Precaution, Anticipation, **Secure + Clean Out**
- All actions at this point operate at Stage 3
Site Reuse + Resiliency | Safety

- Water recedes relatively fast, event after major flood events
- Cleaning process takes significant time

Interior Debris

Exterior Garden + Esplanade
Interventions require significant consideration of implications for future:

- Permanently sealing doors and openings
  - Increase hydrostatic pressure
  - Changes functionality of NHL’s significance

- Esplanade Barriers
  - Debris forced toward other sites further downstream
  - Reduce integrity of the view
Site Reuse + Resiliency | Sustainability

- Future plans to expand into currently unused space
- Learn from work up to this point, but potential for new strategies

North Wing Expansion / Natatorium
Site Reuse + Resiliency | Sustainability

- Requires new building permits, collaboration with city agencies
- Interior bulkhead (moving) to reinforce interior partition walls (4ft)
Key Take Aways

- Learn from each flood, adapt as needed
- Debris from flooding poses more challenges than flooding itself
- Take cues from historic construction
- Goal is to minimize vulnerability and prioritize safety
- Live with the water, but protect wherever possible
Special Thanks

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Claire Donato | Senior Associate and Director of Restoration and Historic Architecture, Mark B. Thompson Associates LLC, Architecture & Planning