

GATEWAY NATIONAL RECREATION AREA SANDY HOOK, NJ

HISTORIC WATER PLANT BUILDING 341
PMIS NO. 152823A

LIMITED STRUCTURAL INVESTIGATION & REPORT



NATIONAL PARK SERVICE
January 14, 2014

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Executive Summary

The following report represents a limited structural investigation of the Historic Water Plant Building 341, located in the Sandy Hook Unit of Gateway National Recreation Area, in Monmouth County, New Jersey. The survey was performed in October 2013, in preparation for a reroofing and rehabilitation project (part of a separate contract). The limited condition assessment focused on the structural steel framing, brick masonry bearing walls and existing windows.

The report is presented in two main sections; masonry/window assessment and structural assessment with corresponding recommendations for each condition. The typical brick masonry deficiencies observed at the building include:

- Brick:
 - Unstable parapet walls
 - Missing mortar
 - Damaged bricks
 - Cracks
 - Soiling and stains
- Limestone:
 - Displaced stone belt course
 - Damaged limestone at the belt course
 - Failed patching
 - Cracks
 - Missing mortar
 - Deteriorated limestone
- Deteriorated concrete masonry units (CMU)
- Vegetation growth in gutters and walls
- Rusted and broken windows

The structural investigation included an assessment visually and through selective probes. Observed conditions include:

- Rusted trusses and purlins, including bearing plates
- Rusted steel lintels
- Cracked brick masonry bearing walls
- Water damage and rusted framing at upper roof framing
- Spalled concrete at lower roof framing

Recommendations for these deficiencies are also included in each section. The recommended repair work and cost estimate have been divided into high and low priority areas. High priority areas are those that are actively failing, and should be addressed in conjunction with the reroofing project. Low priority areas are those that are not actively failing or are aesthetic in nature, and can be addressed after the high priority issues have been resolved.

Introduction

In preparation for a separate reroofing and exterior building envelope rehabilitation contract, Gateway National Recreation Area engaged John Milner Architects to perform a limited structural investigation and provide related recommendations.

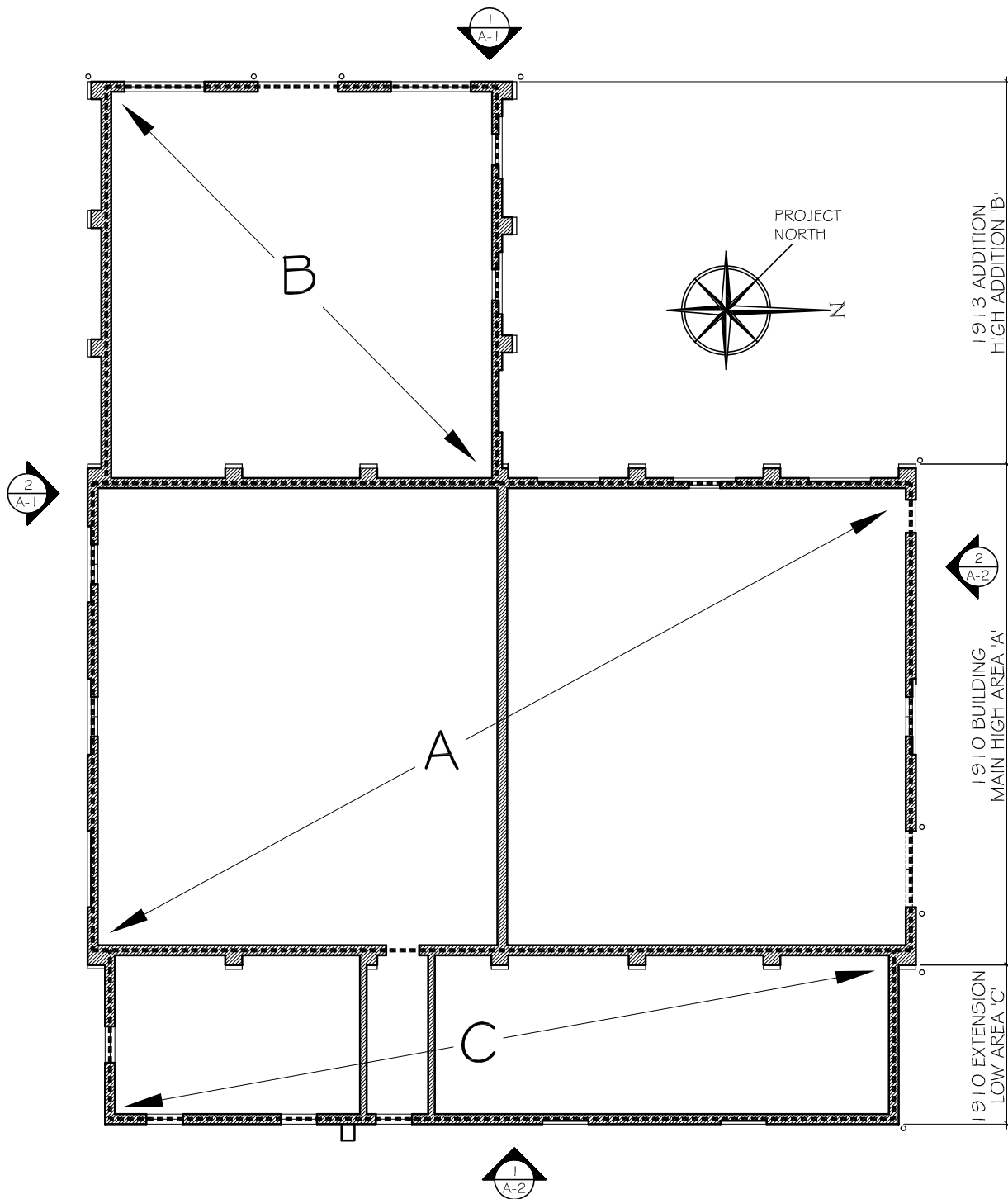
John Milner Architects, Inc., Keast & Hood Co. Structural Engineers and Knapp Masonry completed an exterior and interior survey of the Historic Water Plant Building 341 October 22-24, 2013. The survey was focused on the assessment of the structural steel framing, brick masonry bearing walls and existing windows.

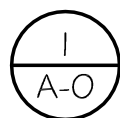
The Historic Water Plant Building 341 is located within the Sandy Hook Unit of Gateway National Recreation Area, in Monmouth County, New Jersey. The Water Plant is separated into three buildings: 1910 Building Main High Area 'A' (Building A), 1913 Addition High Addition 'B' (Building B) and 1910 Extension Low Area 'C' (Building C) (see Key Plan). Building A measures 85 feet by 50 feet, Building B measures 40 feet by 40 feet and Building C measures 17 feet by 80 feet.

The water plant was constructed with brick masonry bearing walls in both the original building and the addition. The masonry walls support the roof, constructed with steel trusses, steel purlins and wood rafters seated on a wood sill of Buildings A and B. The steel trusses are pocketed into the masonry, supported by steel plates, and anchored with 1-inch diameter anchor bolts. The masonry walls and steel trusses support the purlins, while roof sheathing is supported by rafters. In 1971, the original classical arched windows were filled in with Concrete Masonry Unit (CMU). In some of the openings, small metal windows were set within the CMU. The roof of the one story south extension (Building C) is supported by concrete slabs spanning wide flange steel beams.

The primary methods employed for the condition survey included visual inspection of the interior and exterior and selective probing of the steel truss bearings and steel lintels. The visual survey was conducted at close range for the majority of the building and by use of binoculars for those areas out of reach. The probes involved careful removal masonry to permit visual examination of truss and lintel bearings at select locations determined at a pre-survey site meetings on September 26, 2013. Conditions observed were recorded photographically and on elevation drawings. Mortar samples were also taken from several locations on the exterior and interior around the trusses and analyzed.

This report presents, in narrative form, the results of the condition survey and assessment of the Historic Water Plant Building 341 with prioritized corresponding recommendations for repairs.




KEY PLAN
 SCALE: 1/16" = 1'-0"

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Investigation and Report for the
Historic Water Plant, Building 341
 Sandy Hook, Monmouth County, New Jersey

JOHN MILNER ARCHITECTS, inc.
 104 Lakeview Drive, Chadds Ford, Pennsylvania 19317 • (610) 388-0111

KEY PLAN

A-0

MASONRY ASSESSMENT & RECOMMENDATIONS

BRICK WALL CONSTRUCTION

There are several areas of the building where the exterior brick walls, specifically the parapet walls, will need to be fully dismantled and reconstructed. The brick parapet appears to be rotating outward on all four elevations of the original 1910 building and three elevations on the 1913 addition. This movement appears to have several causes. It is likely that the horizontal coping stone joints began to deteriorate and allowed water to penetrate the top of the wall. When the building was reroofed, the new roofing material was wrapped up over the parapet wall in an effort to protect the top of the wall. Not only did the termination bar cause damage to the limestone coping stones (see p. 11), there were no provisions for change in direction (horizontal roof to vertical wall), and the roof membrane subsequently pulled up from the decking, creating a weakness in the membrane, which is now punctured with numerous large holes, allowing water to freely penetrate the building. Rust jacking from the trusses is partially causing the wall movement, as well as freeze-thaw damage from the water. On the east elevation of Building C, there is a large area where the original brick has been infilled with red bricks. The area adjacent to this section is also in poor condition.



Figure 1: This photograph shows the north elevation of the 1910 building. The masonry parapet appears to be rotating, and is structurally unstable.



Figure 2: This photograph shows the west elevation of the 1910 building. The masonry parapet is in very poor condition and will need to be completely rebuilt from the large limestone band course up.

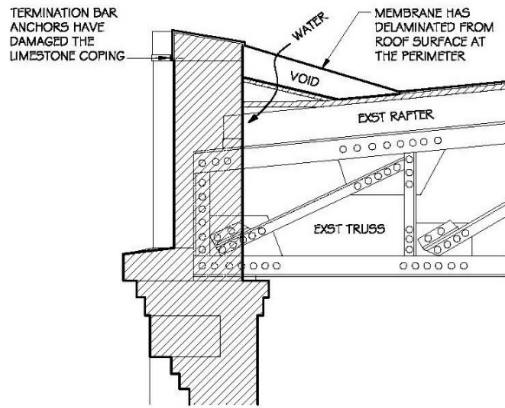


Figure 3: Diagram of the Parapet wall and the southeast corner of Building A showing typical large holes in roof membrane near scupper.

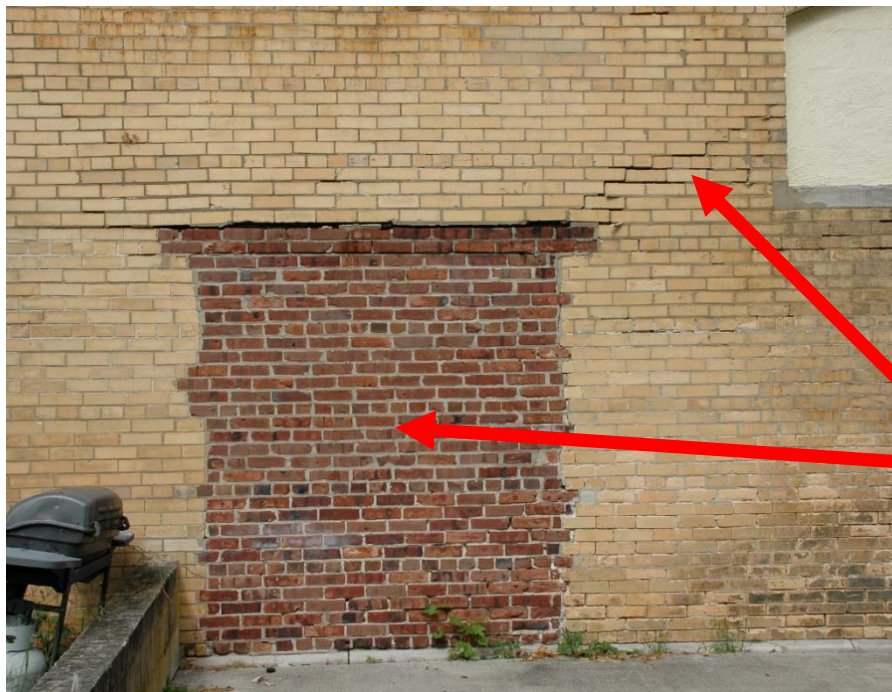


Figure 4: A large area on the east elevation of the 1910 extension has been infilled with red bricks and the surrounding bricks are structurally unstable. These areas will need to be rebuilt.

Recommendations:

In all areas where the masonry walls are deteriorating, each section will need to be disassembled and the bricks in good condition shall be salvaged. Approximately 20% of the bricks will need to be replaced, however existing bricks shall be reused where possible. The parapet will need to be rebuilt, replicating all details. For locations and quantities of brick to be rebuilt, refer to drawings on pages 23-25.

BRICK REPOINTING

Much of the pointing on the building has deteriorated due to weathering, water penetration and deferred maintenance. This is a common problem with masonry construction, especially in historic buildings.



Figure 5: This photograph shows the west end of the north elevation of the 1910 building. The mortar in this area has deteriorated and will need to be repointed.

Recommendations:

The existing deteriorating mortar should be raked back to sound mortar and repointed with approved mortar. Mortar samples were taken and will be used to specify pointing (Appendix B). For locations and quantities of brick to be repointed, refer to drawings on pages 23 -25.

MISSING AND DAMAGED BRICKS

In several places, bricks are broken or missing. One cause of missing or damaged bricks is weathering and water infiltration. Another cause is damage from vehicles or equipment. Each elevation has missing or damaged bricks, and approximately 115 bricks will need to be replaced on the structure.

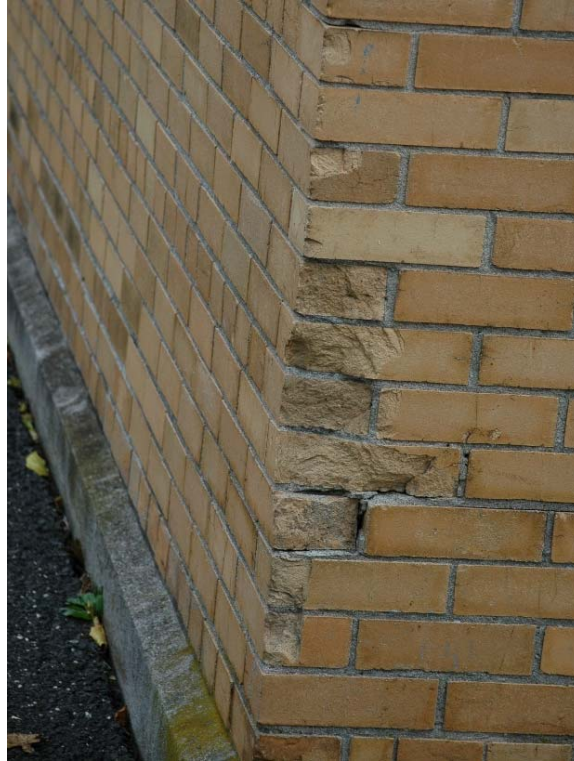


Figure 6: This photograph shows broken bricks on the the southwest corner of the 1913 addition. Broken and missing bricks will need to be replaced.

Recommendations:

The broken bricks should be carefully removed and replaced with bricks to match the color and size of existing bricks. Missing bricks should also be replaced. A total of 35 bricks need to be replaced on the west elevation, 20 bricks on the east elevation, 15 bricks on the north elevation and 42 on the south elevation. For locations of bricks to be replaced, refer to drawings on pages 23-25.

It is also recommended that bollards be installed in several locations of the building to protect the corners and prevent future damage. On the 1910 building, bollards should be installed on the east and west corners of the north elevation and on each side of the overhead door. On the 1910 lower extension, a bollard should be installed on the east corner of the north elevation. On the 1913 addition, bollards should be installed on the north and south corners of the west elevation and on each side of the center door.

BRICK CRACKS

As with most historic structures, masonry cracks are a common problem on this building. Cracks can be caused by water infiltration, expansion and contraction, steel jacking, settlement and cracks, all of which cause bricks to break.



Figure 7: This photograph shows a crack in the masonry on the north side of the east elevation of the 1910 extension. The crack has resulted in broken bricks and a crack in the limestone belt course.



Figure 8: This photograph shows an exterior and interior crack in the bricks and mortar joint above the central door on the west elevation of the 1913 addition. This demonstrates the expansion and contraction of CMU vs. the expansion and contraction of brick.

Recommendations:

Cracks in the mortar joints will need to be repaired by raking and repointing the area. If the crack is wide, crack stitching with stainless steel pins should be installed on every third course. Broken bricks as a result of the crack will need to be cut out and replaced with new bricks. For locations and quantities of brick cracks to be repaired, refer to drawings on pages 23- 25.

LIMESTONE CONDITIONS

One important character defining feature of the water plant is the use of limestone accents throughout the building. Limestone is used on the belt course, water table, window sills, pier caps, lintel courses, arch skews and copings. Existing limestone is in fair to poor condition and repairs are required. In several locations the limestone has deteriorated as a result of water infiltration causing freeze-thaw. The following conditions were assessed and recommendations have been made:

A. DISPLACEMENT OF LIMESTONE BELT COURSE:



Figure 9: This photograph shows the west corner of the north elevation of the 1910 building. The limestone has shifted due to vegetation. The stone is in good condition but will need to be reset.

Recommendations:

In several areas, the belt course will need to be reset, as will the corbelled brick courses below. For locations and quantities for resetting the limestone belt course, refer to drawings on pages 23-25.

B. DAMAGED LIMESTONE BELT COURSE:



Figure 10: This photograph shows the limestone belt course on the north side of the east elevation of the 1910 building. This section of the belt course has severely deteriorated and will need to be replaced.

Recommendations:

In locations where the limestone belt course is damaged beyond repair, sections will need to be replaced. Removal of existing stone and installation of new stone to match will be required. For locations and quantities of replacing limestone belt course, refer to drawings on pages 23-25.

C. LIMESTONE SPALLS, LOSSES AND FAILED PATCHING



Figure 11: Some of the limestone is in fair to poor condition and has been previously patched, as seen here. Old failing patches will need to be removed and new patches installed. This photograph shows the south window of the east elevation of the 1910 extension.



Figure 12: Much of the limestone is in fair to good condition with specific areas of damage. These damaged areas should be patched. This photograph shows the west end of the south elevation of the 1910 building.

Recommendations:

Another area of concern with the limestone is damage due to failed existing patches, spalls and stone losses. Repairs range from small patches less than 12 square inches and large patches more than 12 square inches. The existing patches need to be removed and loss area will be prepared and filled with approved mortar. New spalling and holes will also need to be patched with approved mortar. The repair of spalls, failed patches and losses is similar; all damaged material will first be removed. Loss area will be prepared and approved patch material will be installed. For locations and quantities of patching limestone, refer to drawings on pages 23-25.

D. LIMESTONE CRACKS



Figure 13: Typical limestone crack in a window sill that will need to be repaired. This sill is located on the west side of the north elevation of the 1910 extension.

Recommendations:

Each elevation has several cracks in the limestone; especially in the belt course and water table. Cracks will be routed out and patched, and deep cracks will have stainless steel pins installed in epoxy. For locations and quantities of limestone cracks to be repaired, refer to drawings on pages 23-25.

E. LIMESTONE REPOINTING



Figure 14: Mortar is missing between two pieces of limestone. This photograph shows the east pier of the south elevation of the 1913 addition.

Recommendations:

Similarly to repointing the bricks, the limestone will also need to be repointed in several areas. Existing mortar should be raked and repointed with approved mortar to match existing. For locations and quantities of limestone repointing, refer to drawings on pages 23-25.

F. DETERIORATED LIMESTONE (DUTCHMAN)



Figure 15: Parts of the limestone base are severely deteriorated. This photograph shows the east end of the north elevation.

Recommendations:

Large areas of the limestone base have deteriorated as a result of their contact with the ground and/or pavement. The areas that are deteriorated should be cut back and new stone Dutchman should be installed to replicate the existing stone. Dutchman will be set in epoxy adhesive and secured in place with stainless steel anchors set in epoxy. For locations and quantities of Dutchman limestone, refer to drawings on pages 23-25.

DETERIORATED CONCRETE MASONRY UNIT (CMU)

All of the original arched window and door openings have been infilled with Concrete Masonry Unit (CMU). Some infill has received metal windows. Over time, several of the CMU infills have deteriorated as a result of the delaminating steel of the windows and lintels.

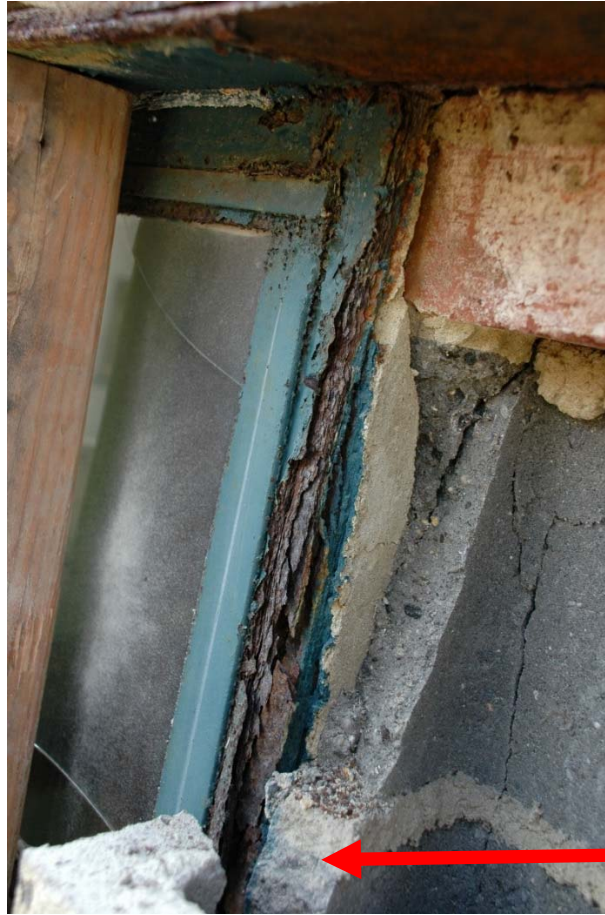


Figure 16: The delaminating steel on the window has caused the CMU infill to crack and split. This window is located on the west end of the north elevation of the 1913 addition.

Recommendations:

In places where the damage is more significant than hairline cracks or holes, the CMU will need to be rebuilt. Some of the CMU infills have been fractured by steel jacking and need to be replaced. For locations and quantities of rebuilding CMU, refer to drawings on pages 23-25.

STUCCO REPAIR OF CONCRETE MASONRY UNIT (CMU) INFILL

As previously mentioned, all of the original window openings have been infilled with CMU. At a number of locations, smaller steel windows have been set within the CMU. Over time, the window lintels have rusted and require replacement or repair (see structural report).



Figure 17: Moisture has penetrated the CMU infill and has caused cracks in the joints. This is the south infill of the 1910 building above the extension.



Figure 18: This deteriorating steel window, located in the south opening of the north elevation, has expanded and caused cracks in the CMU infill.

Recommendations:

CMU infill should be coated with three coats stucco system installed over galvanized expanded metal lathe to prevent water from penetrating the CMU. A sealant joint should be installed at the perimeter of the infill. It is recommended that all work pertaining to CMU crack repairs on the section above the

lower extension be coordinated with roof work. For locations and quantities for CMU repair, refer to drawings on pages 23-25.

VEGETATION

In several locations, water infiltration has caused cracks and openings in the mortar, allowing the growth of vegetation.



Figure 19: Infiltrating moisture has caused cracks and openings in the masonry, providing a place for vegetation. This photograph shows the west corner of the north elevation of the 1910 building.



Figure 20: Water infiltration has resulted in openings in the mortar where vegetation is growing, damaging more bricks as a result. This is the east corner of the north elevation of the 1910 building.

Recommendations:

The vegetation should be carefully removed and the masonry and pointing should be replaced or repaired as needed. Removal of vegetation should be done in conjunction with the rebuilding of the parapet walls. For locations and quantities of vegetation to be removed, refer to drawings on pages 23-25.

DOWNSPOUTS AND LEADER BOXES

Although leader boxes, scuppers and downspouts will be part of the reroofing campaign (N.I.C.), openings in new masonry parapets will need to be coordinated and bricks repaired as the result of damage from deteriorated rain water collectors (RWCs).



Figure 21: Typical downspout in need of replacement, located on the east end of the south elevation of the 1910 building.



Figure 22: Typical deterioration of leader boxes and downspouts in need of replacement. These downspouts are located on the south elevation.

Recommendations:

It is recommended that all of the downspouts, leader boxes and scuppers on the building be replaced with copper RWCs. This should be coordinated with the roof replacement (part of a separate contract).

WINDOWS

All of the original classical arched windows on the Water Plant were removed in 1971 and replaced with smaller steel units set in CMU infill. Many of the windows are deteriorated due to water penetration and lack of maintenance, causing the steel to rust and in some case delaminate. A portion of the window frame is embedded in the masonry and is inaccessible. This reduces the life expectancy significantly. Window putty glazing is deteriorated and needs 100% replacement. Several units have broken or cracked glass.



Figure 23: Delaminating steel of a typical window due to moisture. This window is located on the west end of the north elevation of the 1913 addition.

Recommendations:

All windows should be removed from CMU infill and restored (this will require removal of CMU at the jambs). All rust is to be mechanically removed, and any damaged members should be replaced. Windows are to have glass removed and be primed and painted. Glass will be reinstalled as will the unit. Work is to be coordinated with lintel replacement or repair (see structural report). Windows damaged beyond repair are to be replaced. According to the *Asbestos Containing Building Material Survey*, prepared by PRIZIM (2009), samples of glazing and caulking materials were not collected or tested. However, it is reasonable to assume that they may contain asbestos or Polychlorinated Biphenyls (PCBs), and as a consequence all window removal procedures will need to follow state guidelines for hazardous material removal. For locations and quantities of windows to be repaired or replaced, refer to drawings on pages 23-25.

Alternate: Replace all windows with new aluminum units. Factory-finished aluminum (or fiberglass) windows would be more durable in the shore environment than steel windows. The replacement windows installed in 1971 are not character-defining, and an alternate material such as aluminum should be acceptable.

BRICK AND LIMESTONE CLEANING

In several locations on the building, biological, atmospheric and rust stains are evident in the masonry.



Figure 24: The top arrow shows atmospheric stains and the bottom arrow shows rust stains. This shows the center bay of the west elevation of the 1913 addition.

Recommendations:

The entire building should receive a general cleaning. Several locations will require special attention to remove heavy biological, atmospheric and rust stains in the masonry. These areas should be cleaned, starting with water and a soft bristle brush, the least aggressive method of cleaning. If water isn't a sufficient cleaner, a mild detergent should be used. The last option would be to use a masonry cleaner if absolutely necessary. After cleaning, application of a biocide may be considered to prevent stains from reoccurring in the future.

Conclusion

After reviewing the findings from the field work, there are significant areas of deteriorated masonry and truss bearings that require repair. Many of these repairs should occur prior to, or in conjunction with, the reroofing projects to avoid damage to the new roof and to integrate flashing, etc. The recommended work has been prioritized as “High Priority” and “Low Priority.” High priority areas are classified as those that are actively deteriorating and will continue to deteriorate if not addressed immediately. Low priority areas are those that are not actively failing or are aesthetic in nature. The high priorities are:

Main High Area ‘A’

1. Rebuild cornices and provide new coping stones over through-wall flashing.
2. Repair trusses and purlins.
3. Work on east wall above the Low Extension.
4. Repair brick in east wall at south corner.
5. Any work that will affect new roof (NIC)

High Addition ‘B’

1. Rebuild cornices and provide new coping stones over through-wall flashing.
2. Repair trusses and purlins.
3. Rebuild CMU infill at 2 windows at the north side of the Addition.
4. Repair brick in east wall above door at west wall.
5. Any work that will affect new roof (NIC).

Low Area ‘C’

1. Provide new coping stones over through-wall flashing.
2. Rebuild (red) brick and bulging brick on the east wall of Lower Area ‘C’
3. Repair concrete ceiling at Lower Area ‘C’
4. Any work that will affect new roof (NIC)

The remaining recommended work (low priority) can be addressed after these high priority items are completed. These include items such as pointing, window replacement, and the installation of bollards. These repairs may be phased by building, or as funding allows.

The cost estimate which follows has been organized in the same manner.

SCOPE OF WORK NOTES

1. RAKE JOINTS AND REPOINT BRICK (NUMBER IN PARENTHESIS INDICATES APPROXIMATE PERCENTAGE OF BRICK TO BE REPOINTED IN AREA INDICATED).
2. REMOVE AND SALVAGE BRICK IN AREA INDICATED, REBUILD USING ORIGINAL BRICK.
3. REMOVE LIMESTONE COPING. PROVIDE COPPER THROUGH WALL FLASHING AND NEW LIMESTONE COPING (ALTERNATE: CAST STONE COPING). COORDINATE WITH NEW ROOF WORK, NIC.
4. REPLACE MISSING OR DAMAGED BRICK (NUMBER IN PARENTHESIS INDICATES APPROXIMATE BRICKS TO BE REPLACED IN AREA INDICATED)
5. REPAIR BRICK CRACK: (NUMBER IN PARENTHESIS INDICATES APPROXIMATE LENGTH OF CRACK FOLLOWED BY NUMBER OF DAMAGED BRICKS TO BE REPLACED - * INDICATES BRICK STITCHING AT EVERY 2 COURSES).
6. LIMESTONE PATCH (NUMBER IN PARENTHESIS INDICATES APPROXIMATE SIZE OF PATCH).
7. LIMESTONE CRACK REPAIR (NUMBER IN PARENTHESIS INDICATES APPROXIMATE LENGTH OF CRACK - * INDICATES STAINLESS PINS REQUIRED).
8. DUTCHMAN REPAIR (NUMBER IN PARENTHESIS INDICATES APPROXIMATE SIZE OF DUTCHMAN).
9. REPLACE DAMAGED OR BROKEN LIMESTONE MEMBER (NUMBER IN PARENTHESIS INDICATES APPROXIMATE APPROXIMATE SIZE OF STONE).
10. REMOVE AND RESET LIMESTONE MEMBER.
11. REMOVE EXISTING CMU INFILL AND PROVIDE NEW 8" CMU INFILL WITH GALVANIZED METAL LATH AND 3 COAT STUCCO SYSTEM AT EXTERIOR FACE.
12. PROVIDE GALVANIZED METAL LATH AND 3 COAT STUCCO SYSTEM AT EXTERIOR FACE OF CMU INFILL.
13. RESTORE EXISTING STEEL WINDOW: REMOVE, REMOVE AND SALVAGE GLASS, STRIP PAINT, REMOVE ALL RUST, REPLACE DAMAGED MEMBERS, REINSTALL OR REPLACE GLASS AND REINSTALL WINDOW - ALTERNATE: PROVIDE NEW ALUMINUM WINDOWS.
14. PROVIDE NEW STEEL WINDOW TO MATCH EXISTING - ALTERNATE: PROVIDE NEW ALUMINUM WINDOWS.
15. COORDINATE OPENING IN NEW OR EXISTING MASONRY FOR NEW SCUPPER AND DOWNSPOUT (NIC)
16. PROVIDE 6" DIAMETER STEEL BOLLARDS FILLED WITH CONCRETE.

GENERAL NOTES

- A. CLEAN BRICK AND LIMESTONE SURFACES TO REMOVE ATMOSPHERIC, BIOLOGICAL AND RUST STAINING.
- B. REMOVE ALL PLANT LIFE GROWING ON AND IN SURFACES
- C. PREPARE AND PAINT ALL EXTERIOR WOOD AND METAL SURFACES.

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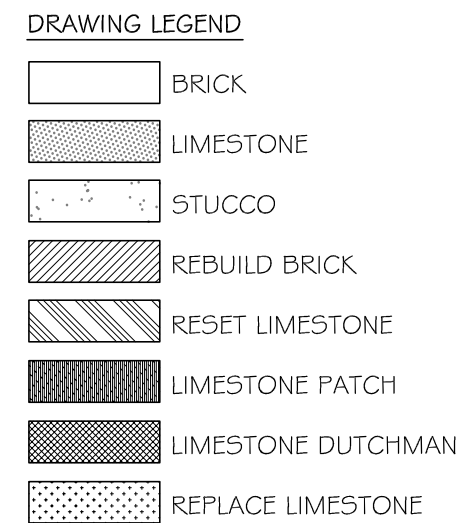
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SCOPE OF WORK NOTES

A-N



SCALE: 1/8" = 1'-0"

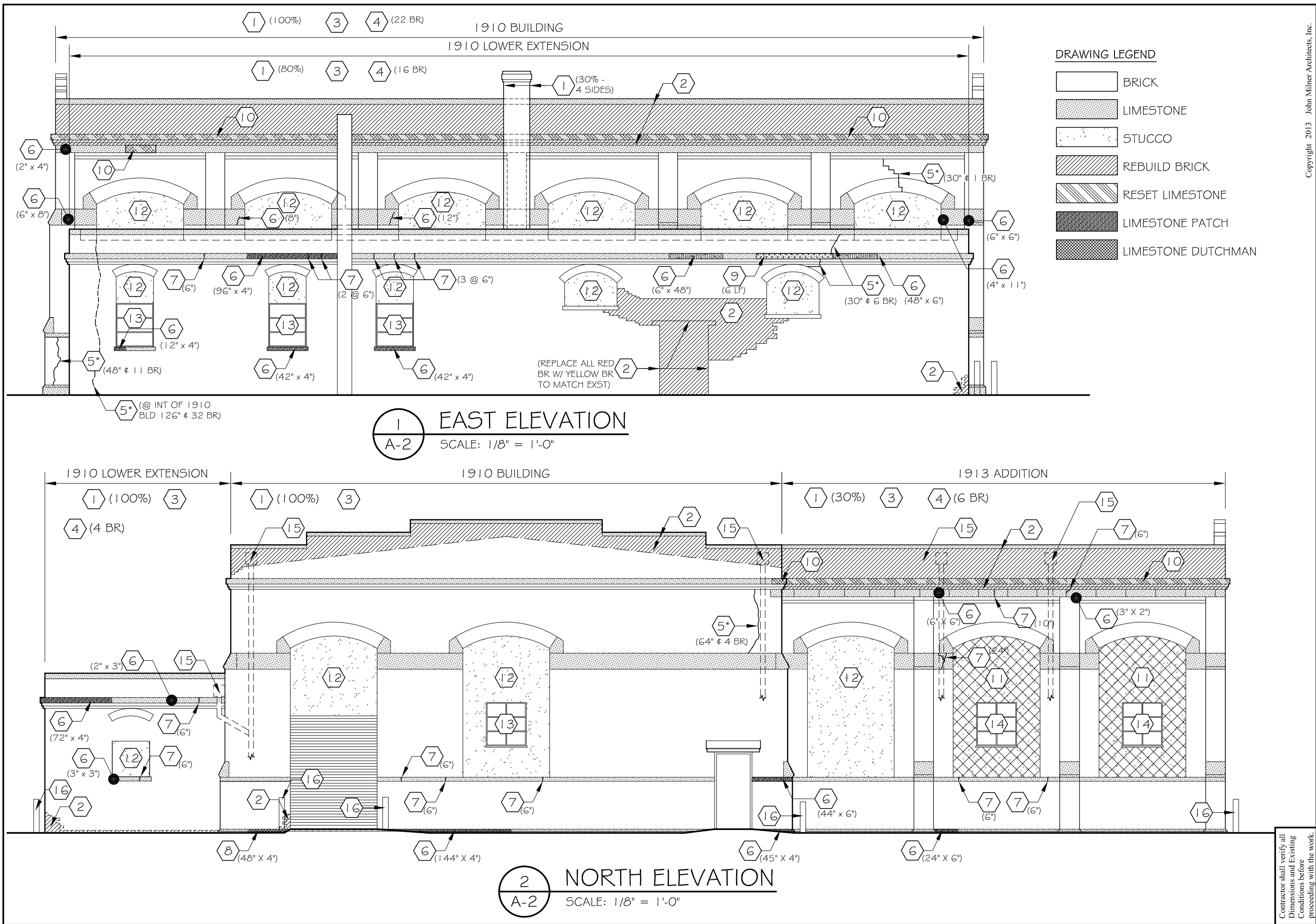
SCALE: 1/8" = 1'-0"

Contractor shall verify all Dimensions and Existing Conditions before proceeding with the work.

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Investigation and Report for the
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No.

EAST & NORTH
ELEVATIONS

A-2

**NATIONAL PARK SERVICE
GATEWAY NATIONAL RECREATION AREA
SANDY HOOK UNIT
BUILDING 341 HISTORIC WATER PLANT
STRUCTURAL REPORT – STRUCTURAL FRAMING**



Prepared For:

Christine Carter, AIA
John Milner Architects, Inc.
104 Lakeview Drive
Chadds Ford, PA 19317

&

The National Park Service

30 December 2013

Prepared By:

KH KEAST & HOOD CO.

Constantine G. Doukakis, PE
PE No. 24GE04008800
Cert. of Author. No. 24GA27961300

Brian Wentz, CDT, PE

400 Market Street, Suite 1250
Philadelphia, PA 19106
215-625-0099
KH#130102

I. Introduction

At the request of Christine Carter, AIA, John Milner Architects, and the National Park Service, Keast & Hood Co. has completed a review of the structural steel framing and brick masonry bearing walls of the Historic Water Plant Building 341 in the Sandy Hook Unit of Gateway National Recreation Area located in Ft. Hancock, NJ.

II. Background

The Historic Water Plant Building 341 (Image 1, Image 2) was constructed in two building campaigns. The original southern portion was constructed in 1910 with an addition constructed to the north in 1913. In plan, the current building is L-shaped. The original rectangular section measures 85' × 50' with a lower one-story extension to the east 17' deep while the addition measures 40' × 42'. Both the original section and addition are about 25' high with a single interior height.

The water plant is constructed with brick masonry bearing walls throughout the original portion and addition. The roof framing consists of wood rafters supported by steel purlins and wood sills on the masonry wall. The purlins are supported by the masonry walls and steel trusses. Rafters support wood roof sheathing. In the lower one-story Area C, wide flange steel beams carry a cast-in-place concrete roof.

Trusses are built-up construction with steel plates and angles. In the original building and addition, trusses span the short direction, are pocketed into the masonry and bear on steel plates. The plates are anchored into the wall with 1" diameter anchors bolts (Image 3).

A later renovation in 1971 saw the large arched door and window openings infilled with CMU. Some of these openings include smaller windows placed within, while others are fully infilled. While renovation drawings call for precast concrete lintels, steel angles were used instead (Image 4).

An assessment of the building's structural steel framing and brick masonry walls was conducted by Brian D. Wentz, PE, and Aliya Turner of Keast & Hood Co. This assessment is based on the review of previously issued reports and a walk-through assessment and field observations of the aforementioned structure conducted on September 26, 2013, and October 23, 2013. The assessment was made in conjunction with John Milner Architects, Inc. We report herewith on the existing structural conditions.

III. Methodology

During an initial site visit on September 26, 2013, Keast & Hood Co. determined the location for four exterior and four interior exploratory probes. The probes required the removal of portions of the masonry walls to better determine the condition of embedded steel members. Prior to our arrival on site, John Milner Architects, Inc. arranged for a contractor to provide an aerial lift, ladders, and scaffold bridge panels to assist in reviewing the probes. The contractor also assisted in relocating ladders on site. Our assessment of the existing framing utilized visual observations and probing.

- A: Visual: A visual assessment of the existing steel trusses and purlins completed during the initial walk-through and follow-up survey.
- B: Probing: As part of the condition assessment, a contractor opened several probes in the masonry walls. This method is used to determine the extent or existence of hidden deterioration. A map of the probe locations is attached to the end of this report. A total of eight probe locations were completed on site during the assessment; five were interior probes and three were exterior probes. The probes completed provide an representative sample of the existing conditions.

IV. Existing Materials, Existing Conditions & Recommendations

A: Trusses and Purlins: Access to trusses and purlins was via aerial lift in select locations. Probes cut in the masonry permitted a condition assessment of the embedded steel.

1. *Existing Trusses and Purlins*: Built up steel trusses and wide flange steel purlins support the roof system at the water plant. In the one-story extension, the roof is supported by concrete slabs bearing on wide flange beams.
2. *Existing Conditions*: Where steel was embedded in masonry, extensive corrosion was present (Image 5). The corrosion was removed with a chisel and hammer (provided by the contractor) to assess the integrity of the remaining steel. At the interface between the wall and the steel, a distinct line exists between corroded and sound steel. This interaction exhibits extensive corrosion. This is likely where water runs along the face of the masonry (Image 6). In these areas, section loss up to ¼" was observed (Image 7). While significant corrosion was observed on the base plates, no serious section loss was recorded except at probe location T-1. In this location, the base plate appears to be made of separate stacked plates and the corrosion was great enough such that the thickness could no longer be determined.

The corrosion of steel members in the truss system has led to rust jacking and corresponding masonry cracking where the trusses pocket into the wall. However, there is no cracking in the walls beneath the truss, either interior or exterior. Therefore, the embedded anchors probably exhibit minimal corrosion.

Although probes were not made at all truss or purlin ends, conditions seen in one location were assumed to exist in locations of identical construction or campaign.

- T-1: South wall of addition, westernmost truss. This is the location of the heavily corroded stacked base plate.
- T-2 (alt): South wall of original section, westernmost purlin. Corrosion of purlin noted as typical of all areas.
- T-3 and T-4: East wall of original section, northern trusses. Long horizontal crack observed (See Section C).
- W-4: East wall of one-story original addition, northern beam. Wide flange beam is concrete encased, with an exposed bottom flange. Steel was corroded. Slate shims were in evidence under the beam.

3. *Recommendations*:

A-1: At all truss ends:

- o Remove all masonry to expose the embedded end of the truss. Salvage the existing brick.
- o Clean all embedded steel of corrosion using power tool cleaning techniques.
- o Notify engineer to review existing steel conditions, if section loss is less than 25%, then no reinforcements will be required.
- o Field weld joint between bottom chord angles and gusset plate.
- o Coat all embedded steel with a rust-inhibitive coating.
- o Reinstall existing brick in wall pocket around truss end.

- A-2: At all truss bearing locations within the addition (to be completed after truss end cleaning and repairs):
 - o Partially remove existing brick below the corroded stacked bearing plates.
 - o Remove half of the corroded stacked bearing plates.
 - o Notify engineer to review existing steel conditions, if section loss is less than 25%, then no reinforcements will be required.
 - o Clean the existing tie-down anchor of corrosion.
 - o Install a replacement base plate (half width).
 - o Drypack below base plate.
 - o Repeat on opposite half of bearing plate.
 - o Recommendation is such that shoring of trusses is not required.
- A-3: At all truss bearing locations within the original tall section:
 - o Clean the existing bearing plate of corrosion.
 - o Notify engineer to review existing steel conditions, if section loss is less than 25%, then no reinforcements will be required.
- A-4: At all purlin ends:
 - o Install shoring to temporarily support purlin end.
 - o Remove all masonry to expose the embedded end of the purlin. Salvage the existing brick.
 - o Clean all embedded steel of corrosion using power tool cleaning techniques. Notify engineer to review existing steel conditions, if section loss is less than 25%, then no reinforcements will be required.
 - o Coat all embedded steel with a rust-inhibitive coating.
 - o Reinstall existing brick in wall pocket around purlin.
- A-5: South One-Story Building:
 - o Expose all beam ends by removing portions of the concrete.
 - o Clean all embedded portions of the steel beam and the exposed bottom flange.
 - o Notify engineer to review existing steel conditions, if section loss is less than 25%, then no reinforcements will be required.
 - o Coat all steel surfaces with a rust inhibitive coating.
 - o Infill pockets at beam ends with brick.

B: Steel Lintels: Access to the steel lintels was via scaffolding and ladders in select locations.

1. *Existing Lintels*: During the 1971 renovation, the large arched door and window opening were infilled with CMU. All new doors and window openings were supported with two steel angles (Image 8), with the exception of an opening on the one-story east wall, where upside down railroad track sections were used as lintels.
2. *Existing Conditions*: In general, the steel members have corroded, and rust-jacking has led to deterioration of the surrounding masonry. Extent of deterioration varies around the building.
 - W-1: North wall of addition, west window. Steel lintels are heavily corroded. The CMU infill on the north side of the opening was split.

- W-2: North wall of original section, east door. Extensive corrosion was observed in both steel angles.
- W-3: East wall of one-story section, infilled door opening. Two upside down railroad track sections were inserted into the wall to serve as a lintel. The opening has since been filled with plain red brick (Image 10). Extensive corrosion of the rails has caused the deterioration of the infill brick and original brick (Image 9).

Visual observations were made of the remaining steel lintels from the ground. At the western door in the addition, the lintel was inspected from a ladder and determined to be corroded.

3. *Recommendations:*

B-1: Clean and paint (Provide repair at nine (9) window openings):

- o Expose both sides of the double angle lintel.
- o Clean all steel of corrosion.
- o Coat with a rust-inhibitive coating.
- o Replace removed masonry.

B-2: Replace Lintels: (Provide replacement at four (4) window/door openings):

- o Expose both sides of the double angle lintel.
- o Replace existing lintel with a galvanized double angle to match the existing.
- o Repair existing masonry at the perimeter of the wall opening.
- o Replace removed masonry.

B-2 (Alt-1): Replace All Lintels:

- o Replace all existing lintel with a galvanized double angle to match the existing.

B-2 (Alt-2): Replace All Lintels:

- o Replace all existing lintel with a reinforced precast CMU lintel.

B-3: At location W-3:

- o Remove only a third of the steel lintel working from the inside and outside face of wall; remove by field cutting.
- o Remove the portion of masonry below the removed section of lintel.
- o Infill opening with CMU and brick veneer; provide dowels to the existing masonry jambs at CMU; tooth brick veneer to the existing.
- o Repeat for the remaining two-thirds.

C: Brick Masonry Bearing Walls: Visual assessment of the brick masonry bearing walls was completed from the ground along the interior and exterior of the water plant and from an aerial lift or ladder at select locations on the interior.

1. *Existing Walls:* The water plant walls are constructed with brick masonry. Limestone coursing accents the exterior at the bottom of the original window openings and at the arch spring point. Two additional limestone courses are associated with the parapet, one at the bottom acting as a sill, and a second, two brick courses below. Limestone coping tops the parapet. The original openings were supported by brick arches. Exterior brick is tan, while interior is unfinished red brick. At truss height, the wall corbels

outward, creating a shelf on the interior and an extrusion on the exterior. Piers below truss locations break the surface of the exterior wall.

On the southern wall of the original building, two tie-rods puncture the exterior wall and connect to the perpendicular interior walls. The eastern tie-rod is at about half the wall height, while the western tie-rod is closer to the roof. It is presumed that the tie-rods were installed due to the cracks that developed in the adjacent walls.

2. *Existing Conditions:* In general, the walls of the water plant are in fair condition. Condition assessment was limited to the structural conditions.

On the interior, a horizontal crack traverses the entire wall at the same elevation as the top of an exterior limestone course, two courses down from the bottom of the truss (Image 11). The brick above the crack is displaced by up to ½” in some locations. The crack and upward displacement was seen at probe locations T-3 and T-4. Given the construction of the wall and the broad extent and character of the masonry deterioration seen around the building, the parapet wall appears to be hinged at the limestone course and is rotating outward.

In the 1913 addition, large cracks in the southwest corner extend through the entire width of the existing masonry and the CMU infill (Image 12). Both the west and south elevation cracks are widest at the top and run diagonally from the top of the walls down to the west corner. The presence of cracks in both the west and north walls coupled with the character and orientations suggest a settlement issue.

A large crack in the east wall of the original section runs from the north corner diagonally to the bottom north corner of the infilled window, around the CMU infill, and continues to the top of the wall (Image 13). This crack appears to be caused by thermal expansion of the infill masonry.

Exterior wall exhibits vertical cracks associated with rust jacking of trusses and purlins in most locations.

3. *Recommendations:* All masonry repairs should be coordinated with the architectural portion of the assessment. The following are our recommendations for stabilizing the observed deteriorated conditions:

C-1: Parapet walls: Rebuild all parapet walls; replicating all details.

C-2: Cracks at Southwest Corner of the addition:

- o Underpin southwest corner (15 feet each side) down to sound material.
- o Install anchor pins across the crack at 24” on-centers.
- o Repoint crack; replacing all cracked brick with matching brick.

- D. Upper Roof Framing: Access to view the roof framing was via aerial lift in select interior locations.

1. *Existing Framing:* The wood rafters rest on a wood sill inset into the masonry. The rafters are notched to fit over the sill. Roof sheathing consists of board sheathing.

-
2. *Existing Conditions:* The wood framing and wall plate is generally in fair condition. In several locations, previous repairs and sistered rafters were visible. Where the rafters are supported on the wood sill, the wood rafters are in poor condition, exhibiting wood rot and splitting (Image 14).
 3. *Recommendations:*
 - D-1: Replace wood wall plate during parapet reconstruction; provide a pressure treated wall plate to match the dimensions of the existing plate.
 - D-2: Replace all rafters and roof sheathing that exhibit decay.
 - E. Lower Roof Framing: Access was also provided to the low roof exterior on the east via ladder. The review of the concrete slab was from the ground floor below; only the northern portion of the slab was visible.
 1. *Existing Framing:* The existing low roof framing consists of a concrete slab spanning between steel beams. A previous roof opening has been infilled with wood framing.
 2. *Existing Conditions:* The top surface of the concrete slab was covered with roofing membrane. The underside of the concrete slab exhibits areas of spalling concrete and corroding reinforcing steel (Image 15).
 3. *Recommendations:*
 - E.1: In the areas of the slab with spalling concrete, remove all loose and deteriorated concrete and expose all reinforcing bars. Clean the existing reinforcing bars of corrosion; replace or supplement bars that exhibit a section loss of more than a third of their original cross-section. Repair the concrete with an overhead concrete repair mortar.
 - E.2: During the roofing replacement, replace the wood infill framing with pressure treated lumber. Match the existing framing layout and member size of the existing framing.

V. Conclusion

Generally, the structural steel members are in fair condition, with deterioration localized where steel is embedded within masonry. The masonry bearing walls are in fair condition, with localized cracking at the embedded steel members. Deterioration stems from corrosion of steel due to extensive water infiltration. Section loss in the steel and rust-jacking in the masonry has compromised the integrity of the system. Recommendations contained herein aim to remedy current deficiencies of the system and extend the service life of the water plant.

VI. Images



Image 1– North elevation of the Water Plant.



Image 2– West and south elevations of the Water Plant.

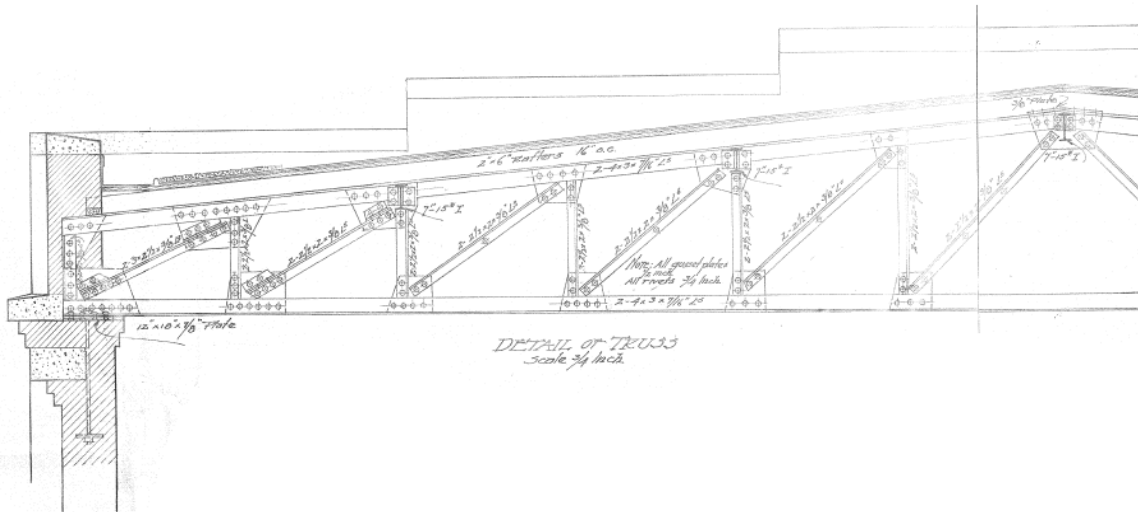


Image 3– Truss detail from 1912 drawing.

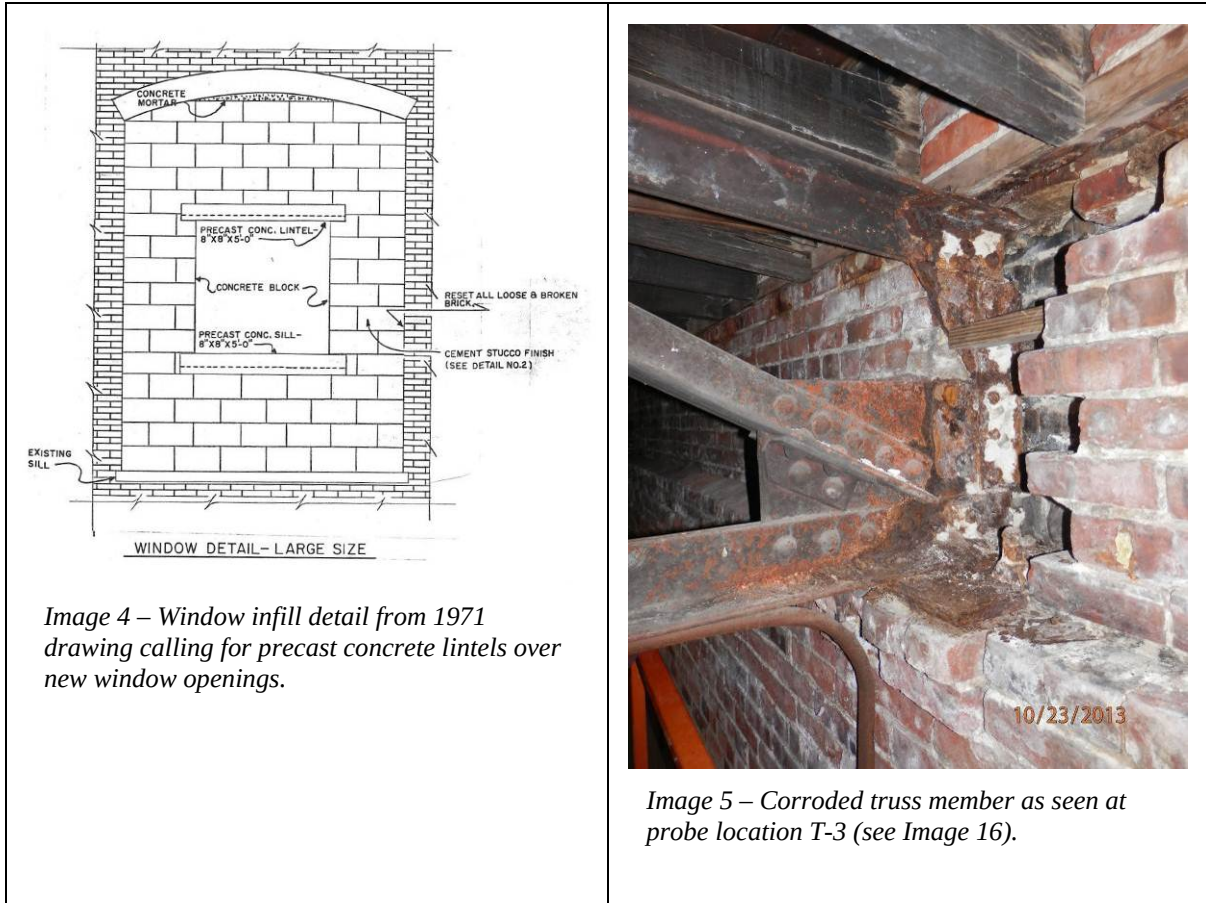




Image 6 – At locations T-3 & T-4, red line indicates extent of brick wall. Dark portions of the truss to the left are areas of high section loss due to corrosion, likely from water running down wall and truss.



Image 7 – Section loss (top arrows) compared to intact section (bottom arrows) of bottom chord at probe location T-3 (see Image 16).



Image 8 – Two angles supported window opening at probe location W-1 (see Image 16). Outer angle is turned on its long side.



Image 9 – At W-4 probe location, railroad track sections used as a lintel.



Image 10 – Probe location W-3 (see Image 16), showing masonry deterioration from rust-jacking.



Image 11 – Horizontal crack running two courses below truss as seen at probe location T-3 (see Image 16).



Image 12 – Crack through CMU infill on south wall of addition. Day light is visible through the crack.



Image 13 – Crack in east wall at northeast corner of the original building.



Image 14 – Split wood roof joist at sill with previous repairs as seen at probe location T-3 (see Image 16).



Image 15 – The underside of the concrete slab exhibits spalling and corroding reinforcing steel; shown location is just inside the east addition of the north portion of the original building.

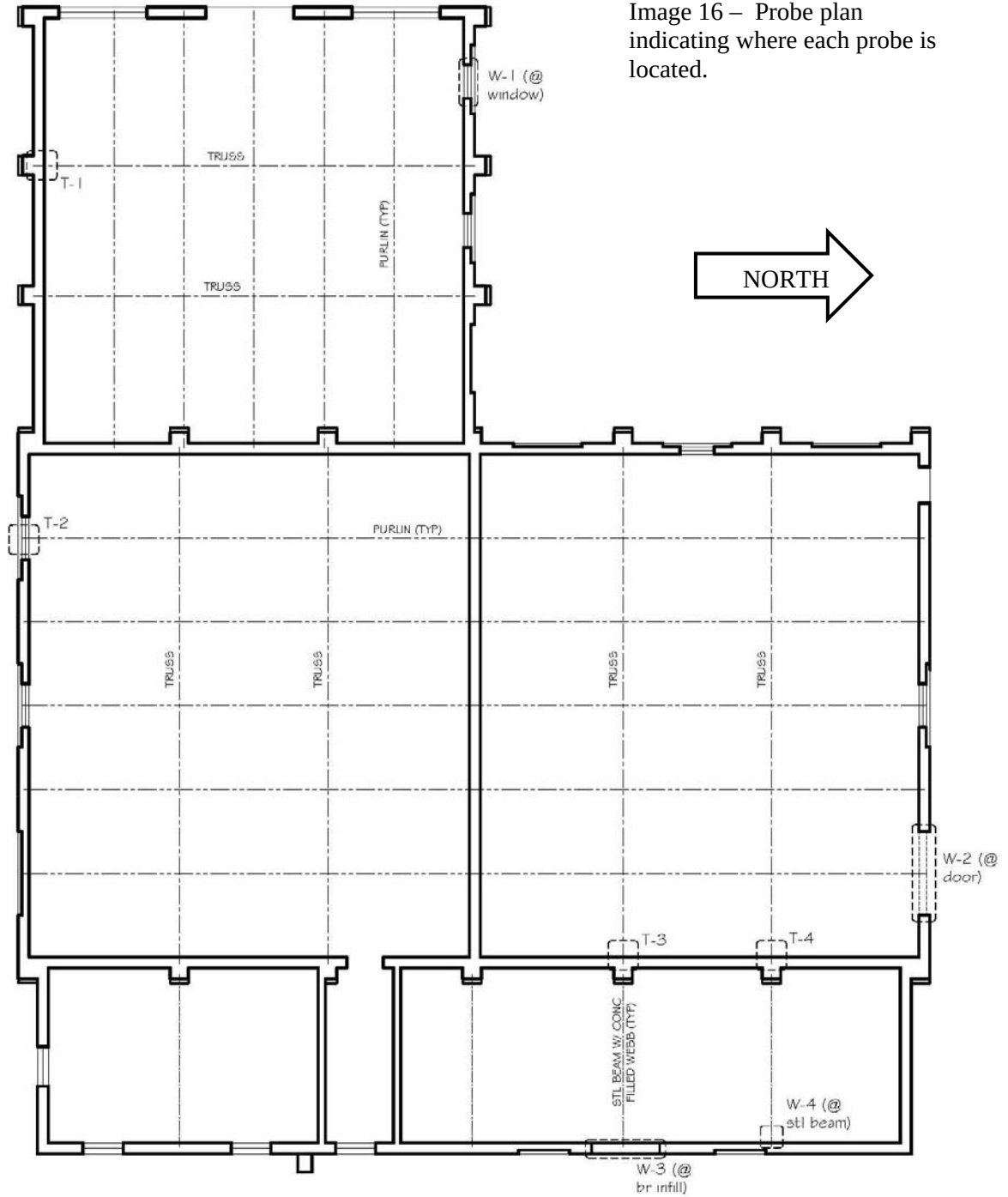


Image 16 – Probe plan indicating where each probe is located.

Appendix A:

Cost Estimate

**JOHN MILNER ARCHITECTS
GATEWAY NATIONAL RECREATION AREA
HISTORIC WATER PLANT BUILDING 341
LIMITED STRUCTURAL INVESTIGATION & REPORT
SANDY HOOK, NEW JERSEY
DETAILS - CLASS C SUBMISSION COST ESTIMATE**

ICI #: 209379-19
Prep: mcf
Date: 11/22/2013
Revised: 1/11/2014

INTERNATIONAL CONSULTANTS, INC.
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PHILADELPHIA, PENNSYLVANIA
PHILADELPHIA, PENNSYLVANIA

215 / 923.8888

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SUMMARY

BUILDING A - HIGH PRIORITY	\$	534,959.29
BUILDING B - HIGH PRIORITY	\$	439,130.84
BUILDING C - HIGH PRIORITY	\$	249,914.41
Sub-total High Priority	\$	1,224,004.54
BUILDING A - LOW PRIORITY	\$	242,823.38
BUILDING B - LOW PRIORITY	\$	189,493.99
BUILDING C - LOW PRIORITY	\$	164,434.47
Sub-total Low Priority	\$	596,751.83
TOTAL	\$	1,820,756.37

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Description	Quantity	Unit	Material Cost Unit Cost	Amount	Total Including All Mark Ups
BUILDING A - High Priority (Priority 1)					
					<i>Mark Ups</i> <i>2.09484</i>
Temporary Protection/Barriers	1	LS	\$ 5,000.00	\$ 5,000	\$ 10,474
Scaffolding/Lifts/Access	1	LS	25,000.00	25,000	\$ 52,371
Masonry Conditions					
Reconstruct Parapet					
- West Elevation	120	SF	100.00	12,000	\$ 25,138
- Replace Coping	42	LF	75.00	3,150	\$ 6,599
- East Elevation	240	SF	100.00	24,000	\$ 50,276
- Replace Coping	84	LF	75.00	6,300	\$ 13,197
- North Elevation	85	SF	100.00	8,500	\$ 17,806
- Replace Coping	50	LF	75.00	3,750	\$ 7,856
- South Elevation	85	SF	100.00	8,500	\$ 17,806
- Replace Coping	50	LF	75.00	3,750	\$ 7,856
Brick Cracks - Repair, Pin, Repl Damaged Brick					
- West	3	LF	275.00	825	\$ 1,728
- East (*included in structural)	-	LF	275.00	-	\$ -
- North	-	LF	275.00	-	\$ -
- South	6	LF	275.00	1,650	\$ 3,456
Limestone					
Reset Displaced Limestone Belt Course					
- West	-	LF	600.00	-	\$ -
- East	4	LF	600.00	2,400	\$ 5,028
Replace limestone					
- East	20	SF	275.00	5,500	\$ 11,522
CMU Cracks - Stucco Surface w/Lath, Seal & Paint					
- East	3	EA	975.00	2,925	\$ 6,127
- West	-	EA	975.00	-	\$ -
- North	-	EA	975.00	-	\$ -
- South	-	EA	975.00	-	\$ -
Vegetation - Remove Vegetation, Repair Masonry	1	LS	5,000.00	5,000	\$ 10,474
Structural					
Trusses & Purlins					
Truss Ends - Remove Masonry to Expose, Clean Stl, Weld Plate, Coat & Reinstall Brick	10	EA	3,750.00	37,500	78,557
Truss @ Addition - Replace Brick & Stacked Plates Below Truss Bearing	4	EA	3,200.00	12,800	26,814
Purlin Ends - Remove Masonry to Expose, Clean Stl, Coat & Reinstall Brick	20	EA	1,750.00	35,000	73,319
Lintels					
Replace Lintel @ Infilled Door (W3)	1	EA	2,850.00	2,850	5,970
Brick Masonry Bearing Walls					
Parapet Wall - Rebuild	Included Above				
Crack @ NE Corner - Underpin, Pin & Repoint Crack	1	EA	18,500.00	18,500	38,755

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Description	Quantity	Unit	Material Cost		Total Including All Mark Ups
			Unit Cost	Amount	
BUILDING A - High Priority (Priority 1)					
Roof					
Replace Wood Sill During Parapet Rebuild	164	LF	50.00	8,200	17,178
Replace Deteriorated Joist (Assume 15%)	655	SF	25.00	16,375	34,303
Replace Deteriorated Roof Decking (Assume 15%)	655	SF	9.00	5,895	12,349
SUBTOTAL				\$	255,370
Contingency	15%				38,306
Subtotal				\$	293,676
General Conditions	20%				58,735
Protecting & Preserving Historic Fabric	10%				35,241
Overhead & Profit	20%				77,530
Contracting Method Adjustment (Negotiated Contract)	15%				69,777
TOTAL CONSTRUCTION COST				\$	534,959
				\$	534,959

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BUILDING B - High Priority (Priority 1)					
					<i>Mark Ups</i> <i>2.09484</i>
Temporary Protection/Barriers	1	LS	\$ 5,000.00	\$ 5,000	\$ 10,474
Scaffolding/Lifts/Access	1	LS	25,000.00	25,000	\$ 52,371
Masonry Conditions					
Reconstruct Parapet					
- West Elevation	68	SF	100.00	6,800	\$ 14,245
- Replace Coping	42	LF	75.00	3,150	\$ 6,599
- East Elevation	-	SF	100.00	-	\$ -
- Replace Coping	-	LF	75.00	-	\$ -
- North Elevation	112	SF	100.00	11,200	\$ 23,462
- Replace Coping	40	LF	75.00	3,000	\$ 6,285
- South Elevation	112	SF	100.00	11,200	\$ 23,462
- Replace Coping	40	LF	75.00	3,000	\$ 6,285
Brick Cracks - Repair, Pin, Repl Damaged Brick					
- West	3	LF	275.00	825	\$ 1,728
- East	-	LF	275.00	-	\$ -
- North	-	LF	275.00	-	\$ -
- South	-	SF	275.00	-	\$ -
Limestone					
Reset Displaced Limestone Belt Course					
- West	42	LF	600.00	25,200	\$ 52,790
- East	42	LF	600.00	25,200	\$ 52,790
- North	40	LF	600.00	24,000	\$ 50,276
Replace Limestone Beltcourse					
- West	4	LF	1,250.00	5,000	\$ 10,474
Concrete Masonry Units					
Rebuild CMU @ Infill Areas @ North	2	EA	2,500.00	5,000	\$ 10,474
Vegetation - Remove Vegetation, Repair Masonry	1	LS	1,000.00	1,000	\$ 2,095
Windows - Repair, Restore Windows	2	EA	2,600.00	5,200	\$ 10,893
Alternate - Replace with Aluminum	2	EA	1,750.00		
Structural					
Trusses & Purlins					
Truss Ends - Remove Masonry to Expose, Clean Stl, Weld Plate, Coat & Reinstall Brick	-	EA	3,750.00	-	\$ -
Truss @ Addition - Replace Brick & Stacked Plates Below Truss Bearing	4	EA	3,200.00	12,800	\$ 26,814
Purlin Ends - Remove Masonry to Expose, Clean Stl, Coat & Reinstall Brick	10	EA	1,750.00	17,500	\$ 36,660
Beam Ends - Remove Masonry to Expose, Clean Stl, Coat & Reinstall Brick	-	EA	1,900.00	-	\$ -
Lintels					
Replace Lintels	2	EA	2,250.00	4,500	\$ 9,427
Brick Masonry Bearing Walls					
Parapet Wall - Rebuild					Included Above

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Description	Quantity	Unit	Material Cost		Total Including All Mark Ups	
			Unit Cost	Amount		
BUILDING B - High Priority (Priority 1)						
Crack @ NE Corner - Underpin, Pin & Repoint Crack	-	EA	18,500.00	-	\$	-
Roof						
Replace Wood Sill During Parapet Rebuild	80	LF	50.00	4,000	\$	8,379
Replace Deteriorated Joist (Assume 15%)	325	SF	25.00	8,125	\$	17,021
Replace Deteriorated Roof Decking (Assume 15%)	325	SF	9.00	2,925	\$	6,127
SUBTOTAL				\$ 209,625		
Contingency	15%			31,444		
Subtotal				\$ 241,069		
General Conditions	20%			48,214		
Protecting & Preserving Historic Fabric	10%			28,928		
Overhead & Profit	20%			63,642		
Contracting Method Adjustment (Negotiated Contract)	15%			57,278		
TOTAL CONSTRUCTION COST				\$ 439,131	\$	439,131

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Description	Quantity	Unit	Material Cost Unit Cost	Amount	Total Including All Mark Ups
BUILDING C - High Priority (Priority 1)					<i>Mark Ups</i> <i>2.09484</i>
Temporary Protection/Barriers	1	LS	\$ 5,000.00	\$ 5,000	\$ 10,474
Scaffolding/Lifts/Access	1	LS	25,000.00	25,000	\$ 52,371
Masonry Conditions					
Reconstruct Parapet					
- West Elevation	-	SF	100.00	-	\$ -
- Replace Coping	-	LF	75.00	-	\$ -
- East Elevation	-	SF	100.00	-	\$ -
- Replace Coping	80	LF	75.00	6,000	\$ 12,569
- North Elevation	-	SF	100.00	-	\$ -
- Replace Coping	17	LF	75.00	1,275	\$ 2,671
- South Elevation	-	SF	100.00	-	\$ -
- Replace Coping	17	LF	75.00	1,275	\$ 2,671
Limestone					
Reset Displaced Limestone Belt Course					
- South	40	LF	600.00	24,000	\$ 50,276
Vegetation - Remove Vegetation, Repair Masonry	1	LS	2,000.00	2,000	\$ 4,190
Structural					
Trusses & Purlins					
Beam Ends - Remove Masonry to Expose, Clean Stl, Coat & Reinstall Brick	10	EA	1,900.00	19,000	\$ 39,802
Low Roof					
Repair Concrete Spalls (Assume 15%)	130	SF	275.00	35,750	\$ 74,891
SUBTOTAL				\$ 119,300	
Contingency				17,895	
Subtotal				\$ 137,195	
General Conditions				27,439	
Protecting & Preserving Historic Fabric				16,463	
Overhead & Profit				36,219	
Contracting Method Adjustment (Negotiated Contract)				32,598	
TOTAL CONSTRUCTION COST				\$ 249,914	\$ 249,914

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Description	Quantity	Unit	Material Cost Unit Cost	Amount	Total Including All Mark Ups
BUILDING A - Low Priority (Priority 2)					<i>Mark Ups</i> <i>2.09484</i>
Temporary Protection/Barriers	1	LS	\$ 2,500.00	\$ 2,500	\$ 5,237
Scaffolding/Lifts/Access	1	LS	10,000.00	10,000	\$ 20,948
Masonry Conditions					
Brick Pointing - Rake & Repoint					
- West	370	SF	30.00	11,100	\$ 23,253
- East	286	SF	30.00	8,580	\$ 17,974
- North	790	SF	30.00	23,700	\$ 49,648
- South	126	SF	30.00	3,780	\$ 7,918
Missing/Damaged Brick - Remove & Replace Damaged Brick					
- West	2	SF	100.00	200	\$ 419
- East	22	SF	100.00	2,200	\$ 4,609
- North	-	SF	100.00	-	\$ -
- South	28	SF	100.00	2,800	\$ 5,866
Install Bollards @ Corners	4	EA	650.00	2,600	\$ 5,447
Brick Cracks - Repair, Pin, Repl Damaged Brick					
- West	-	LF	275.00	-	\$ -
- East	-	LF	275.00	-	\$ -
- North	6	LF	275.00	1,650	\$ 3,456
- South	-	LF	275.00	-	\$ -
Patch/Repair Limestone Spalls					
- West - Small	-	EA	325.00	-	\$ -
- West - Large	-	EA	675.00	-	\$ -
- East - Small	1	EA	325.00	325	\$ 681
- East - Large	2	EA	675.00	1,350	\$ 2,828
- North - Small	-	EA	325.00	-	\$ -
- North - Large	3	EA	675.00	2,025	\$ 4,242
- South - Small	2	EA	325.00	650	\$ 1,362
- South - Large	-	EA	675.00	-	\$ -
Repair Limestone Cracks - Grout, Pin as Required					
- West	4	EA	425.00	1,700	\$ 3,561
- East	-	EA	425.00	-	\$ -
- North	3	EA	425.00	1,275	\$ 2,671
- South	5	EA	425.00	2,125	\$ 4,452
Repoint Limestone					
- West	58	LF	20.00	1,160	\$ 2,430
- East	25	LF	20.00	500	\$ 1,047
- North	20	LF	20.00	400	\$ 838
- South	16	SF	20.00	320	\$ 670
Limestone Dutchman @ Deteriorated Base	4	LF	850.00	3,400	\$ 7,122
Concrete Masonry Units					
CMU Cracks - Stucco Surface w/Lath, Seal & Paint					
- East	-	EA	975.00	-	\$ -
- West	3	EA	975.00	2,925	\$ 6,127
- North	1.5	EA	975.00	1,463	\$ 3,064
- South	2.5	EA	975.00	2,438	\$ 5,106
Windows - Repair, Restore Windows	5	EA	2,600.00	13,000	\$ 27,233

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HISTORIC WATER PLANT BUILDING 341
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DETAILS - CLASS C SUBMISSION COST ESTIMATE

ICI #: 209379-19
 Prep: mcf
 Date: 11/22/2013
 Revised: 1/11/2014

Description	Quantity	Unit	Material Cost Unit Cost	Amount	Total Including All Mark Ups
BUILDING A - Low Priority (Priority 2)					<i>Mark Ups</i>
Alternate - Replace with Aluminum	5	EA		1,750.00	
Brick & Limestone Cleaning					
- East	1,050	SF	2.50	2,625	\$ 5,499
- West	1,080	SF	2.50	2,700	\$ 5,656
- North	1,020	SF	2.50	2,550	\$ 5,342
- South	990	SF	2.50	2,475	\$ 5,185
Structural					
Lintels					
Clean & Paint Lintels	4	EA	350.00	1,400	\$ 2,933
SUBTOTAL				\$ 115,915	
Contingency	15%			17,387	
Subtotal				\$ 133,302	
General Conditions	20%			26,660	
Protecting & Preserving Historic Fabric	10%			15,996	
Overhead & Profit	20%			35,192	
Contracting Method Adjustment (Negotiated Contract)	15%			31,673	
TOTAL CONSTRUCTION COST				\$ 242,823	\$ 242,823

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ICI #: 209379-19
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 Date: 11/22/2013
 Revised: 1/11/2014

Description	Quantity	Unit	Material Cost Unit Cost	Amount	Total Including All Mark Ups
BUILDING B - Low Priority (Priority 2)					<i>Mark Ups</i> <i>2.09484</i>
Temporary Protection/Barriers	1	LS	\$ 2,500.00	\$ 2,500	\$ 5,237
Scaffolding/Lifts/Access	1	LS	10,000.00	10,000	\$ 20,948
Masonry Conditions					
Brick Pointing - Rake & Repoint					
- West	550	SF	30.00	16,500	\$ 34,565
- East	-	SF	30.00	-	\$ -
- North	180	SF	30.00	5,400	\$ 11,312
- South	165	SF	30.00	4,950	\$ 10,369
Missing/Damaged Brick - Remove & Replace Damaged Brick					
- West	26	SF	100.00	2,600	\$ 5,447
- East	-	SF	100.00	-	\$ -
- North	6	SF	100.00	600	\$ 1,257
- South	25	SF	100.00	2,500	\$ 5,237
Install Bollards @ Corners	4	EA	650.00	2,600	\$ 5,447
Brick Cracks - Repair, Pin, Repl Damaged Brick					
- West	-	LF	275.00	-	\$ -
- East	-	LF	275.00	-	\$ -
- North	-	LF	275.00	-	\$ -
- South	9	LF	275.00	2,475	\$ 5,185
Limestone					
Reset Displaced Limestone Belt Course					
- West	-	LF	600.00	-	\$ -
- East	4	LF	600.00	2,400	\$ 5,028
Patch/Repair Limestone Spalls					
- West - Small	-	EA	325.00	-	\$ -
- West - Large	-	EA	675.00	-	\$ -
- East - Small	-	EA	325.00	-	\$ -
- East - Large	-	EA	675.00	-	\$ -
- North - Small	1	EA	325.00	325	\$ 681
- North - Large	2	EA	675.00	1,350	\$ 2,828
- South - Small	1	EA	325.00	325	\$ 681
- South - Large	1	EA	675.00	675	\$ 1,414
Repair Limestone Cracks - Grout, Pin as Required					
- West	9	EA	425.00	3,825	\$ 8,013
- East	-	EA	425.00	-	\$ -
- North	5	EA	425.00	2,125	\$ 4,452
- South	14	EA	425.00	5,950	\$ 12,464
Repoint Limestone					
- West	-	LF	20.00	-	\$ -
- East	42	LF	20.00	840	\$ 1,760
- North	32	LF	20.00	640	\$ 1,341
- South	37	SF	20.00	740	\$ 1,550
Concrete Masonry Units					
CMU Cracks - Parge Surface w/Lath, Seal & Paint					
- East	-	EA	975.00	-	\$ -
- West	2.5	EA	975.00	2,438	\$ 5,106
- North	1	EA	975.00	975	\$ 2,042
- South	2	EA	975.00	1,950	\$ 4,085
1.00 Windows - Repair, Restore Windows	2	EA	2,600.00	5,200	\$ 10,893

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Description	Quantity	Unit	Material Cost Unit Cost	Amount	Total Including All Mark Ups
BUILDING B - Low Priority (Priority 2)					<i>Mark Ups</i>
Alternate - Replace with Aluminum	2	EA	1,750.00		
Brick & Limestone Cleaning					
- East	1,100	SF	2.50	2,750	\$ 5,761
- West	1,180	SF	2.50	2,950	\$ 6,180
- North	760	SF	2.50	1,900	\$ 3,980
- South	770	SF	2.50	1,925	\$ 4,033
Structural					
Lintels					
Clean & Paint Lintels	3	EA	350.00	1,050	\$ 2,200
SUBTOTAL				\$ 90,458	
Contingency	15%			13,569	
Subtotal				\$ 104,026	
General Conditions	20%			20,805	
Protecting & Preserving Historic Fabric	10%			12,483	
Overhead & Profit	20%			27,463	
Contracting Method Adjustment (Negotiated Contract)	15%			24,717	
TOTAL CONSTRUCTION COST				\$ 189,494	\$ 189,494

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Description	Quantity	Unit	Material Cost		Total Including
			Unit Cost	Amount	All Mark Ups
BUILDING C - Low Priority (Priority 2)					
					<i>Mark Ups</i>
					<i>2.09484</i>
Temporary Protection/Barriers	1	LS	\$ 1,000.00	\$ 1,000	\$ 2,095
Scaffolding/Lifts/Access	1	LS	5,000.00	5,000	\$ 10,474
Masonry Conditions					
Brick Pointing - Rake & Repoint					
- West	-	SF	30.00	-	\$ -
- East	740	SF	30.00	22,200	\$ 46,505
- North	200	SF	30.00	6,000	\$ 12,569
- South	200	SF	30.00	6,000	\$ 12,569
Missing/Damaged Brick - Remove & Replace Damaged Brick					
- West	-	SF	100.00	-	\$ -
- East	16	SF	100.00	1,600	\$ 3,352
- North	4	SF	100.00	400	\$ 838
- South	-	SF	100.00	-	\$ -
Install Bollards @ Corners	1	EA	650.00	650	\$ 1,362
Limestone					
Replace Limestone Beltcourse					
- East	8	LF	1,250.00	10,000	\$ 20,948
Patch/Repair Limestone Spalls					
- West - Small	-	EA	325.00	-	\$ -
- West - Large	-	EA	675.00	-	\$ -
- East - Small	-	EA	325.00	-	\$ -
- East - Large	6	EA	675.00	4,050	\$ 8,484
- North - Small	2	EA	325.00	650	\$ 1,362
- North - Large	1	EA	675.00	675	\$ 1,414
- South - Small	-	EA	325.00	-	\$ -
- South - Large	1	EA	675.00	675	\$ 1,414
Repair Limestone Cracks - Grout, Pin as Required					
- West	-	EA	425.00	-	\$ -
- East	6	EA	425.00	2,550	\$ 5,342
- North	2	EA	425.00	850	\$ 1,781
- South	-	EA	425.00	-	\$ -
Repoint Limestone					
- West	11	LF	20.00	220	\$ 461
- East	-	LF	20.00	-	\$ -
- North	4	LF	20.00	80	\$ 168
- South	4	LF	20.00	80	\$ 168
Concrete Masonry Units					
CMU Cracks - Stucco Surface w/Lath, Seal & Paint					
- East	2	EA	975.00	1,950	\$ 4,085
- West	-	EA	975.00	-	\$ -
- North	0.5	EA	975.00	488	\$ 1,021
- South	0.5	EA	975.00	488	\$ 1,021
Windows - Repair, Restore Windows					
	4	EA	2,600.00	10,400	\$ 21,786
Alternate - Replace with Aluminum	4	EA	1,750.00		
Brick & Limestone Cleaning					
- East	-	SF	2.50	-	\$ -
	-	SF	2.50	-	\$ -

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Description	Quantity	Unit	Material Cost Unit Cost	Amount	Total Including All Mark Ups
BUILDING C - Low Priority (Priority 2)					
- West	-	SF	2.50	-	\$ -
- North	220	SF	2.50	550	\$ 1,152
- South	216	SF	2.50	540	\$ 1,131
Structural					
Lintels					
Clean & Paint Lintels	4	EA	350.00	1,400	\$ 2,933
SUBTOTAL				\$ 78,495	
Contingency	15%			11,774	
Subtotal				\$ 90,269	
General Conditions	20%			18,054	
Protecting & Preserving Historic Fabric	10%			10,832	
Overhead & Profit	20%			23,831	
Contracting Method Adjustment (Negotiated Contract)	15%			21,448	
TOTAL CONSTRUCTION COST				\$ 164,434	\$ 164,434

**JOHN MILNER ARCHITECTS
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BASIS OF ESTIMATE NOTES

Site Square Footage	N / A	
Building Square Footage	7,375	SF

Assumed Construction Period - 9 Months - Dates To be Determined

Unit Prices used in this estimate come from numerous sources, including previous projects in the North Jersey and surrounding areas, conversations with Suppliers, Contractors, Engineers, and Published Reference Manuals such as RS Means, Saylor, Walker and adjusted for location, site conditions, size of contract and project and other relevant factors.

All Cost are based on Sandy Hook, New Jersey Area Wage Rates

All Local Sales Tax are included in Subcontractor Unit Prices Rate (7%)

General Conditions are based on Above-Mentioned Respective Construction Periods

20% Overhead & Profit has been added to all Direct & Indirect costs.

A Contingency of 15% has been included for unforeseen conditions.

An Allowance of 10% for Protecting and Preserving Historic Fabric has been added

An Allowance of 15% for the Contracting Method Adjustment (Negotiated Contract) has been added

An Escalation factor of 4%/yr calculated to the midpoint of construction should be added once a construction period is established

Information used in the preparation of this Estimate includes:

John Milner Architects Limited Structural Investigation & Report draft, dated November 8, 2013,
received by ICI November 18, 2013

No architectural, engineering, or project management fees are included in this Estimate.

Appendix B:
Mortar Analysis

MORTAR ANALYSIS

During the course of the survey and probes, select mortar samples were taken as representative of the mortars found at the three building sections. Sample locations and extent of mortar types are indicated on the diagram below.

Visual observation indicated that the bedding mortar and pointing mortar were the same. It appears that the brick work was pointed as it was laid. With the exception of Sample W3, all of the samples taken are of very similar composition and color:

W1: Lime-based mortar - 3 parts yellow mason sand/1 part lime

T1: Lime-based mortar - 3 parts yellow mason sand/ 1 part lime

T2 Alternate: Lime- based mortar - 1 ½ parts yellow mason sand/ 1 ½ parts white mason sand/ 1 part lime

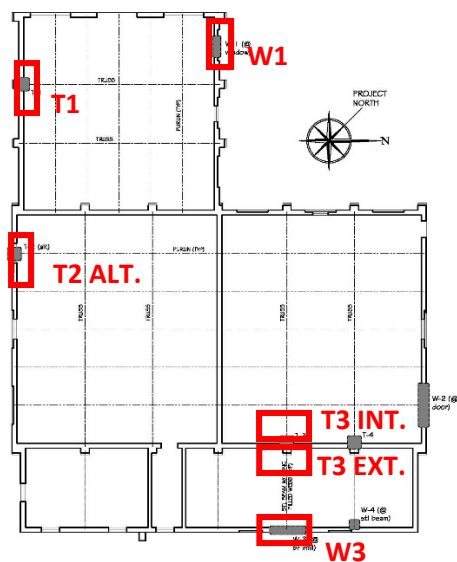
T3 Interior Wythe - Lime-based mortar: 2 parts yellow mason sand/ 1 part lime

T3 Exterior Wythe - Lime-based mortar: 3 parts yellow mason sand/ 1 part lime

Sample **W3** was taken at the brick infill around the window and consisted of two different mortars: early brick mortar and a harder, patching mortar. As indicated in the analysis, the original mortar is the same as the samples referenced above (3 parts yellow mason sand and 1 part NHL 3.5). The infill mortar, however, is significantly different and is the only mortar sample to contain cement (1 part gray Portland cement and 3 parts yellow mason sand).

Based on the mortar samples and common historic preservation practice, the bedding and pointing mortar recommended for future use is Type N (1 part cement/ 1 part hydrated lime/ 6 parts sand). This mortar is the best match for the age and hardness of the brick. Type N is a general-purpose, structural mortar, softer in nature, but more durable than the original lime mortar used on the Water Plant. Type N will provide a strength of 750 psi, and is recommended for severe weather exposure.

Where exterior masonry was removed for the exploratory probes, it was reinstalled by the mason using the following mixture - 1 part lime/ 1 part cement/6 parts yellow bar sand.



MORTAR SAMPLE LOCATIONS

MATERIALS CONSERVATION			
Mortar Analysis			
Project/Site: Sandy Hook Water Treatment Plant			
Location: Sandy Hook, NJ		Date Sampled:	
Analysis Performed By: M. Federico		Date Analyzed: 11/14/2013	
DESCRIPTION OF SAMPLE			
Type/Location: Unknown		SAMPLE No. T1	
Surface Appearance:			
Cross Section: None			
Color: white and gray		Texture: rough	
Hardness: 2.5 Mohs		Gross Wgt.: 50.00g	
COMPONENTS			
Fines:	Color: pale clay, matte	Wgt.: 0.99g	Wgt. %: 1.98%
	Organic Matter: None		
	Composition: Unknown		
Acid Soluble Fraction:	Wgt: 15.64g	Wgt. %: 31.28%	
	Desc: None	Filtrate Color: pale yellow	
	Composition: Carbonate		
Aggregate:	Color: light gray, buff	Wgt.: 33.37g	Wgt. %: 66.74%
	Grain Shape: angular, semi-round		
	Mineralogy: Unknown		
	Sieve analysis:	<u>Screen</u>	<u>% Retained</u>
		8	0%
		16	0.06%
		30	8.13%
		50	64.05%
	100	19.61%	
	200	4.98%	
	pan	3.17%	

ASSESSMENT

Mortar Type: Lime-based mortar.

Fines: Chalky, pale yellow and white. Matte.

Acid Soluble: Lime-based binder 100% soluble in acid.

Aggregate: Gray and brown aggregate. More than 70% passing through a size 30 screen.

RECOMMENDED FOMULATION

Lime-based mortar

3: yellow mason sand

1: NHL 3.5

PHOTOGRAPHS



Figure 1. Mortar Sample before acid digestion.

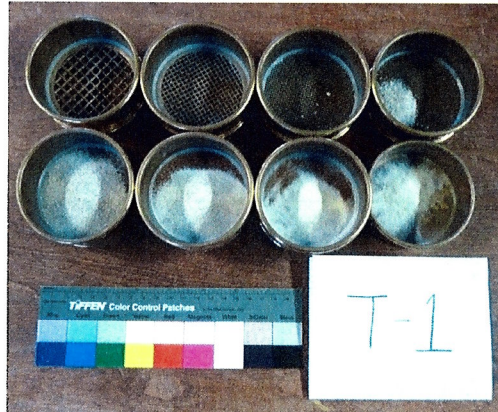


Figure 2. Sieved aggregate after acid digestion.

MATERIALS CONSERVATION			
Mortar Analysis			
Project/Site: Sandy Hook Water Treatment Plant			
Location: Sandy Hook, NJ		Date Sampled:	
Analysis Performed By: M. Federico		Date Analyzed: 11/14/2013	
DESCRIPTION OF SAMPLE			
Type/Location: Unknown		SAMPLE No. T-2 Alt	
Surface Appearance: soiled			
Cross Section: None			
Color: Light gray, buff		Texture: Rough	
Hardness: 3 Mohs		Gross Wgt.: 50g	
COMPONENTS			
Fines:	Color: Chalky white, yellow	Wgt.: 1.04g	Wgt. %: 2.08%
	Organic Matter: None		
	Composition: Unknown		
Acid Soluble Fraction:	Wgt: 8.80g	Wgt. %: 17.60%	
	Desc:	Filtrate Color: pale yellow	
	Composition: Carbonate		
Aggregate:	Color: Light gray, buff	Wgt.: 40.16g	Wgt. %: 80.32%
	Grain Shape: angular, semi-round		
	Mineralogy: Unknown		
	Sieve analysis:	<u>Screen</u>	<u>% Retained</u>
		8	0%
		16	1.52%
		30	20.85%
	50	65.19%	
	100	10.41%	
	200	1.58%	
	pan	0%	

ASSESSMENT

Mortar Type: Lime-based mortar

Fines: Chalky, white. Matte.

Acid Soluble: Lime-based mortar 100% soluble in acid

Aggregate: Gray and off-white aggregate. More than 70% passing through a size 30 screen.

RECOMMENDED FOMULATION

Lime-based mortar

1.5: yellow mason sand

1.5: white mason sand

1: NHL 3.5

PHOTOGRAPHS



Figure 1. Mortar Sample before acid digestion.



Figure 2. Sieved aggregate after acid digestion.

MATERIALS CONSERVATION			
Mortar Analysis			
Project/Site: Sandy Hook Water Treatment Plant			
Location: Sandy Hook, NJ		Date Sampled:	
Analysis Performed By: M. Federico		Date Analyzed: 11/14/2013	
DESCRIPTION OF SAMPLE			
Type/Location: Unknown		SAMPLE No. T-3 Interior Wythe	
Surface Appearance: Rough			
Cross Section: None			
Color: tan/grey		Texture: Rough	
Hardness: 2.5 Mohs		Gross Wgt.: 50g	
COMPONENTS			
Fines:	Color: Chalky white	Wgt.: 1.18g	Wgt. %: 2.36%
	Organic Matter: None		
	Composition: Unknown		
Acid Soluble Fraction:	Wgt: 12.85g	Wgt. %: 25.70%	
	Desc:	Filtrate Color: chalky white/ yellow	
	Composition: Carbonate		
Aggregate:	Color: Tan	Wgt.: 35.97g	Wgt. %: 71.94g
	Grain Shape: Angular		
	Mineralogy: Unknown		
	Sieve analysis:	<u>Screen</u>	<u>% Retained</u>
		8	%
		16	0.98%
		30	19.62%
		50	67.08%
	100	10.36%	
	200	1.22%	
	pan	0.74%	

ASSESSMENT

Mortar Type: Lime-based mortar

Fines: Chalky, pale yellow and white. Matte.

Acid Soluble: Lime-based binder 100% soluble in acid.

Aggregate: grey and brown aggregate. More than 70% passing through a size 30 screen.

RECOMMENDED FORMULATION

Lime-based mortar

2: yellow mason sand

1: NHL 3.5

PHOTOGRAPHS



Figure 1. Mortar sample before acid digestion



Figure 2. Sieved aggregate after acid digestion

MATERIALS CONSERVATION			
Mortar Analysis			
Project/Site: Sandy Hook Water Treatment Plant			
Location: Sandy Hook, NJ		Date Sampled:	
Analysis Performed By: M. Federico		Date Analyzed: 11/14/2013	
DESCRIPTION OF SAMPLE			
Type/Location: Unknown		SAMPLE No. T-3 Exterior Wythe	
Surface Appearance: soiled			
Cross Section: None			
Color: tan/yellow		Texture: Rough	
Hardness: 3 Mohs		Gross Wgt.: 50g	
COMPONENTS			
Fines:	Color: Chalky white	Wgt.: 2.11	Wgt. %: 4.22%
	Organic Matter: Brick fragments		
	Composition: Unknown		
Acid Soluble Fraction:	Wgt: 8.93g	Wgt. %: 17.86%	
	Desc: None	Filtrate tan, yellow	
	Composition: Carbonate		
Aggregate:	Color: Tan	Wgt.: 35.97g	Wgt. %: 71.94g
	Grain Shape: Angular		
	Mineralogy: Unknown		
	Sieve analysis:	<u>Screen</u>	<u>% Retained</u>
		8	0%
		16	1.04%
		30	25.74%
		50	67.57%
		100	5.02%
		200	0.63%
	pan	0%	

ASSESSMENT

Mortar Type: Lime-based mortar

Fines: Chalky, pale yellow and white. Matte.

Acid Soluble: Lime-based binder 100% soluble in acid.

Aggregate: grey and brown aggregate. More than 70% passing through a size 30 screen.

RECOMMENDED FORMULATION

Lime-based mortar

3: yellow mason sand

1: NHL 3.5

PHOTOGRAPHS



Figure 1. Mortar sample before acid digestion



Figure 2 Fines after acid digestion



Figure 3 Sieved aggregate

MATERIALS CONSERVATION			
Mortar Analysis			
Project/Site: Sandy Hook Water Treatment Plant			
Location: Sandy Hook, NJ		Date Sampled:	
Analysis Performed By: M. Federico		Date Analyzed: 11/14/2013	
DESCRIPTION OF SAMPLE			
Type/Location: Unknown		SAMPLE No. W-1	
Surface Appearance: Rough			
Cross Section: None			
Color: Pale white		Texture: Rough	
Hardness: 2.5 Mohs		Gross Wgt.: 25.00g	
COMPONENTS			
Fines:	Color: Chalky white, yellow	Wgt.: 0.64g	Wgt. %: 2.56%
	Organic Matter: None		
	Composition: Unknown		
Acid Soluble Fraction:	Wgt: 7.71g	Wgt. %: 30.84%	
	Desc: None	Filtrate Color: chalky white	
	Composition: Carbonate		
Aggregate:	Color: Yellow, tan, brown	Wgt.: 16.65g	Wgt. %: 66.60%
	Grain Shape: angular, semi-round		
	Mineralogy: Unknown		
	Sieve analysis:	<u>Screen</u>	<u>% Retained</u>
		8	0%
		16	0%
		30	8.25%
		50	66.47%
	100	21.18%	
	200	2.29%	
	pan	1.18%	

ASSESSMENT

Mortar Type: Lime-based mortar

Fines: Chalky, pale yellow and white. Matte.

Acid Soluble: Lime-based mortar 100% soluble in acid.

Aggregate: Gray and brown aggregate. More than 70% passing through a size 30 screen.

RECOMMENDED FORMULATION

Lime-based mortar

3: yellow mason sand

1: NHL 3.5

PHOTOGRAPHS

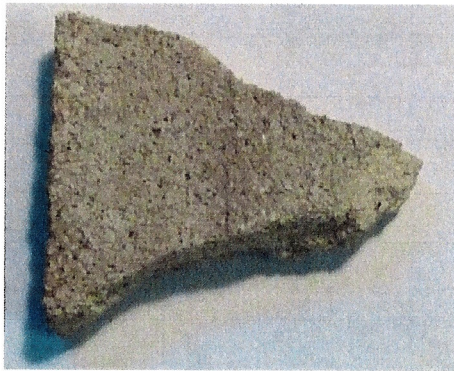


Figure 1. Mortar Sample before acid digestion.



Figure 2. Sieved aggregate after acid digestion.

MATERIALS CONSERVATION			
Mortar Analysis			
Project/Site: Sandy Hook Water Treatment Plant			
Location: Sandy Hook, NJ		Date Sampled:	
Analysis Performed By: M. Federico		Date Analyzed: 11/14/2013	
DESCRIPTION OF SAMPLE			
Type/Location: Unknown		SAMPLE No. W3	
Surface Appearance:			
Cross Section: None			
Color: white and gray		Texture: variegated smooth and rough	
Hardness: 4 Mohs		Gross Wgt.: 50.00g	
COMPONENTS			
Fines:	Color: tan, gray, matte	Wgt.: 1.24g	Wgt. %: 2.48%
	Organic Matter: None		
	Composition: Unknown		
Acid Soluble Fraction:	Wgt: 12.84g	Wgt. %: 25.68%	
	Desc: None	Filtrate Color: pale yellowe	
	Composition: Carbonate		
Aggregate:	Color: gray, brown, yellow	Wgt.: 35.92g	Wgt. %: 71.84%
	Grain Shape: angular, semi-round		
	Mineralogy: Unknown		
	Sieve analysis:	<u>Screen</u>	<u>% Retained</u>
		8	9.29%
		16	1.31%
		30	13.07%
		50	52.23%
	100	21.76%	
	200	1.44%	
	pan	0.90%	

ASSESSMENT

Mortar Type: Sample W-3 consisted of both Portland and lime-based mortars. The Portland-based sample did not fully break down during acid digestion.

Fines: Tan and gray fines, matte.

Acid Soluble: Due to Portland cement content, large clusters did not dissolve.

Aggregate: Gray and brown aggregate. More than 70% passing through a size 30 screen.

RECOMMENDED FOMULATION

Lime-based mortar

3: yellow mason sand

1: NHL 3.5

Portland-based mortar

3: yellow mason sand

1: gray Portland cement

PHOTOGRAPHS



Figure 1. Mortar Sample before acid digestion.



Figure 2. Sieved aggregate after acid digestion.

DATE: 12/5/2013

REVIEW COMMENTS

PARK AND PKG. NO: Draft Report dated November 25, 2013

PROJECT: PMIS 152823A Limited Structural Investigation & Report, Sandy Hook Water Plant Building 341

REVIEWER: GATE

NO.	DRAWING	REVIEW COMMENTS	ACTION TAKEN ON COMMENTS
1.	Page 3	Executive Summary: Identify also the masonry consultant.	Knapp Masonry has been added.
2.	Page 3	Executive Summary: Survey also included lower concrete roof deck & any other areas of structural deterioration; if no other areas of deterioration were found, state such somewhere within report.	Included "Lower concrete roof" Also added "parapet walls" for other areas of structural deterioration.
3.	Page 3	Executive Summary: Include probing of steel lintels.	Included "probing of steel lintels"
4.	Page 3	2 nd paragraph, line 4: Need elevation drawings to "supplement the written document with ... drawings of each recommendation as applicable", per SOW 2.0 Scope B.8.	Drawings of elevations are now included.
5.	Page 3	Executive Summary: Include exterior mortar analysis (for future pointing and bedding).	Included "exterior mortar analysis"
6.	Page 3	Executive Summary: Clarify if last sentence means that all recommended repairs must be undertaken, and if so, identify within what timeframe (there is no Conclusions section). Also, identify if/how work could/should be phased if possible, or if it must be performed simultaneously.	Conclusion section has been added. Work has been prioritized in the conclusion and cost estimate has been modified.
7.	Page 4	Line 1: Change "Hook Gateway" to "Hook Unit of Gateway".	Changed to "Hook Unit of Gateway"
8.	Page 4	Line 3: Consider replacing "small" with "lower", and adding length.	Replaced with "lower" and added length
9.	Page 4	Line 9: Please identify "wood battens"; are they like sleepers on the steel?	"Wood battens" have been removed.
10.	Page 4	Line 12: Clarify if beams are "steel".	Clarified that beams are "steel"
11.	Page 4	Last Paragraph appears to be a summary: Importance and necessity of repairs seems understated. Any urgent safety concerns (falling masonry, stone & concrete)? For example, Maintenance has picked up falling debris before and subsequent to the field investigation.	Stated safety concerns and priorities.
12.	General	Specific areas of repairs are not delineated/shown (see SOW, p. 5, B.8)	Drawings of elevations have been added.

NO.	DRAWING	REVIEW COMMENTS	ACTION TAKEN ON COMMENTS
13.	Page 5	Line 2: Somehow identify portion of original building referred to (Area B in SOW). Lines 1, 2, 3 & 5: Identify cause(s) of needing reconstruction, rotating outward, deteriorated coping and poor brick.	Building has been divided into sections, drawings have been provided and causes have been identified where evident.
14.	Page 5	Line 3: JMA's "east" is different than SOW (clarify throughout document); note that this "east" is also different than the "extension on the south side" from page 4 (suggest including a key plan).	A key plan has been added to clarify directions.
15.	Page 6	Figure 3: Change "structural" to "structurally".	Changed to "structurally"
16.	Page 6	Clarify west, east, north and south (typical throughout document); for example, there can only be two stepped 1910 walls – yet 3 are noted. A key plan with north arrow would be helpful. The written orientations and location descriptions such as "base of purlins" are insufficiently clear (confusing to most); thorough photos with delineations would be helpful throughout document. Dimensions (i.e. square & linear feet) delineated on photos would be helpful throughout document. Identify portions of building (i.e. areas A, B & C from SOW, or similarly).	Key Plan has been added.
17.	Page 6	3 rd Paragraph, line 2: location of brick infill is not clear; identify photographically.	Photograph changed, drawings have been added and show location of infill.
18.	Pages 6 & 7	Identify/clarify: 2 nd paragraph, line 3: north side; 3 rd paragraph, line 3: north side; 4 th paragraph, line 3: west side; 5 th paragraph, line 3 (top of p. 7): west side	Key Plan and drawings have been added.
19.	Pages 6 & 7	Identify/clarify: repetitious 83 and 90 linear feet: is this all? Coincidentally same?	Quantities have been modified.
20.	Page 7	Recommendations: Similar comments regarding clarifying portions of building, orientations, dimensional delineations, photos, etc.	Key plan and drawings added.
21.	Page 7	Recommendations, line 2: "pointed"?	Changed to "pointing".
22.	Page 8	Recommendations: Similar comments regarding clarifying portions of building, orientations, quantities, photos, etc.	Key Plan has been added, quantities and photos have been modified.
23.	Pages 9 & 10	Recommendations: Similar comments regarding clarifying portions of building, orientations, quantities, photos, etc.	Key Plan has been added, quantities and photos have been modified.
24.	Pages 11 to 16	Recommendations: Similar comments regarding clarifying portions of building, orientations, quantities, photos, etc.	Key Plan has been added, quantities and photos have been modified.
25.	Page 11	Recommendations: The "entire" belt course and "all" of the two brick courses?	Recommendations have been modified.
26.	Page 12	B. DAM"A"GED	Spelling fixed.

NO.	DRAWING	REVIEW COMMENTS	ACTION TAKEN ON COMMENTS
27.	Page 16	F. DETERIO"R"ATED	Spelling fixed.
28.	Pages 17 & 18	Recommendations: Similar comments regarding clarifying portions of building, orientations, quantities, photos, etc.	Key Plan has been added, quantities and photos have been modified.
29.	Page 18	Recommendations: Consider qualifying/limiting recommendation, and differentiating from page 17, by adding opening such as "Where deterioration is limited to holes and hairline cracks,..."	We are recommending stucco on CMU infill surfaces to deter future water infiltration as a precautionary measure. This will resolve the issue of holes and hairline cracks without addressing them specifically.
30.	Page 18	Recommendations: Without the clarifications requested above, it is difficult to discern if this treatment is recommended at all CMU infill areas on the building except the 2 noted on page 17.	See Comment #29.
31.	Page 18	Recommendations, line 3: Change "should painted" to "should be painted"	Changed to "should be painted"
32.	Page 19	VEGETATION: Similar comments regarding clarifying portions of building, orientations, quantities, photos, etc.	Key Plan has been added, quantities and photos have been modified.
33.	Page 20	Line 2: Change "long" to "longer". 1 st paragraph: Similar comments regarding clarifying portions of building, orientations, quantities, photos, etc.	Changed to "longer". Key plan added, quantities and photos have been modified.
34.	Page 20	Small photos are difficult to see; larger photos would be more helpful (typical throughout document).	Photographs have been enlarged.
35.	Page 20	Recommendations: Clarify recommended replacement material where currently missing and/or plastic. At SOW Photo 21, does not JMA recommend reinstallation of an abandoned RWC? Any recommendations for adding interim roof drainage points along long sides of Area A?	Although RWCs, scuppers and leader boxes will be part of the roofing project and are not in this contract, JMI would recommend replacing them with copper.
36.	Page 21	Windows: Similar comments regarding clarifying portions of building, orientations, quantities, photos, etc.	Key Plan has been added, quantities and photos have been modified.
37.	Page 21	Recommendations: Address asbestos-containing window putty.	Reference added per hazmat report.
38.	Page 21	Alternate: Address pros/cons of aluminum option (recommendation?).	Factory-finished aluminum (or fiberglass) windows would stand up better to the shore environment than steel windows. We don't feel that the replacement windows installed in 1971 are character-defining and that an alternate material can be considered.
39.	Page 22	Recommendations: Regarding the several special attention areas, see similar comments regarding clarifying portions of building, orientations, quantities, photos, etc.	Key Plan has been added, quantities and photos have been modified.
40.	Masonry Assessm't	Provide structural engineer signature & seal on final copies, per SOW 4.0 Submittals 6.a.	Keast & Hood will provide signed and sealed title page for hardcopy submittal on January 2, 2014.
41.	Masonry Assessm't	Need recommendations for coping stones damaged by fasteners, and probably adhesive, of reroofing termination bars; include in estimate.	Replacement coping stones are included in estimate.

NO.	DRAWING	REVIEW COMMENTS	ACTION TAKEN ON COMMENTS
42.	Pages 23 to 36, and 38 to 55	Include report page numbers.	Report page numbers coordinated with JMA report.
43.	Page 23	II, line 4: Consider changing "a one" to "a lower one"	Revised.
44.	Page 23	II, 2 nd paragraph, line 4: Please identify "wood battens"; are they like sleepers on the steel? While the Park would prefer references to the SOW Area denotations throughout the document, the "Area C" appears to be the only reference; be consistent throughout report.	The term "wood batten" has been removed.
45.	Page 24	To JMA: Please confirm that one less interior probe than required was performed, and initiate credit correspondence.	8 probes, per contract, were performed. Interior truss probes: T1, T2 (ALT), T3 and T4. Lintel/window probes W1, W2, W3 and W4 at alternate location were determined in field.
46.	Page 25	IV.A.2, 4 th paragraph: Discussed by all parties prior to the field work being performed, the limited number of probes was intended as being representative samples, and should be noted as such in the report.	This information was added to section III.B
47.	Page 25	IV.A.3.A-1: If section loss enumerated on above does not need to be made up, then state such.	Added a bullet item, "Notify engineer to review existing steel conditions, if no significant section loss then no reinforcements will be required."
48.	Page 26	A-2, first bullet: Recommendations for truss bearing locations within original tall section (SOW Area A)? 2 nd bullet: Aren't stacked plates only at T-1 (what about all others)?	Repairs noted in A-2 are for the addition roof trusses only. The original tall section had solid single piece bearing plates. A new bullet point was added regarding cleaning the bearing plates of the original tall section.
49.	Page 26	A-3: Any section loss to be made up? 1 st bullet: "temporarily"	Now A-4: From the one probe reviewed, it is anticipated that only cleaning will be required. If contractor notices significant section loss, they would be directed to notify engineer/architect. Note revised.
50.	Page 26	A-4: Any section loss to be made up?	Now A-5: From the one probe reviewed, it is anticipated that only cleaning will be required. If contractor notices significant section loss, they would be directed to notify engineer/architect.
51.	Page 26	B: Steel Lintels: Denote probe access (similar to trusses).	Information was added to section III.B
52.	Page 27	3. Recommendations: Any section loss to be made up? Confirm that all lintels referenced in this section are located within CMU – not brick (except W-3); only CMU is to be replaced, as brick is to be salvaged.	From the probes reviewed, it is anticipated that only cleaning will be required at some lintels. If contractor notices significant section loss, they would be directed to notify engineer/architect.
53.	Page 27	B-1: Clarify nine or 8? Identify which openings. "Expose".	Note revised.
54.	Page 27	B-2: Clarify three or 4? Identify which openings. "Expose".	Note revised.

NO.	DRAWING	REVIEW COMMENTS	ACTION TAKEN ON COMMENTS
55.	Page 27	B-3: Clarify how a third of the steel lintel is to be removed if it is comprised of 2 pieces. 1 st bullet: Is a third to be removed AT A TIME?	Lintel will need to be field cut. Only 1/3 of lintel to be removed at a time, last bullet item is to repeat the procedure.
56.	Page 27	C.1, 1 st paragraph: line 6: replace "shifts" with corbels"? line 8: change "the wall" to "the exterior wall"?	Note revised.
57.	Page 27	C.2, 2nd paragraph, line 1 (& page 28, lines 1 & 2): Which wall? The T-3/T-4 wall all the way to the west exterior? Or all similar walls (SOW Areas A & B)?	Note indicates, "The southern wall of the original building". This is the wall facing the main street.
58.	Page 28	2 nd paragraph, line 1: Replace "1921" with "1912"	Changed to 1913.
59.	Page 28	3 rd paragraph: Cause?	The cause for this crack is not easily determined, but it could suggest a thermal expansion issue. Note added to report.
60.	Page 28	3. Recommendations: "coordinated"; C-2: Corner "of the addition"	Note revised
61.	Page 28	D: Relocate "Access was also provided to the low roof exterior in the south via ladder" to page 29 E? Sheathing condition/recommendation? Consider replacing "joist(s)" with "rafter(s)" throughout. Rafter & sheathing recommendations in light of parapet reconstruction?	Note revised
62.	Page 28	D.1: Does sheathing rest on battens/condition of battens? D.2: Condition of sill?	Battens was removed. Sill = wall plate. Wall plate is to be replaced with parapet reconstruction.
63.	Page 28	D-1: Replace with what/pressure-treated?	Note revised
64.	Page 29	Please note that concrete is actively falling from the slab (ceiling) and is a safety concern of the Park. Recommendation for wood infill section/can it remain?	Added an additional recommendation to replace the wood infill with pressure treated lumber.
65.	Page 29	Conclusion: Consider relocating "and masonry bearing walls" to a new 2 nd paragraph and summarizing same.	Revised.
66.	Page 30	Image 3: Replace "1921" with "1912".	Revised.
67.	Page 31	Image 4: Replace "renovation" with "drawing".	Revised.
68.	Page 32	Image 6: T-3 location?	Probe plan is now called out as Image 16. Referenced at all other images.
69.	Page 33	Image 9: W-3 location?	Probe plan is now called out as Image 16. Referenced at all other images.
70.	Page 35	Image 13: Location adjacent to T-4? Image 15: Location adjacent to W-3 or W-4?	13 – northeast corner of the original building. 15 – just inside the east addition of the north portion of the original building
71.	Page 36	In the absence of the SOW Area A, B & C notations or an overall key plan, this drawing served as a useful reference for the entire report; it should include a north arrow.	North arrow added.

NO.	DRAWING	REVIEW COMMENTS	ACTION TAKEN ON COMMENTS
72.	General & Estimate	In the absence of the SOW Area A, B & C breakdown and options (both required), provide some mechanism acceptable to the Park, in coordination with Architectural recommendations, for controlling construction costs, i.e., phasing. For example, does JMA recommend the steel truss repair, the parapet walls and roofs as Phase 1, and the masonry wall field repointing, crack repair, infill windows and other repairs as Phase 2? Alternatively, what is necessary to install new roofs?	Work has been prioritized and cost estimate has been reorganized by building section and priority. Priority 1 items are required for roof installation in our opinion.
73.	Estimate	Pages 38 to 41: Update estimate as necessary related to this review.	Cost estimate has been updated and reorganized.
74.	Estimate	Pages 38 to 41: Include Labor costs throughout.	Per Denver Service Center – Class C cost estimates do not separate labor and materials – they are unit costs.
75.	Estimate	Pages 38 to 41: Per SOW 1.0 Background, A. Overview, 4: Include required replacements/work associated with items related to the structural deficiencies, such as roof decking, roof rafters and windows.	Roof joists, sill, windows and roof deck included.
76.	Estimate	Pages 38 to 41: Include ALL recommendations, such as bollards (p. 8).	All items are now in cost estimate.
77.	Page 42	What/which are recommended bedding and pointing mortars that were used for the exterior masonry reinstallations?	Section added for mortar.
78.	Page 43	Identify which mortar samples are "representative pointing and bedding mortars throughout all areas of the building", per SOW 4.0 Submittals 4.	Section added for mortar.
79.	Pages 44 to 55	Are the mortar strengths available?	No. The mortar analysis identified mortar characteristics only and a recommended formula for repointing.
80.	Pages 44 to 55	Identify and comment on differences in formulations.	Section added for mortar.
81.	General	Recognizing that a reroofing project triggered the need for this assessment, it is the Park's opinion that the deteriorated condition of the parapets is a direct result of the poor roof details, which JMA opted to not comment on or identify as a cause.	A more thorough discussion of causes has been added.
82.	Overall	Thank you.	

DATE: 01/06/2014

REVIEW COMMENTS

PARK AND PKG. NO: Draft Report dated December 31, 2013

PROJECT: PMIS 152823A Limited Structural Investigation & Report, Sandy Hook Water Plant Building 341

REVIEWER: GATE

NO.	DRAWING	REVIEW COMMENTS	ACTION TAKEN ON COMMENTS
1.	P. 4	3 rd paragraph, line 5: Sizes of Buildings B & C are transposed.	Corrected.
2.	P. 5	Key Plan: Two elevations are incorrectly noted.	Corrected.
3.	P. 20	Alternate: Include justification for aluminum option in report, similar to JMA's previous Action Taken Comments.	Included justification.
4.	P. 22	Last line: delete "by".	"By" deleted.
5.	P. 27, K&H	II, line 4: Change "a one" to "a lower one". II, 2 nd paragraph, line 4: Area incorrectly changed to "B".	References have been updated.
6.	Pp. 29 & 30, K&H	3 Recommendations: For A-1 through A-5 as applicable, please define significant and insignificant thresholds and recommendations for each. For example, recommendation for insignificant loss may be clean and coat as already noted for some (A-1, A-4 & A-5), while recommendation for significant loss may be to consult with engineer (once threshold is defined) as currently only noted for one (A-1).	A percentage was added to the notes indicating the threshold for significant section loss.
7.	P. 31, K&H	B-1: Correct "nine" or "8"? B-2: Correct "three" or "4"?	Items have been coordinated.
8.	P. 32, K&H	4 th paragraph: Previous Action Taken Comment indicates that a note regarding possible cause of thermal expansion has been added, but cannot find in report; please identify location.	Text has been added to the paragraph.
9.	P. 32, K&H	4 th paragraph, last line: Change "fo" to "of".	Corrected.
10.	P. 36, K&H	Image 6: Identify location, as done for Image 5 (is it T-3?).	Reference to probe number added.
11.	P. 37, K&H	Image 9: Identify location, as done for Image 10 (is it W-3?).	Reference to probe number added.
12.	P. 40, K&H	Image 16: Previous Action Taken Comment indicates that a north arrow has been added, but cannot find.	North arrow added to plan.
13.	Pp. 43 to 54, Estimate	While the Park concurs that unit costs are acceptable, representing the estimate as material costs without labor costs is misleading. Please either remove the labor cost columns or simply clarify in the end notes on page 54.	Labor cost columns have been removed.
14.	Overall	The Park recognizes and appreciates the significant improvements to this version over the initial draft. Thank you.	